THE INSTITUTE OF CONSERVATION

Conservation in Colour

Innovations and experiences in creating colour for textile treatment and display.

Postprints from the Symposium of the ICON Textile Group

8th November 2019

People's History Museum Manchester

Edited by Viola Nicastro and Terri Dewhurst

Contents

Foreword

Viola Nicastro, Icon Textile Group Events Coordinator

The 2019 Icon Textile Group Colour Symposium took place on the 8th November at the People's History Museum in Manchester and it was attended by 51 delegates.
This one-day event included a programme of formal presentations, and an informal 'Show and Tell' session focusing on practical suggestions on the topic of colouring techniques in textile conservation, and a roundtable discussion about dyes.
This symposium coincided with the Textile Society conference '*The Power of Colour'* taking place on the 9th November at the Museum of Science and Industry, Manchester.
A guided tour of the Textile Conservation Department of the People's History Museum, focusing on the treatment and display of painted banners, and a tour of the Conservation Studio of the Whitworth Art Gallery and the exhibition '*Indigo; A Blue to Dye For'* were also available.

The programme of talks and discussion focussed on the theme of Colour, which centred around the ethical and practical challenges of camouflaging, digital printing, dyeing, infilling and creating non-invasive overlays for the treatment of textiles with extensive areas of loss, fading, staining, or presenting disfiguring past treatments.
During the day a wide range of objects was covered, including the treatment of banners, flags, tapestries, carpets, furnishings, contemporary textiles, costumes and accessories. The individual challenges presented by each object and the different techniques employed to re-integrate colour gave us the opportunity to question our practise and to reflect on the reversibility and non-reversibility of what we use and debate what is ethically appropriate and acceptable.
A presentation and roundtable discussion on the topic of dyes encouraged us to reflect on what type of dyes we use, why, and what challenges we face to recreate colour. The topic of sustainability of natural dyes compared to synthetic dyes was also discussed.
The 'Show and Tell' session also gave an insight on practical solutions to painting Reemay®, Japanese paper, covering magnets, and more.

This small event was set up to encourage discussion and knowledge exchange between the delegates. The content was shared live on Twitter.

On behalf of the Textile Group Committee I would like to thank everyone who contributed to the 2019 Symposium and associated activities including the speakers and our Manchester hosts. It was a very successful and well-received event, where everyone actively shared their experience. Thank you also to all my Committee colleagues for their hard work in planning and managing the event.

Viola Nicastro
ICON Textile Group Committee Events Coordinator

The Treatment of Previous Repairs in an Eighteenth Century Carpet

Nicola Gentle, ACR, Free-lance textile conservator & researcher, Devon

Summary

This paper describes the treatment of previous repairs in an 18th century carpet to bring back the original concept of imagery and design, while at the same time taking the viewer's eye away from visual distraction [1]. A retouching technique using a system of water-based paints developed at the Rijksmuseum, Amsterdam, was recently adopted in England during conservation of a carpet in the care of the National Trust [2].

In the past, extensive overstitching repairs have been carried out where the wool knots had deteriorated. Often the yarns used did not match that of the area of original carpet. To remove these repairs would weaken the carpet's structure but by retouching them with paint, the stability of the stitching could be retained and the balance of the design restored.

Introduction

In 2018, conservation work was completed on an important British carpet. It was designed by architect Robert Adam (1728 - 1792) for Saltram House in Devon, then home to John Parker, 1st Baron Boringdon (1735 - 1788). Adam was approached by Parker in 1768 to remodel the East Front of Saltram House as a suite of Neoclassical rooms to include a Saloon and Dining Room. These interiors are considered amongst the finest examples of his classical style, which created harmony and balance in every aspect from floor to ceiling and all details in between.

The Saltram Saloon carpet

Typically, Adam's design for a carpet would reflect that of the ceiling in proportion of layout and repeated motifs. Shading around the motifs throughout the carpet was a key feature giving a three-dimensional effect that echoes the elaborate plaster moulding on the ceiling.

Drawings for the Saltram Saloon carpet are preserved in Sir John Soane's Museum, London, which also holds his designs for the Saloon ceiling [3], (Fig 1).

Figure 1. The Saloon at Saltram after conservation of the ceiling and the carpet. © National Trust

Carpets for both the Saloon and the Dining Room were made by Thomas Whitty (1713 – 1792) at his renowned factory established in 1755 in Axminster, Devon. The one made for the Saloon measures over 13 metres by 6 metres and is thought to weigh around 310 kilos.

The construction of the carpet is on a wool warp and a bast vegetable fibre weft with a shallow pile of wool knots. A count of around 38 knots per square inch would have placed it in the classification 'best sort' within the range of Axminster's production at that date [4]. The scale and boldness of Adam's design did not require a finer knot count. Much skill can be observed in the production; it is understood that Thomas Whitty used the labour of young weavers aged around 10 to 15 years for their agility in knotting. Initially, his own children were put to good use overseen by their aunt, Betty Harvey, (Church 2004; Axminster Heritage Centre 2005).

During the recent observations of the carpet section by section, evidence of the diagonal exchange in the weft between adjacent weavers has been recorded, showing that six workers were employed across its width. The process of weaving on such a wide loom was evolved by Whitty and that made him a prime maker of his day. The textile conservators working on the carpet were always mindful and appreciative of the very young skilled weavers.

A sum of £126 was paid for the carpet when it was delivered to Saltram in September 1770, the equivalent of around £22,000 today, (Johnson 1998, Evans 2012).

History of the carpet's use

It is not known how the carpet fared in its early years. Tradition suggests that for dances in the Saloon it would be rolled up and a design chalked onto the bare floorboards. However, the extent of repairs it underwent in the 19th century (discussed more fully below) suggests not only degradation of the wool knots but also deterioration from more general wear and tear.

Saltram House remained with the Parker family until 1957 when it was acquired by the National Trust. During early years of Trust ownership, the carpet continued to suffer physical damage due to arrangements of the Chippendale suite of furniture throughout the Saloon, rather than a more acceptable - and historically correct - placement around the edges. Although a drugget was used for a public visitor route along one side, the central area of the carpet was certainly walked upon for occasions such as candlelight suppers and concerts.

Latterly, protection was attempted during such events by laying down boards topped with a painted canvas replica which had been made for the filming of Jane Austen's 'Sense and Sensibility' in 1995. That brought its own problems of potential damage from the necessary physical manipulation of the covering layers over such a large area. By this time, everyday visitors were restricted to entering the Saloon at one end only where the carpet was partially rolled up. However, house staff were still required to walk across one corner every day to remove and replace security shutters at the windows.

Condition survey and assessment of previous repairs

In 1997, the author was commissioned to make a survey to assess current damage and deterioration of the carpet, knot by knot. For this, photographic images were pieced together on sixteen A3 boards and then Melinex® overlay sheets were annotated with the factors of condition - such as loss of pile and splitting.

As well as the concerns about condition, observations were made of extensive stitching repairs carried out in the past where the original wool knots had degraded or the more brittle weft yarns had deteriorated causing break-down of the weave structure. These were recorded on separate overlays, noting their quality of execution and colour-matching.

The stitching showed varying degrees of skill. Within the central 'lotus' cartouche, some repairs were extremely unsightly, distorting and damaging to both the structure and appearance of the carpet. In places, coarse linen threads had been randomly run through on the reverse before the cobbled wool stitching was worked on the pile face. Thankfully, this haphazard approach was relatively minimal. For the most part, the extensive repair stitching over original knots throughout the carpet had been nicely carried out but, more often than not, with incorrect colours.

Much of this type of repair follows what should be dark shadowing of motifs within the design, yet threads of yellow, golden, ochre, olive and green colours had been used. None of these ever matched the dull black of the original knots which had deteriorated considerably, no doubt due to use of an iron mordant in the dye, but are still discernible underneath. Analysis of some repair threads revealed a combination of natural and early synthetic dyes, suggesting most of the overstitching was made in the latter part of the 19th century [5].

The choice of lighter colours may be deliberate. Perhaps this was a 19th century attempt to brighten up the carpet: that would fit with the history of the House. In the 1880s, after years of financial troubles, Albert, 3rd Earl of Morley, brought the Parker family back to Saltram and began a major programme of refurbishment, (Johnson 2008, Evans 2012).

Shadowing within the Saloon Carpet's design

Shadowing around motifs throughout the carpet is integral to Adam's design, bringing it in harmony with the three-dimensional plasterwork on the ceiling. While remains of the original dark shading can still clearly be seen on the reverse, the overstitching made in brightly coloured thread on the pile face completely upsets the balance and concept of overall design.

Over the years, several bids were made to raise funding for conservation of the carpet. In 2002 and again in 2008, the author was asked to make feasibility studies regarding the possible removal of repairs. Trials were carried out to estimate time required to take out the different types of stitching and, more importantly, to assess impact on the carpet during the unpicking process and the condition of its structure afterwards.

Even when the repairs were easy to pull out, there was a worry that remains of the original knots were being disturbed. The unpicking process was seen to leave the weave structure very vulnerable with a need for some sort of strengthening and possible in-filling.

Conservation of the Saltram Saloon Carpet

In 2016, improvements to environmental control were put in place throughout the house, thus meeting the necessary criteria to secure funding for work on the carpet to go ahead as part of a larger Robert Adam Interior project which would also include conservation of the Saloon Ceiling and eventually cleaning of the damask wall-hangings [6].

Cleaning of the carpet was carried out in situ at Saltram. Firstly, thorough consistent vacuuming was undertaken by House staff and volunteers under the supervision of a textile conservator (the author). This was followed with surface wet-cleaning by an experienced specialist - Glyn Charnock, of Chameleon Cleaning, Norwich - using deionised water and the non-ionic detergent Dehypon® LS 54

applied through a sympathetic method he has evolved in collaboration with the National Trust textile conservators.

Then, a team of free-lance textile conservators based in the South West began support of the carpet, first working with pile face down, tacking in place a total backing of prepared linen cloth. Next, with the pile face up, a permanent pattern of stitching was worked onto the linen for overall strength and laid-couching made for more support within the areas of weakness. Gütermann® polyester 'Mara' threads were used, choosing just two colours that would blend either with the dark ground or everywhere else with the exposed weave-structure [7].

Dealing with past repairs

Decisions then had to be made about how to deal with the past repairs. In the central cartouche, the most damaging and unsightly ones were unpicked in order to release the distortion they were causing to the weave and remove any visual distraction to the original design. These areas were supported to the new linen backing. As well as laid-couching with polyester thread, 'brick' couching was carried out using wool yarns. Stitches were made over alternating double warps in a 'brick' pattern, replicating the spacing of missing knots, in order to stabilise the structure and give colour back in the weft direction [8].

However, the majority of repairs, both in the central lotus cartouche and the shadowing throughout are acceptable in their execution though incorrect in colour. To remove them would not only be time-consuming and costly, but also leave the original structure weakened.

The retouching method

It was known that a retouching method using paints had been developed and successfully carried out on previous repairs in tapestries at the Rijksmuseum, Amsterdam, (Albers 2012). Lascaux's Sirius® primary watercolour system comprises five colours (instead of the usual three) magenta, red, yellow, cyan and ultramarine, plus black and white. They are water-based paints with some acrylic content which come in a liquid form. Thus, a full range of shades can be mixed with precision using a drop-by-drop method and recipes for colour-matching can be noted to be reproduced as required [9]. The paints had been fully tested by the Rijksmuseum and showed very acceptable light- and wet-fastness qualities [10]. Although reversibility of the method is questionable, there seems sufficient justification to use the technique where it would only be applied on parts of a textile that are not original.

Before going ahead with this approach on the Saltram Saloon carpet, some trials were requested by the National Trust to compare Lascaux Sirius® watercolour black and Lascaux Artist Acrylic® black. The results with Sirius watercolour were by far the more compatible both in use and appearance: application of the paint was seen to penetrate the repair thread while not spreading to the original yarns. It gave a sympathetic finish in contrast to the Artist Acrylic which produced a superficial crusty layer.

With such a retouching method, the support given by old repairs in the carpet would be retained while the balance of Robert Adam's design concept would be regained.

In discussion with Ksynia Marko, then Advisor on Textile Conservation to the National Trust, the retouching treatment was considered to be an ideal solution. All the past deliberate changes to the carpet had already been fully recorded in the survey of 1997. Any future retouching adjustments would be noted likewise on new overlay sheets.

Understanding the process

Mieke Albers, senior textile conservator at the Rijksmuseum, was invited to Saltram to give a master-class in techniques of mixing colour and application of the paints. Although most of the incorrect colours in repairs to the shadowing could be treated with just two coats of Sirius® black, there were many places where more guidance was welcome. This training gave the conservators involved a good start for tackling the more complex areas, particularly in the various pink shades of the central 'lotus' and diverse colours of individual motifs (Fig 2).

The retouching phase would be carried out by the author and four of the textile conservators already involved in the project: they could recognise the repairs and also understood the condition of the carpet [11]. For this process, the established set-up on the roller-to-roller system used for the stitching phase was maintained, with an extra row of tables inserted to allow a longer overall view as the paint was applied, working section by section from the centre towards each warp end in turn (Fig 3).

Complex matching of colours necessary in the central 'lotus' and other individual floral motifs was helped by observation of the remains of original knots under the repairs and by referring to the same imagery on the other quarters of the carpet.

Figure 2. The conservators learnt how to make recipes using the drop-by-drop method of Lascaux's primary watercolour system.

Figure 3. Working through the carpet, section by section, from the centre out towards each warp end in turn.

Application of the paint

The use of very fine brushes and a recipe with little water could ensure containment of paint within the repair threads without spreading to neighbouring areas. This would also reduce drying time between applications and the set-up with long surface view ensured the retouching was totally dry before the section was rolled up.

Applying the black paint was often quite straight-forward in the shading of the geometric design. The method of retouching not only takes away the unsympathetic colours of the repairs but also unifies and disguises unevenness in the stitching and dulls any sheen on the threads that had been used in the 19th century.

Elsewhere, the shadow repairs could sometimes be very close to the original foliage colours and required concentration and some discussion to distinguish between them. It was especially satisfying to regain the flow of design within the floral garlands and to reduce the shiny gold stitches to a matt black shadowing, (Fig 4 & 5). Clarity within the flowers and definition of the individual varieties were restored simply by removing the distraction of the incorrect colours. It is known that Thomas Whitty had a particular interest in plants and botanical imagery, (Church 2004; MacInnes-Hurd 2012), (Fig 6 & 7).

Figures 4 & 5. Before and after retouching shadowing repairs within the floral garlands.

Use of replica carpet pieces

The next phase in the Robert Adam interior project was for Axminster Carpets™ to photograph the entire carpet and create templates for replica sections to be woven with the original design and colours. The replica pieces may be used in rotation as walkways across the room or as areas for interpretation of displays, thus enabling future flexibility and access to the Saloon while protecting the original from further damage. It was questioned: surely the colours for the replica weaving could just be created by digital enhancement - but without the conservators' retouching, how would the factory know what to enhance?

One aspect of the retouching treatment which it has not been possible to fully test yet is the 'rub' factor. The longevity of paint applied to repairs in a hanging tapestry could be very different to that used on a walked-upon carpet. Despite any risks of eventual loss of colour, the recent retouching process was seen as an opportunity to document the carpet's design in its original colours and to display this within Robert Adam's scheme for the Interior as a whole.

It is anticipated that the effect of future foot-fall in the Saloon will be carefully monitored – and reconsidered if necessary - most importantly in assessment of condition of the original textile under the replica, but also in recording how the retouching is faring.


Figures 6 & 7. Before and after retouching repairs to one of the floral motifs.

Conclusions

The Saloon at Saltram is considered to be one of Adam's finest design schemes. The overall aim of the Robert Adam Interior project was to return the complete space to how it would have looked at the beginning of the 19th century - that is, before the repairs to the carpet were made. The method of retouching has surely restored integrity and finesse to Adam's design.

This treatment was seen to give a sympathetic result both to the visual aspects of the carpet and to maintaining the support given by the well-worked past repairs. Thus, returning the original colours to the carpet would be justified and the treatment considered a means to counteract deliberate changes rather than merely compensate for loss. Above all, it was a way of documenting original visual information within an important object: the conservation of the carpet's design.

Much of the conservation treatment was carried out in view of the public. Interest in the National Trust's dialogue with the Rijksmuseum, Amsterdam, was certainly seen to enhance the experience of visitors to Saltram during that time. Since then, conservators from the National Trust Textile Conservation Studio, Norfolk, have worked in further collaboration with those at the Rijksmuseum to establish the retouching technique as a viable method to be considered on repairs in tapestries, (Langley 2019).

Acknowledgements

I would like to pay tribute to the personnel from the National Trust who supported this project over the years: particularly the late Sue Baumbach, Ksynia Marko, Marilyn Dunn and Neil Wressell. I thank the textile conservators who made the retouching method a success: namely Juliet Campbell, Liz Flintoff, Holly MacInnes-Hurd and Hester Walshaw. And many thanks are due to Mieke Albers of the Rijksmuseum for sharing her methods and expertise.

Notes

[1] The paper is based on one presented to the textile conservation group of VDR (Verband der Restauratoren), the German institute of conservation, at Nuremberg, June 2018, and subsequently published in the VDR journal Beiträge, issue 1/2019.
[2] Lascaux's Sirius® primary watercolour system.
[3] Sir John Soane's Museum Collection Online: Saltram Park, Devon: designs for the house and estate, for John Parker, 1768-82. Drawings for the ceiling are dated 1768 while those for the carpet are from 1769. http://collections.soane.org/drawings

[4] 9/10 knots per 5cm (1.97inch) on the weft, 14/15knots per 5cm (1.97inch) on the warp.
[5] Dye analysis was carried out at the Textile Research in Archaeology facility, York. Penelope Walton Rogers, unpublished report dated May 2003.
[6] The Robert Adam Interior project was able to go ahead thanks to the generosity of the Wolfson Foundation.
[7] With the theme of Colour, this paper focuses on treatment of the past repairs and does not address the many other issues encountered within the carpet project as a whole.
[8] Later, some retouching was made to blend the yarns more completely with original colours.
[9] Lascaux claims 78,000 hues can be achieved with this system.
[10] Samples of retouching on tapestries were successfully tested in the conservation wet-cleaning process of De Witt in Belgium.
[11] This phase of the project took a total of 660 work hours.

Materials and Suppliers

Dehypon® LS 54 from BASF
UK Supplier:
Conservation Resources
Building 345 Heyford Park
Upper Heyford, Bicester, Oxfordshire OX25 5HA
sales@conservation-resources.co.uk

Linen support: Artists Canvas NRO9
Claessens Canvas
Molenstraat 47, 8790 Waregem, Belgium
info@claessenscanvas.com

Polyester threads: Mara 50 and 70
A & E Gütermann®
Landstr. 1, 79261 Gutach-Breisgau, Germany
contact@guetermann.com

Wool yarns: ready-dyed Crewel and Tapestry wools
Appletons Wool Ltd

13 Meadow View
Crendon Industrial Park
Long Crendon, Bucks, HP18 9EQ, UK
sales@appletons.org.uk

Retouching paints: Sirius® primary watercolour system
Lascaux Colours & Restauro
Barbara Diethelm AG
Zürichstrasse 42
CH-8306 Brüttisellen, Switzerland
info@lascaux.ch
UK Suppliers:
Jackson's Art Supplies
AP Fitzpatrick

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Colour Conundrums and Digital Dilemmas: Printed Photographic Infill Patches for a 17th Century Tapestry

Jane Smith & Nadine Wilson, Senior Textile Conservator & Textile Conservator, National Trust Textile Conservation Studio

History of the project

Digitally printed photographic patches have been used to infill holes on three tapestries at the National Trust Conservation Studio over a period of 11 years. The tapestries are part of the collection at Cotehele, a National Trust property in Cornwall. They hang in the King Charles Room.

The tapestries are English, designed by Francis Cleyn who was the official designer and draughtsman to the Mortlake tapestry manufactory (Thomson 1906) and woven between 1670 –1690. They depict the Greek myth of Hero and Leander, originally designed as a set of six, although only three remain at Cotehele. In letters written in 1670 by Sir Sackville Crow, an English politician, they were considered to be a sought-after design and one of only four designs worth making (Thomson 1906: 285-286,302). 'Leander Taking Leave of His Parents' (w. 580cm x h. 288cm) depicts Leander, a young man from Abydos about to swim the Hellespont (a strait of water between Abydos and Sestos) to visit Hero, a priestess of Aphrodite, who is waiting in her tower on the island of Sestos. 'Leander Swimming the Hellespont' (w. 327cm x h. 278cm) shows this journey and 'Death of Hero and Leander' (w. 226cm x h. 282cm) shows the dead body of Leander washed onto the rocks of Sestos during a storm, with Hero distraught and about to collapse.

Figure 1. Death of Hero & Leander: Reverse of tapestry showing the extent of the 1960's adhesive patch treatment ©National Trust/Pete Huggins

The tapestries had come into the National Trust's (NT) care in 1974 but prior to this, they underwent restoration and an extensive adhesive patch treatment by the Anglo-Persian Carpet Company of South Kensington in the 1960's whilst in the care of the Edgcumbe Trustees. Surveys in 2005 and 2013, whilst the tapestries were still on display, identified that they were in a very poor condition; the adhesive had become discoloured and brittle leaving the tapestries stiff and inflexible in places. Assessed as being of importance to the NT's collection and through funding from the NT and Wolfson Foundation (an independent grant-making charity), a full programme of remedial conservation was possible.

This started in 2008 with 'Leander Swimming the Hellespont' arriving at the Studio for further assessment and treatment. The Anglo-Persian Carpet Company's work had resulted in areas of tapestry being cut away and linen patches, 69 in all, glued to the reverse to infill holes and support weak areas. The same method was also applied to the two other tapestries in the set; 'Leander Taking leave of His Parents' had 244 patches and 'Death of Hero and Leander' had 174 patches (7 types of linen and cotton were evident). The adhesive used was shellac and, in some areas, latex. Some of the patches had been painted on to match the design on the front.

Prior to wet cleaning and the commencement of the stitched treatment, the patches required removal. The adhesive had deteriorated to such an extent that the patches were easily peeled away but thick residue remained on the silk and wool weft and the wool warps, which needed to be removed. It was not possible to pass a needle through the tapestry at this point. Tests had been carried out at the Studio to find the best method of glue removal. The adhesive residue on the reverse of the tapestry was successfully removed with a mixture of 50:50 denatured alcohol/acetone which was poured through the tapestry whilst it was on a suction table (Arnott and Wilson 2010: 49-57). After the adhesive removal process was completed, each tapestry was sent for wet cleaning to De Wit, a wet-cleaning facility in Belgium. As well as general soiling, much of the adhesive residue was removed, though some orange/brown-coloured staining on the reverse of the tapestry was permanent.

Figure 2. Leander Taking Leave of His Parents: Detail of front of the tapestry showing the areas of loss after the removal of the 1960's adhesive patches ©National Trust/Nadine Wilson

Figure 3. Death of Hero & Leander: Front of the tapestry showing a detail of a shell with a plain 1960's infill patch ©National Trust/Pete Huggins

At the tendering stage of the project, consideration was given to how the holes left by the removal of the 1960s patches would be treated. Generally, when there are losses in a tapestry, smaller areas are re-warped and couched. Larger areas are infilled with plain fabric, either a plain weave wool or repp fabric, which imitates the tapestry weave. These infills should be identifiable as being an addition to the tapestry and should not mislead the viewer (Lennard and Hayward2006: 138-144). Over recent years, digital technology has been used more in the heritage sector, to allow objects that are damaged or have missing areas to be viewed as a whole, appearing similar to their original appearance (Lennard, F., Baldursdóttir, T. and Loosemore, V.2008: 55-65).

Previously conserved at the Textile Conservation Studio, 'The Separation of Abraham and Lot', a Mortlake tapestry from Blickling Hall, had also undergone a 1960s adhesive treatment by the Anglo-Persian Carpet Company. The large hole on Abraham's chest (20 x 40cm) was re-warped, brick-couched and holes in the foreground had plain repp patches inserted to fill in the less-detailed background losses. The decision was made to re-warp this relatively large hole in the chest as it was placed centrally in the design and did not have a large amount of detail other than drapery.

However, the Hero and Leander tapestries from Cotehele had extensive areas of loss, spread throughout the design. 'Leander Swimming the Hellespont' had a large loss of w. 92cm x h. 164cm and was not suitable for re-warping due to its size and the complexity of the design (featuring parts of the tower's column, the rocky shoreline and Hero's floral dress). It was felt that a plain infill patch would have been visually disruptive and to paint a patch with the missing design relied on excellent painting skills.

The use of printed infills in textile conservation

After discussions, it was decided to use a printed photographic patch on the advice of Ksynia Marko who, at the time, was Textile Conservation Studio Manager and National Trust Textile Conservation Advisor. It was a technique not previously used within the NT, although Marko was aware of full-sized printed facsimile tapestries being hung as replicas whilst the original tapestries were removed for conservation. Zardi & Zardi produced these for Houghton Hall and P.J. Keeling, the director, had given a paper at the Icon Textile Group Forum in April 2006 describing the method of digital printing. (Keeling 2007: 35-37) Frances Hartog had recorded the V&A's use of a digital patch infill on a carpet (Hartog 2009). Around this time, Alice Cole had also written an MA dissertation, 'Digital Printing for Textile Conservation', which detailed the printing techniques, types of inks available and fabrics suitable for printing (Cole 2007).

Commissioning the first photographic infill patch

The idea of using this method for the first Cotehele tapestry seemed achievable. With their experience of printing facsimile tapestries, Zardi & Zardi were commissioned to produce the printed patches in 2008. There were several stages involved in commissioning a patch for 'Leander Swimming the Hellespont'. To be able to produce the infill, source material from another tapestry of the same design was required. Fortunately, the National Trust has three examples of tapestries with the swimming scene; at Lyme Park, Anglesey Abbey and Hardwick Hall. The tapestry at Lyme Park, hanging in the entrance hall and woven by Mortlake, was chosen as it was the most similar in design and colour scheme.

Zardi & Zardi required high-quality images of both tapestries, using large format photography to produce 5x4 inch colour transparencies, which they considered necessary to enable good reproduction quality. Fortunately, the Studio used the services of a local professional photographer who still had this type of camera, at a time when digital photography was becoming the norm.

As a reference, size and colour scales were included in all images and dimensions of the missing sections of tapestry provided for Zardi & Zardi. At this stage, the conservators were warned that colour and size matching could potentially be a difficult and lengthy process.
For colour-matching purposes, A3 colour prints of each transparency were produced by the photographer on an ink jet printer onto photo paper, having first converted the transparencies to digital images. As most of the missing area of tapestry was brown and green in tone, these were used when altering the colour balance and a seemingly satisfactory colour match was achieved. The only notable difference between the colours of the two tapestries was the column; Lyme Park's had a blue column and Cotehele's was brown. Zardi & Zardi were able to alter the colour using Adobe Photoshop®. The fabric printing was undertaken by Elanbach, a printing company based in Wales.

Zardi & Zardi supplied a bleached, plain weave linen fabric to scour before the test prints were carried out. These showed that the white fabric had an impact on the overall colouring and appearance of the printed design. Following this, a series of further test prints were requested on different fabrics and the decision was made to test the printing onto a yellow ochre-dyed fabric; the weight of the supplied linen was most suited to use within the tapestry, but with dyeing it provided a better foundation colour on which to print, a more toned-down effect. The aim was to produce a patch that blended in tonally and receded from view, which was successful. From a distance, the tapestry image was complete and readable as a whole and on closer inspection, the photographic image shows the individual warps one would expect to see on a tapestry.

A full-sized photographic print of 'Leander Swimming the Hellespont' was used at Cotehele whilst the tapestry was being conserved in the Studio.

Printed infill patches for the 'Leander Taking Leave of His Parents'

Eight years later, in 2015, the next tapestry of this set, 'Leander Taking Leave of His Parents', arrived at the Studio. This had the same issues as the first, but was much larger, measuring nearly 6 x 3 m, and the losses were spread across a wider area of the tapestry. Initially, it was hoped to produce one large patch for the main losses across the figures and smaller ones for the sky and ground.

At Hardwick Hall, a photograph was taken of the same scene, again a Mortlake tapestry dating from the mid-17th century, which hangs on the great main staircase. Though a similar design, the main differences between the two tapestries was the colour; the blue tunic and boots of Leander and the plain design of his mother's dress, seen as red clothing and a floral dress on the Hardwick tapestry.

There were some differences in producing this printed infill, as opposed to the first in 2008. Zardi & Zardi no longer required large format negatives, instead favouring professional high- quality digital photography. The printers they used had changed to CADWORKS UK Ltd, based in Lancashire.

After scouring and dyeing, the same type of linen fabric was sent to the printer for test prints. CADWORKS felt that a high-quality print couldn't be achieved on the pre-dyed linen; scouring and dyeing had made the surface of the fabric softer, it had lost some body and it was felt that it did not transfer through the printer in a satisfactory way. On advice from Ksynia Marko, the NT Textile Advisor, the process continued using the unscoured, undyed bleached linen as supplied.

Obtaining the correct colours for this printed patch was much more difficult. The first test patches looked too 'clean' and bright and the tones weren't strong enough to saturate the white linen. Also, it became apparent that to achieve the various colours (blues, reds, browns etc.), one large patch was not possible for the figures, as originally planned. The aged, faded green and brown tones

appeared particularly difficult to achieve and this was experimented with for several months, trying to get a better colour-match.

One design feature that needed amending on the printed patch was the addition of shadows beneath the figures and on Leander's knee, so these were added upon request using Adobe Photoshop®. However, these shadows were not the required brown tone, but appeared blue, and when asked to re-adjust these, the result was a purple tone.

At this point, some test patches were suitable, colour-wise, but those for the greener and browner patches were not satisfactory. Due to time and cost restraints of the project, it was decided that to achieve the desired colour and effects, the patches would be painted to tone down and alter the colours.

This process was further developed for the third and final tapestry in this set from Cotehele.

Figure 4. Painting the printed photographic infill patch to match the tones in the tapestry ©National Trust/Jane Smith

Developing the use of painting the printed infill patches for the 'The Death of Hero and Leander'

The same process was followed as with the second tapestry, communicating with CADWORKS via email and telephone, and receiving test samples through the post. After two sets of unsuccessful test prints, the third sample print sent for this tapestry was almost a good colour match but was still too bright and clean looking. It was therefore decided to tone it down with paint rather than ask for more prints.

As with the 'Leander Taking Leave of His Parents' tapestry, Lascaux Sirius® Primary Acrylic paints were used for this purpose. These has been selected initially on the suggestion of Ksynia Marko, who saw a paper presented by Mieke Albers discussing re-touching faded re-weaving in tapestries using the Lascaux Sirius® Primary Watercolour System (Albers 2012: 93-100). Encouraged by this, the Lascaux Sirius® Primary Acrylic paints were chosen for testing on the printed photographic infills for the Hero and Leander tapestries. These matt acrylic paints consist of pure, lightfast pigments and an age resistant binder.

On the 'Death of Hero and Leander' tapestry, artists brushes were used to apply layers of pale washes (up to five times in total), allowing each to fully dry before adding the next. This was successful at dulling the colours down to recreate the aged tones. If the paint was applied too thickly,

there seemed to be an issue with white blooming which had been found when painting patches for the previous tapestry (they required a more intensive colour change).

To keep costs lower, the losses at the lower edge were infilled with the unwanted test prints of the photographic patches produced for the previous Hero and Leander tapestries. Most of this foreground did not have a specific design that needed to be recreated.

Some of the smaller patches were painted before being applied to the tapestry but the larger ones had to be painted once in place as it was not feasible to keep placing the patch behind the tapestry each time the colour match needed to be checked. Very small amounts of paint were applied in a controlled way to avoid any potential colour run into the original object. Thin Melinex® (polyester film, 50 microns) was used over the edges of the tapestry as a barrier layer to protect the original.

The completed patches were attached to the reverse of tapestry with a staggered running stitch worked 1cm into the patch. before framing up. The tapestry was then put onto a loom for the conservation stitching to be worked.

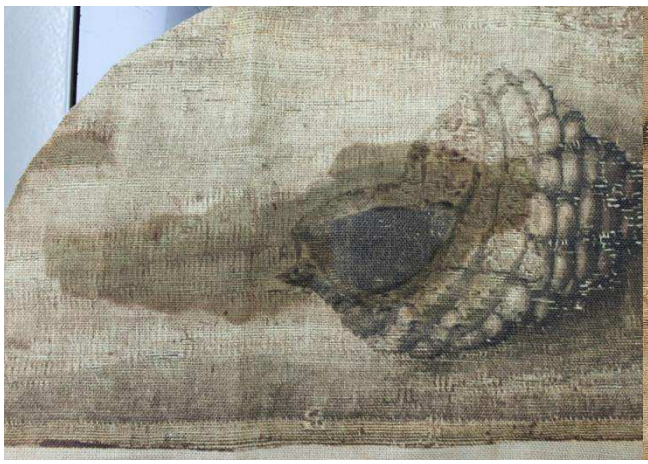

Figure 5. Death of Hero & Leander: Painting the printed photographic infill patch of the shell ©National Trust/Jane Smith

Figure 6. *Death of Hero & Leander*: The shell patch having been inserted to infill the tapestry loss ©National Trust/Pete Huggins

Figure 7. Leander Taking Leave of His Parents: The printed patch having been inserted to infill losses in Leander and his mother ©National Trust/Nadine Wilson

Longevity of the printed patches

The longevity of the paint has not been tested as part of this project.

In October 2009, just before 'Leander Swimming the Hellespont' was returned to Cotehele, colour readings were taken with a spectrophotometer over several small areas, on both the printed infill patch and a reference piece of printed material (the control, which is stored in the Textile Conservation Studio's archives). As part of the ongoing care of this tapestry, it was recommended that these readings were repeated every 2 years to monitor the appearance and any potential changes over time. However, it was not until May 2016, nearly 6 years later, that the first readings were repeated on the infill patch and the control piece from our archive, using a Konica Minolta CM-2600d spectrophotometer [1].

Results show that the colours on the infill patch of the displayed tapestry have not changed significantly and, although there is a measurable change, this is not noticeable visually. However, the tapestry patch is slightly darker than the reference patch and this could be linked to the tapestry being soiled from open display or just a simple variation in the pigment ink intensity in the area measured.

'Leander Swimming the Hellespont' will continue to be monitored, as will the remaining two tapestries of the set. This will be particularly interesting to see whether the use of the Lascaux Sirius® acrylic paints will affect how the patches appear with age.

Conclusion

The technique is visually successful. The tapestry designs can now be appreciated without the losses being so apparent. Although the patches imitate the texture, they are still easily identified close-up as new additions. However, the patches can be tricky to handle. Tensions are created between the soft tapestry and firmer linen as this is stretched around a tapestry frame roller although padding the tapestry roll can help. More stitched gridlines than usual were needed to hold the tapestry to the patch due to the differing structures of the tapestry to linen. Careful handling of the patches is also necessary. Being printed on white linen, any disruption to the surface caused by scratching will reveal the white of the fabric.

It has taken time to get to a workable result and more time is needed to achieve an efficient result. Conservators working to deadlines and estimates often don't get time to develop these ideas and methods, and the client often does not want to pay for it. The process does not seem to have got easier over the three tapestries and 11 years. For 'Death of Hero and Leander' the process, working with the printers, started at the beginning of November and a useable patch was achieved at the beginning of February. The eight weeks planned for this process was optimistic. The cost for the patch was £2,025 and 90 hours were used to prepare, paint and insert the patches.

There have been issues in the printers not being local to the Textile Conservation Studio. Having to communicate by phone calls, emails and to send samples and photographs is time-consuming with both sides often not entirely understanding what the other side means. In the future, it would be helpful for the printers to visit the Studio and understand exactly what they were trying to reproduce. Equally, it would be helpful for the conservators responsible for the project to go to see the printing process to understand what can be achieved and any limitations. It is reasonable to expect that paint will always have to be used to reproduce and achieve the subtleties of colour in an aged tapestry. Making links with a wider range of specialist printing companies would expand our knowledge of what is achievable.

Finally, this process will probably be used again at some point in the future. When the last tapestry is hung early 2020, there will be an opportunity to monitor the treatment further and get reaction from visitors.

Figure 8. Death of Hero & Leander: Front of tapestry after conservation ©National Trust/Pete Huggins

Acknowledgements

The authors would like to thank all our colleagues at The National Trust Textile Conservation Studio, Ksynia Marko, National Trust property staff and PJ Keeling at Zardi & Zardi.

Notes

[1] Internal National Trust report: McCullough. L. *Colour Measurement Report 2016, Cotehele-Tapestry*.

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CADWORKS UK Ltd
www.cadworksuk.co.uk

De Wit
www.dewit.be

Lascaux Sirius® Primary Watercolour System
www.lascaux.ch/dbFile/1607/u-d0ed/Lascaux_Sirius_E.pdf

Wolfson Foundation
www.wolfson.org.uk

Materials and Suppliers

Photographic patch and linen:
Zardi & Zardi
Podgwell Barn
Sevenleaze Lane Edge
Stroud
Gloucestershire
GL6 6NJ
www.zardiandzardi.co.uk

Photographic services:
Chris Tims

Photoworx
Unit 5, Douglas Bader Close
North Walsham Industrial Estate
NR28 0TZ
www.photoworx.co.uk

Robert Thrift
www.facebook.com/robertthriftphotography

Pete Huggins
www.huggins.co.uk

Printers sub-contracted by Zardi & Zardi:
Elanbach
www.elanbach.com

CADWORKS UK Ltd
Unit 1
Woodhill Street
Bury
Lancashire
BL8 1AT
www.cadworksuk.co.uk

Tapestry cleaning:
De Wit Royal Manufacturers of Tapestry
Refuge Tongerlo Abbey
Shoustetsraat 7
2800 Mechelen
Belgium
www.dewit.be

Lascaux Sirius® Primary Acrylic System:
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142 Cambridge Heath Road
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www.shop.apfitzpatrick.co.uk

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London
SE15 6NF

Conservation of Two Degraded Silk Colours: Putting the Colour Back

Liz Rose, Textile Conservator, British Library

The British Library (BL) had not had a dedicated textile conservator until 2015. This new position was created due to the acknowledgement that the BL Collections contained many diverse textile items and recognised that there is a long-term duty of care for these types of items.

The role of textile conservator was jointly funded by the Clothworkers' Foundation and the BL for two years and it was agreed that conservation treatment should be carried out to a set of colours belonging to the Royal East India Volunteers (1796-1799), (Fig 1).

Fig 1. WD 2425 Consecration of the Colours of the Third Regiment of Royal East India Volunteers at Lord's Cricket Ground, London, 29 June 1799 © The British Library Board

It had been known for many years that these two flags in the India Office Collections were in a damaged and fragile state and that they had been overlooked since the India Office amalgamated with the BL in 1982 (Fig 2). Margaret Makepeace, Lead Curator of India Office Collections, reflects in her blog that: 'In 1895 the colours were lent to Empire of India Exhibition at Earl's Court. The catalogue described them as 'tattered and torn in the most approved fashion but no tale of glory hangs thereby. Only in marches and reviews in London Fields did these colours wave to the breeze, and damp and the ravages of rats and mice are responsible for their present condition' (Makepeace, M., 2019).

Fig 2. Foster 1068 and Foster 1069 - before conservation © The British Library Board

This paper focuses on the recolouring of the flags to aid interpretation and enable display, access and research. A brief overview on the full conservation treatment of the flags is given below.

The flags and pole sleeves were surface and wet cleaned to reduce soiling and acidity of the degraded silk and other components. The pole sleeves were supported with silk and dyed nylon net, and the bases of the padded boards were produced in the expected fashion. During this period which spanned approximately eighteen months, there was plenty of time for conjecture and deliberation on how to make these 'flags' readable through conservation treatment.

Two inspirational ICON textile group presentations influenced the decision-making process. The first from P.J. Keeling in 2006 in the presentation, 'Making digital copies of the Venus and Adonis series of tapestries at Houghton Hall' (Keeling, P.J., 2006) and the second from 2015, Maria Jordan and Libby Thompson's presentation, 'Standing on the Shoulders of Others: further developments in polychrome patterned nylon net' (Jordan M. and Thompson L., 2015). After re-reading the post prints it seemed probable that a digital print solution was key to infilling the lost colour from each flag (Fig 3).

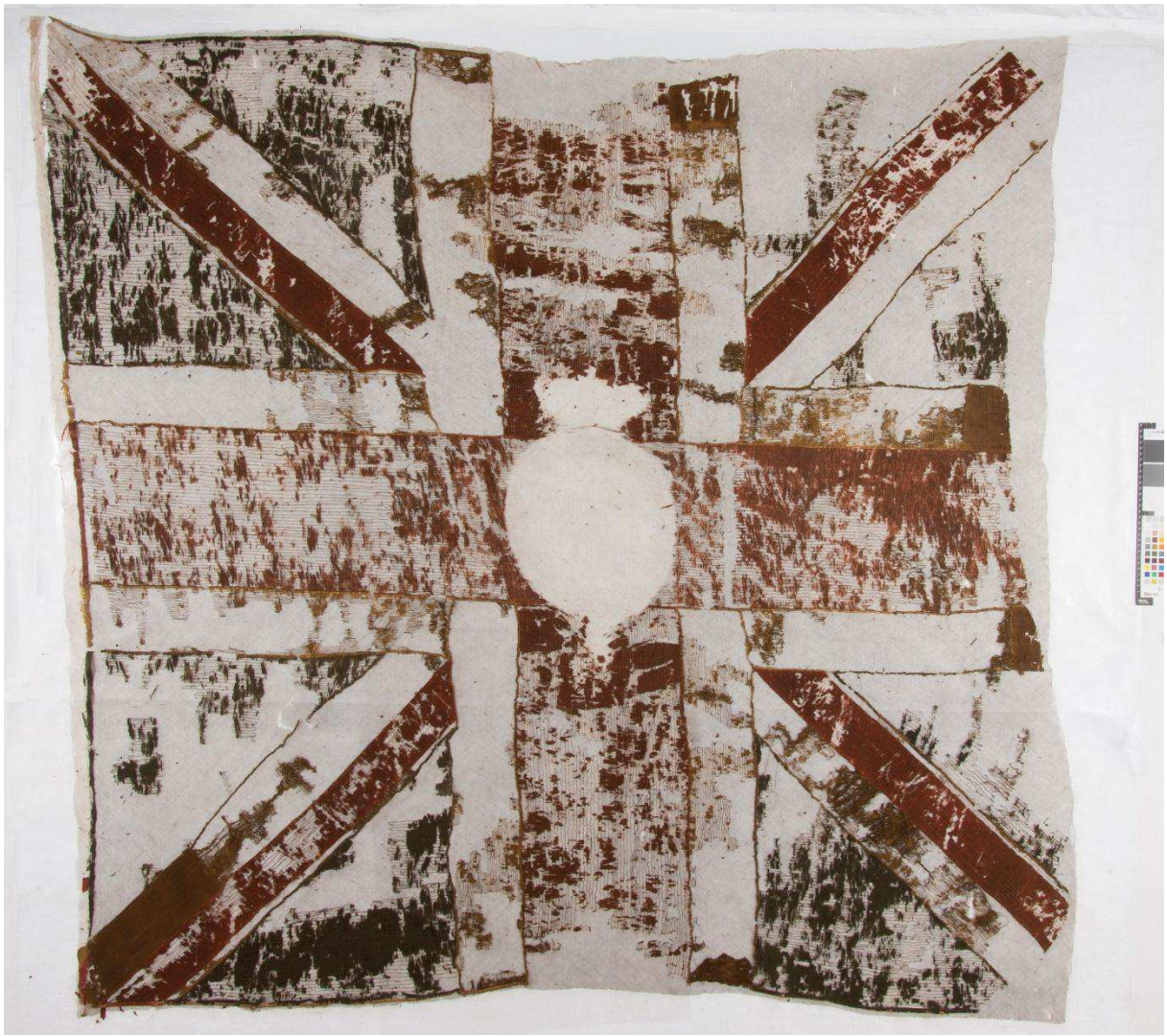

Fig 3. Foster 1068 - showing extent of the silk loss © The British Library Board

Fig 4. Silk infills by Julie McBain © National Conservation Centre, Liverpool

Previous experience as a graphic designer ensured confidence and familiarity with printing technologies, different substrates, sizes and, most importantly, with print terminology. The following notes record the process of pre-production, printing and manipulating the coloured backgrounds to give definition to the flags. A commercial digital printer was found who was able to produce a 'printed flag' onto cotton. This would be used to make a padded board negating the need for separate pieces of dyed silks to infill colour loss, which is a long process, as McBain J. will testify during her time at the National Conservation Centre (Fig 4). It was important to find an efficient solution to reduce overall treatment time, as this was already in excess of what had been estimated for the entire project.

Hatley Print [1] was selected to produce a test (Fig 5 and 6). They had been recommended by Caroline Smith, PA to Cornelia Parker who had designed and commissioned the thirteen metre embroidery of the 'Wikipedia' entry of the Magna Carta which was exhibited at the BL as part of the Magna Carta exhibition in 2015. The text for the Magna Carta entry had been printed onto linen in a uniform size, weight and pale colour. Individuals were sent a section and embroidered over the lettering, returning it when complete to the Royal School of Needlework for assembly.

Fig 5. Printed cotton by Hatley Print - Pantone 189U (uncoated) and 1805U (uncoated) © The British Library Board

Fig 6. Printed cotton by Hatley Print - Pantone 131U (uncoated) © The British Library Board

The Royal East India Volunteer colours comprise of two military sized flags: 6 feet x 6 feet 6 inches, a Union Jack and a Blue Ensign. As an initial test, the small Union Jack on the Ensign was traced on Melinex® together with colour specifications and sent to the digital printer so that a test print could be produced for a prototype board and Oddy testing.
Prior to sending the colour specification, the silk original colours were recorded using a Konica Minolta® spectrophotometer: four readings were taken from silk from different parts of the flag, the average was calculated and used to convert into the desired colour (Table 1 and 2).

Spectrophotometer readings for Foster F1068

F1068	**1**	**2**	**3**	**4**	**Total**	**Ave**
Red L*	13.12	21.14	27.86	7.08	69.2	**17.30**
Red a*	21.62	27.97	31.17	23.07	103.83	**25.96**
Red b*	22.41	35.39	36.73	12.05	106.58	**26.65**
Cream L*	55.32	99.02	85.61	27.89	267.84	**66.96**
Cream a*	30.67	19.05	16.07	16.07	81.86	**20.47**
Cream b*	89.95	74.29	62.03	31.59	257.86	**64.47**
Blue L*	10.19	14.64	18.39	9.99	53.21	**13.30**
Blue a*	6.47	2.87	1.24	6.72	17.3	**4.33**
Blue b*	17.09	21.96	27.3	16.88	83.23	**20.81**

Table 1. The CIELAB color space: color space defined by the International Commission on Illumination in 1976

Spectrophotometer readings for Foster F1069

F1069	**1**	**2**	**3**	**4**	**Total**	**Ave**
Red L*	13.12	21.14	27.86	7.08	69.2	**17.30**
Red a*	21.62	27.97	31.17	23.07	103.83	**25.96**
Red b*	22.41	35.39	36.73	12.05	106.58	**26.65**
Cream L*	55.32	99.02	85.61	27.89	267.84	**66.96**
Cream a*	30.67	19.05	16.07	16.07	81.86	**20.47**
Cream b*	89.95	74.29	62.03	31.59	257.86	**64.47**
Blue L*	10.19	14.64	18.39	9.99	53.21	**13.30**
Blue a*	6.47	2.87	1.24	6.72	17.3	**4.33**
Blue b*	17.09	21.96	27.3	16.88	83.23	**20.81**

Table 2. The CIELAB color space: color space defined by the International Commission on Illumination in 1976

The L*a*b* co-ordinates produced by the spectrophotometer needed to be converted to Pantone® colours [2] before printing but it proved impossible to convert the data to accurate Pantone® colours in 2015. This is much easier now as there is software online and Apps available, and not just design for print software such as Adobe Photoshop® or Adobe Illustrator® [3].

The converted colours were not accurate to the perceived colours of the degraded silk. Therefore, the decision was made to match the silk to colours in the Pantone® swatch. For continuity and interpretation, the printed colours needed to be consistent between both flags.

Oddy Testing
Samples of printed fabrics were received for Oddy testing (see *Table 3 and Table 4*) (Fig 7).

Fig 7. Printed samples used for Oddy testing Table 4 © The British Library Board

Results and Conclusion Table 3

The extent or tarnishing or corrosion of the metal tokens was determined in comparison to that of the tokens from the control vial.

All six samples, including the unprinted fabric, exhibited similar behaviours suggesting that the volatile acids generated during the experiment (as evidenced by the tarnishing of the lead token) is derived from the fabric itself, rather than the pigment.

Results and Conclusion Table 4

The extent or tarnishing or corrosion of the metal tokens was determined in comparison to that of the tokens from the control vial.

Table 4, thirteen samples from the set of nineteen passed the test without any obvious problems; of the remaining six, the principal cause of failure was corrosion of the lead token, indicating evolution of volatile acids over the course of the test.

Several of the ‘B’ series samples appeared prone to dye bleeding, although this did not seem to affect any of the ‘A’ series samples. All colours were chosen from ‘A’ group colours.

Sample		Cu	Pb	Ag
Unprinted fabric		**Pass**	**Minor Fail**	**Pass**
F1805 U	**Red**	**Pass**	**Minor Fail**	**Pass**
131 U	**Orange**	**Pass**	**Minor Fail**	**Pass**
1245 U	**Yellow**	**Pass**	**Minor Fail**	**Pass**
3015 U	**Mid Blue**	**Pass**	**Minor Fail**	**Pass**
2945 U	**Deep Blue**	**Pass**	**Minor Fail**	**Pass**

Table 3. Oddy Tests. Oddy testing 07 06 16 Dr Paul Garside

Sample		Cu	Pb	Ag
A1-1	(Yellow)	**Pass**	**Pass**	**Pass**
A1-2	(Red)	**Pass**	**Pass**	**Pass**
A1-3	(Blue)	**Pass**	**Pass**	**Pass**
A2-1	(Yellow)	**Pass**	**Minor Fail**	**Pass**
A2-2	(Red)	**Pass**	**Pass**	**Pass**
A2-3	(Blue)	**Pass**	**Pass**	**Pass**
A3-1	(Yellow)	**Minor Fail**	**Minor Fail**	**Pass**
A3-2	(Red)	**Pass**	**Pass**	**Pass**
A3-3	(Blue)	**Pass**	**Minor Fail/Fail**	**Pass**
A4-1	(Yellow)	**Pass**	**Pass**	**Pass**

A4-2	(Red)	**Pass**	**Pass**	**Pass**
A4-3	(Blue)	**Pass**	**Pass**	**Pass**
B1-1	(Yellow)	**Pass**	**Pass/ Minor Fail**	**Pass**
B1-2	(Red)	**Pass**	**Pass/ Minor Fail**	**Pass**
B3-1	(Yellow)	**Pass**	**Minor Fail**	**Pass**
B3-2	(Red)	**Pass**	**Pass**	**Pass**
B4-1	(Yellow)	**Pass**	**Pass**	**Pass**
B4-2	(Red)	**Pass**	**Pass**	**Pass**
B4-3	(Blue)	**Pass**	**Pass**	**Pass**

Table 4. Oddy Tests. Oddy testing 05 10 16 Dr Paul Garside

Whilst the first Oddy test (Table 3) was being carried out, a padded board was constructed with the printed small Union Jack from the Ensign. This board was padded with felt, as it would be important to have a soft base into which the flag and conservation net could be stitched. Once the board was made with the cotton (twice) stretched over the board, the small Union Jack of the Ensign was laid over the board. The board was aligned below the flag using Bondina® to smooth the adjustment process and when in the final position the Bondina® was slipped out to reveal the printed colour below (Fig 8). The result was extremely satisfactory as there was good alignment of the Union Jack to the printed Ensign (Fig 9).

The final printing colours were chosen after Oddy testing (Table 3 and 4) twice [4]. The differential between Oddy test results in Table 3 and Table 4 was due to the decision to wash the printed cotton three times giving a much better result on the lead token (Pb, Table 4).
Once it had been established that there was potential for this solution to work, the printed cotton (170gsm), [5] was ordered for the Ensign using the following chosen colours: red colour matched to Pantone® 1805U (Fig 5); dark cream colour matched to Pantone® 131U (Fig 6); blue colour matched to Pantone® 2945U. These were the final colours used in the printing of both flags.

As most of the Ensign was blue with the small Union Jack in the top left corner, the print specification was straight forward. The overall size of the flag was given with a bleedof 300mm all around so that the printed material could be secured to the reverse of the padded board [6]. Most importantly, a central overlap of 220mm – 230mm had to be incorporated as the throat of the printing machine could only print to a maximum of 1000mm. Two lengths were printed approximately 1m 500mm in length (one with the Union Jack surrounded by blue and the other entirely blue) and these had to be joined and then positioned correctly on the padded board.

The print specification for the Union Jack was more challenging as the printed overlap had to be across the horizontal red cross in the middle of the flag (Fig 10). The top, bottom and pole sleeve edge were easily defined but the undefined flight edge colour had to be drawn and created from the

remaining fragmentary silk and cotton bobbinet (Fig 3). The Union Jack was joined and positioned on the padded board. This positioning was challenging as there needed to be visual parity between the both flags after mounting. Both flags had been wet cleaned while sandwiched between 19gsm Reemay®, rolled when dry. They had remained in this state and could be easily moved and unrolled on top of the printed flag when required. This was vital to ensure the prints were positioned correctly on the boards so that when the degraded flags were finally placed on top of the printed cotton-covered padded boards the image and the flag would be in alignment (Fig 11 and 12). The physical size of the boards and flags made this challenging [7] but the final alignment of the flags to board and printed image was a great success: the degraded flags were supported, the lost colour re-established, interpretation, research and possible display enabled (Fig 13).

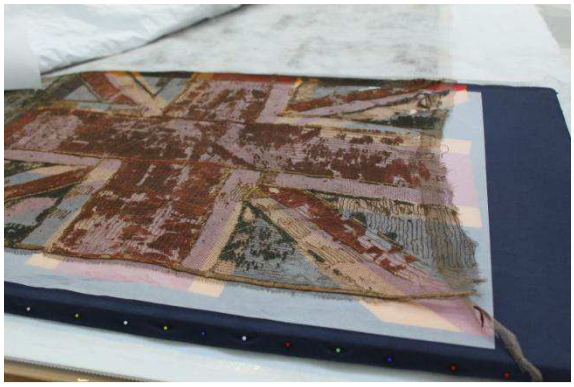

Fig 8. Foster 1069 laid on prototype padded board before alignment with Bondina® below © The British Library Board

Fig 9. Foster 1069 laid on prototype padded board after alignment © The British Library Board

Fig 10. Foster 1068 printed flag pinned in position © The British Library Board

Fig 11. Foster 1068 overlaying printed flag © The British Library Board

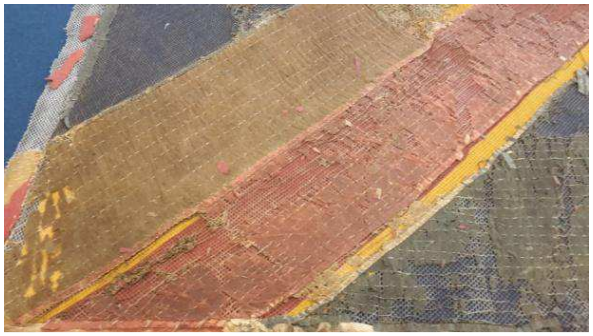

Fig 12. Foster 1068 overlaying printed flag detail © The British Library Board

Fig 13. Foster 1068 and Foster 1069 after conservation © The British Library Board

Acknowledgements

Rosamund Weatherall – Senior Textile Conservator ACR

Notes

[1] Hatley Print – Bespoke, digital textile printers. The Maltings, Castle Precincts, Lewes BN7 1YT. The inks used are water based Reactive Inks printed on a EFI Reggiani Digital Printing Machine

[2] 'Pantone® is the standard language for colours. The formula developed by Pantone is a spot colour. This means that the colour is created from a palette of 18 basic colours, not with screens or dots. Process colours are CMYK colours, the colour is determined by cyan, magenta, yellow and black.' 3 Jun 2019

[3] Conversions for print can be done in Adobe Photoshop® or Adobe Illustrator®, https://www.youtube.com/watch?v=euJYV9BsKUE
Conversion to Pantone®, https://www.ginifab.com/feeds/pms/cmyk_to_pantone.php
Nix colour sensor convertor: RGB, CMYK, L* a* b* and others, https://www.nixsensor.com/free-color-converter/

[4] Oddy test Method. Sections of each sample, of approximate mass 1g, were placed in individual sealable bottles, along with a vial containing 1ml water; three clean metal tokens (copper (Cu), silver (Ag) and lead (Pb) were suspended above each sample on a polyester thread. As a control, a further vial of water and set of tokens were placed in an empty bottle. The bottles were closed with a screw-on lid fitted with a PTFE seal. They were then placed in an oven held at 80 °C, and left for 28 days, after which they were removed and the tokens examined.

Cu - tests for volatile oxidants
Pb - tests for volatile acids
Ag - tests for volatile sulphur compounds

Pass - No (or very minor) tarnishing.
Minor Fail - Some tarnishing, but not extensive; no corrosion spots.
Fail - Extensive tarnishing and corrosion spots.
Severe Fail - Extensive corrosion (to the point of disintegration).
[5] Hatley Print's cotton was available in - 135gsm, 170gsm and 220gsm, at 1500mm wide
[6] Bleed - additional margin of printed colour for flexibility of alignment
[7] Boards - 2100mm (w) and 1900 (h) and flags approx. 1850mm (w) x 1750mm (h)

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Materials and Suppliers

Bondina®	Preservation Equipment Ltd Vinces Rd Diss Norfolk (UK) IP22 4HQ Tel: 01379 647400
Nylon conservation net	Dukeries Textile & Fancy Goods Ltd. Spenica House 15a Melbourne Road West Bridgford Nottingham NG2 5DJ Tel: 0115 981 6330
Red silk for flagpole	Bennett Silks Crown Royal Park Higher Hillgate Stockport SK1 3EY Tel: 0161 476 8600
19gsm Reemay®	Preservation Equipment Ltd Vinces Rd Diss

	Norfolk (UK) IP22 4HQ Tel: 01379 647400
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Colouring for Camouflage: Exploring the Use of Artists' Pencils to Reduce the Visual Disturbance of Irremovable Stains on Textiles

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Introduction

This paper describes the use of artists' pencils to camouflage disfiguring stains and marks on textiles that cannot be removed with cleaning alone or disguised using established methods. Developed by Textile Conservation Limited as a solution to a set of specific client requirements for the treatment of a collection of 20th century printed textiles, the camouflage technique involves colouring the surface fibres of the stained areas with pencils in order to reduce the visibility of small marks and areas of colour loss from wear.

The context and treatment requirements for the project that first prompted the exploration of the technique are explained as these were key factors in the decision to use this unconventional approach. The source, composition and characteristics of the pencils is then described followed by an explanation of their use in the camouflaging process. Some observations on the practical and conceptual issues raised by the use of the technique are made, and suggestions for further research provided.

Fig. 1. Brittany, 1968. Furnishing fabric. Designed by John Piper for David Whitehead Ltd. Screen printed cotton.

Fig. 2. Le Jour et La Nuit, 1947. Scarf. Designed by Óscar Domínguez for Ascher Ltd. Screen printed silk.

Background and context

Over the past five years Textile Conservation Limited has conserved numerous printed textiles dating from the 1920s to the 1960s for two private collectors. The textiles include cut pieces of printed cotton, linen and rayon furnishing fabrics, manufactured by companies such as Edinburgh Weavers, David Whitehead, Heals and Liberty and Co, and printed silk scarves produced by Ascher Ltd. Collectively these textiles are often called 'artists' textiles' as many of the designs were commissioned from well-known artists of the period including Ben Nicholson, Graham Sutherland, Henry Moore, John Piper, Jean Cocteau, Henri Matisse, Pablo Picasso and Salvador Dali (Figs. 1, 2 and

3). Samples of the fabrics are preserved in museum and archive collections around the world, and the origins and development of textiles from this period has formed the subject of research projects, exhibitions and publications (see for example Gerstein 2009; Ikoku 1999; Jackson 2012; Martin 2016; Rayner et al 2012; and Schoeser 1986). The textiles appeal both to individuals interested in 20th century fabric design and manufacture and to art collectors. Today the brightly coloured and boldly executed abstract designs are also popular with interior designers as feature points in large open plan spaces.

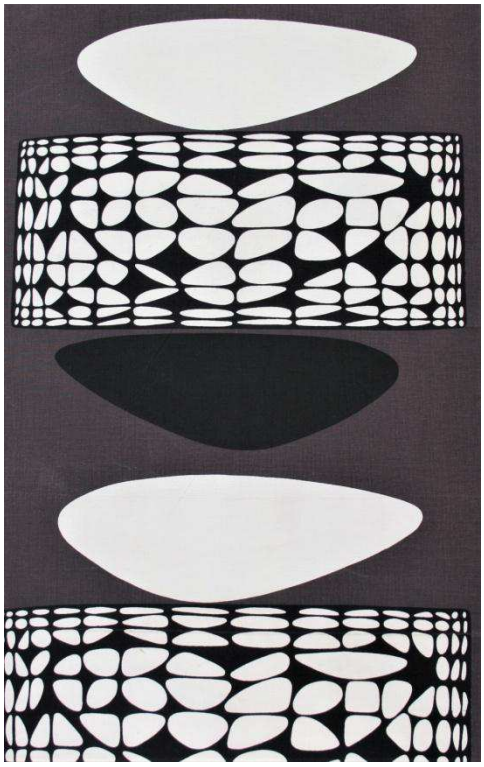

Fig. 3. Kernoo, 1962. Furnishing fabric. Designed by Victor Vasarely for Edinburgh Weavers Ltd. Screen printed cotton.

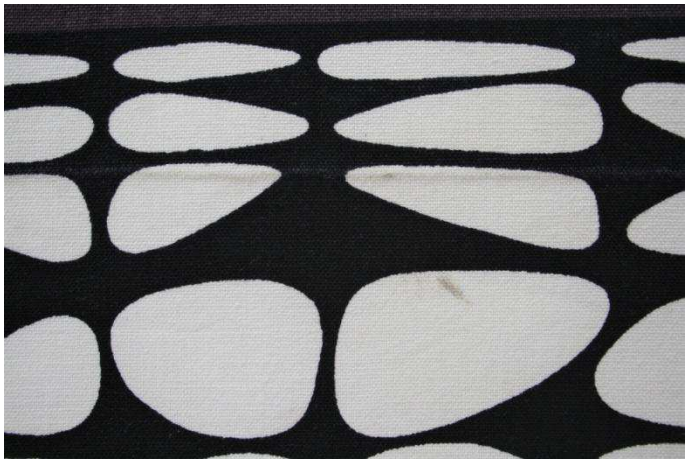

Fig. 4. Stains on Kernoo.

On arrival at the conservation studio the textiles are usually very creased and distorted with overall soiling and discolouration from age, use, storage and trade. The furnishing fabrics have evidence of originally being sewn into curtains and hung at windows. The scarves have marks from wear and strong fold lines from storage. Some items have deterioration related to being nailed or glued to mounts for previous display or cut up and pieced together for reuse or sale. They frequently have various stains and marks including rust, bleach spots, make-up smears, dye transfer and tide lines from wet stains. Sections of the printed designs are also often faint along previous seam and hem lines where the fabric has suffered wear and light damage (Figs. 4, 5 and 6).

The requested treatment includes cleaning, stabilisation and mounting on fabric covered acid free boards. The textiles are then framed (elsewhere) in readiness for hanging display in specialist galleries and art and antique fairs where they are sometimes available for sale. The current role of the textiles, as defined by the clients is no longer primarily as furnishing or fashion fabrics but as two dimensional works of art on fabric.

Fig. 5. Tide lines after washing, before camouflage on Cotswold, 1959. Furnishing fabric. Designed by John Piper for David Whitehead Ltd. Screen printed linen.

Fig. 6. Colour loss through abrasion on Calyx, 1951. Furnishing fabric. Designed by Lucienne Day for Heal's Wholesale and Export Ltd. Screen printed linen.

Cleaning

All the printed textiles brought for treatment are washed using a conservation grade detergent, and wet cleaning is very effective at removing creases, degradation products and general dirt. Shrinkage of the fabrics and loss or bleeding of the printing pigments is not usually an issue so the cleaning process can include measures such as warming of the water and sponging of soiled areas that

increase the efficacy of the treatment. However, in most cases not all stains are removed: tide lines from wet stains for example are particularly tenacious. Removing the general dirt can also make some stains and other marks such as colour loss through wear more apparent than before cleaning.

Although the clients are fully aware and accepting of the limitations of conservation cleaning and appreciate the overall benefits of the approach, they find the residual stains and paler coloured lines from wear obvious and disturbing. They believe the marks interfere with the clarity of the printed designs and therefore lessen the integrity and attractiveness (and thus the value within the art and antique market) of the textiles. This belief is reasonable when the actual textiles are compared with the photographic images of the same fabrics depicted in the publications and generally available on the internet. It is clear these images were either taken when the fabrics were brand new or have been altered digitally to remove any evidence of degradation or damage. The textiles are shown very flat, clean, structurally sound and complete and with bright unfaded colours giving the appearance of graphic artworks rather than fabrics. It is the clients' view that their audience has these published images in mind when viewing the textiles and may be disappointed, even put off by their actual appearance.

Further stain removal through the use of spot bleaching for example has not been applied as the fabrics are degraded and the printed designs cover the entire surface. Overlaying the stained areas with colour matched fabrics is not a viable approach as the stained areas are small. In any case the overlay technique would add texture to the surfaces and change the appearance of the textiles to an unacceptable degree, producing different but no less disturbing visible marks. Careful positioning of the textiles on the mount boards results in the most stained areas being folded out of sight to the reverse but this is not always possible.

An alternative approach

It became clear early on in the relationships with the clients that conventional methods of disguising stains and areas of colour loss would not meet their specific requirements. Doing nothing to reduce the most disturbing marks would also ignore the impact these marks have on the visual integrity of the printed designs and their value to the clients as examples of the artists' textiles genre. A different approach to minimising the disturbance of residual stains and marks was required.

A previous collaboration with a paintings conservator, involving the treatment of a water stained colour field acrylic painting by the British artist Mark Vaux (1932 -) introduced the author to the use of artists' pencils as a retouching medium. The painting included areas of raw (unprimed and/or ungrounded) canvas around a central motif worked in acrylic paint. No varnish was present. Raw canvas paintings are vulnerable to condition problems that do not usually occur on primed and painted artworks (Skelton 2019). The exposed canvas discolours due to degradation and becomes soiled and stained through airborne pollutants, handling and mould. The unpainted areas share more characteristics with textiles than paintings and interestingly Skelton (2019) recommends the paintings conservator consult a textile conservator before trying to remove stains from raw canvas.

In the case of the Vaux painting water dripping from above had caused obvious and disfiguring stains in both the painted and unpainted sections of the artwork. In the unpainted areas the strongest brown tide lines (caused by the water moving dirt and degradation products in the canvas) were mostly removed by the author using localised cleaning techniques, but the canvas within the now removed lines remained paler than the surrounding areas. The paintings conservator used coloured artists' pencils to infill losses in the paint areas and to blend in the paler areas of canvas in the unpainted sections.

This technique is a relatively new but accepted method for retouching the painted parts of colour field paintings and reducing the appearance of stains and discolouration in the raw canvas areas. The treatment is categorised as 'aesthetic compensation'. Other methods include the use of toasted cellulose powder brushed onto the stains (Skelton 2019). The powder is not mixed with an adhesive and can be removed simply with brushing or vacuuming if required. As the unpainted canvas has no size or ground layer no barrier layer of varnish or size is applied over the original surface before retouching.

Camouflage in conservation: a definition

Seeing the very effective results of the retouching process on the Vaux painting encouraged the author to investigate the potential of artists' pencils as a means of masking stains on other textile materials. The word 'camouflage' has been chosen to describe the technique as this distinguishes it from retouching. According to dictionary definitions camouflage is the act, means or result of the hiding or disguising of something by covering it up or changing the way it looks. The word is thought to have come from the Parisian slang term *camoufler* meaning to disguise or to 'make up for the stage'. It may also have its origins in the French word *camouflet* meaning 'smoke blown in someone's face'. Military camouflage uses paint techniques and patterned fabrics to disguise hardware and personnel. In 1915 the French army became the first to create a dedicated camouflage unit. Its practitioners were mostly artists and were known as *camoufleurs*.

The camouflage technique applied to the printed textiles and described below most closely resembles the approach used by professional make-up artists to conceal marks on the skin that are considered unsightly. The area to be concealed is covered with cosmetics in shades that match the colour of the surrounding unmarked areas of skin. The technique employing the artists' pencils is similar in aim and application – coloured pigments are applied to the stained area so that it matches the surrounding unstained area. The applied pigment masks the stain.

In essence the technique involves colouring in the stained areas and it has some features in common with retouching. In conservation/restoration the aim of retouching is to disguise areas of loss, previous repairs and conservation interventions related to stabilisation and it is a routine process in the treatment of easel paintings, wall paintings, works of art on paper, ceramics and photographs. Achieving the desired effect takes practice, patience and good colour matching skills, and novice conservators receive training in the use of the various materials and effects employed within the different disciplines. While it is generally agreed that 'skilfully executed retouching can shift attention away from damages that otherwise would make it difficult for the viewer to comprehend or appreciate a painting' (Brajer 2015), the benefits and disadvantages of retouching are constantly being reviewed in the professional literature.

Artists' pencils

Artists' pencils are made by various fine art and craft suppliers. Many fine art conservators use the Art & Graphic range of colour pencils, watercolour pencils, pastel crayons and pigmented drawing inks made by Faber-Castell for retouching. Faber-Castell was founded in Germany in 1761 and has been run by the same family for over 250 years. It is the world's largest manufacturer of wood-cased pencils and 'secures its leading position on the global market with its tradition of commitment to the highest quality and a wide range of innovative products'[1]. The company has a very good reputation and its products meet the requirements for conservation in terms of quality, consistency and durability.

The Faber-Castell Polychromos range of coloured pencils was launched in 1908. The range is noted for its number of colours (120), high quality acid free and light resistant pigments, brilliance of colour

and optimal application properties. The pigments are bound in a 3.8mm thick, oil-based lead that is encased in wood coated with an environment-friendly water-based varnish. The manufacturer's leaflet claims the pencils stick on many rough surfaces including paper, cardboard, wood, stone, leather and brushed metal (textiles are not mentioned), and for these materials the working properties are described. Light colours are transparent and dark colours opaque. The pencils can be used in an upright or flat position with low to high pressure to create areas of intense or light even colour with no individual strokes visible. They are suitable for hatching, cross hatching and layering of colours to create different shades and add brilliance and vibrancy. An art eraser can be used to remove the pigments from the paper. They can also be dissolved in paraffin oil and used for painting, and combined with other media such as water colour pencils and pastels.

The pencils are readily available from fine art suppliers and craft shops, and via Faber-Castell's online shop (www.faber-castell.co.uk). They can be bought in sets of 12, 24, 36, 60 and 120, or individually. Currently (January 2020), a single pencil can be purchased for around £1.50. Each colour has its own reference name and number. Faber-Castell also produces a range of accessories for use with the pencils including sharpeners and erasers. It is possible to visit the Faber-Castell factory, castle, museum and shop outside Nuremberg, Germany.

Using artists' pencils on textiles

Artists' pencils were not developed for use on textiles, and as noted above no reference to their use with textiles is included in the information supplied by Faber-Castell. A small scale trial of a range of pencils from various suppliers indicated that the Polychromos pencils worked as well on fabric as any other artists' pencil.

The camouflage process is applied after cleaning and drying of the textile. The area to be treated needs to be crease free and the weave aligned. The textile can be laid flat on the work surface for treatment but it is advantageous to place it in the orientation it will be in when displayed. For the printed textiles this is vertical as they are displayed in frames hanging on the wall. The textiles are stitch mounted to their fabric covered boards before the camouflage process allowing them to be stood upright during the treatment if desirable. This orientation gives the conservator a clear view of the whole textile during treatment which can help ensure no single area is over-worked. The area to be treated is photographed before and after conservation treatment (Fig 7).

Fig. 7. Alison Lister camouflaging stains on *Kernoo*.

The pencils are sharpened to a point before use to ensure the greatest accuracy of position and the best contact with the irregular surface of the fabric. Repeated sharpening is normally required. Faber-Castell's own sharpener creates a very good working point.

Colours are selected from the range and applied individually until the stain or colour loss is less apparent. The pencil strokes follow the direction of the warp and weft threads as far as possible. The dry pigment tends not to penetrate deeply into the fibres so is mostly present on the surface. Greater saturation of colour can sometimes be achieved by angling the pencil so that more of the surface of the thread is covered with pigment.

Ideally only a single layer of pigment should be applied over the stained surface as additional layers can start to mask the texture of the fabric and add unwanted sheen. Colours of pencil are chosen to match each area of colour on the textile as precisely as possible to avoid layering. It is not usually possible to mix colours successfully on the textile as the surface can become dimpled or roughened with repeated colouring. There always comes a point when either the surface will not take any more pigment, so no improvement in colour is achievable or the coloured-in area starts to show signs of being disrupted. The need to avoid these negative effects can mean the camouflage results are not as good as might be hoped.

The technique can be applied to any fibre type and fabric structure, although it works best on smooth, flat, densely woven fabrics such as fine plain and twill weaves. Care must be taken with silk satin as the weave can become displaced.

The technique is really only suitable for small absorbed stains, fine tide lines and minor areas of colour loss from wear (Figs. 8 and 9). The presence of added colour becomes increasingly obvious as the treated area gets larger.

If removal is necessary some of the pigment can be lightly brushed off and more removed using an eraser although the limitations on the pressure mean these methods do not always remove all the colour. Wet cleaning readily removes some of the remaining pigment from some fabrics but the results are not consistent across all fabrics. No other removal methods or solutions have yet been tried.

Fig. 8. Detail of tide lines on Cotswold before camouflaging.

Fig. 9. Detail of tide lines on Cotswold after camouflaging.

Observations

The use of the camouflage technique as described above on variety of printed textiles of different fibre and weave types and from different decades and manufacturers has achieved some good results. It has proved possible to camouflage some stains so successfully that they were no longer visible from a normal viewing distance (Figs. 10, 11 and 12 during treatment and Fig. 1 after treatment). However, in most cases only partial concealment of marks is possible, and sometimes there is little or no improvement. It is also difficult to predict in advance how successful a treatment will be even if the conditions are very similar to a previous situation where the technique worked well. It is therefore important to make the limitations of the technique clear to clients.

As is the case with many other conservation treatments the numerous variables present mean no single application or removal method works across all fabric types and condition states. Due to the unique nature of each stained area it is not usually possible to test the technique fully in a specific situation in advance of applying it, so the conservator is reliant on a trial and error approach on the actual object with all the associated risks.

Good colour matching skills are essential. As with conservation dyeing the best match is not always the colour closest to the surrounding fabric: the colour of the stain will have an effect on the final result as it will still be visible in places. To have a good chance of finding the correct colour it is necessary to have available the greatest number of colours in the range which can be expensive. As is also the case with dyeing the camouflage work may look different in the lighting conditions in the studio compared to those in the final display location.

How much camouflaging is carried out is at the discretion of the conservator, and in agreement with the client. Given the 'restoration' nature of the treatment caution usually dictates that only the most obvious and distracting marks are coloured in. However, in practice once those marks have been disguised other lesser stains can became more obvious and the temptation to disguise every stain and mark can creep in. It is helpful to consult with conservation colleagues during the treatment to help ensure that an appropriate balance is being maintained.

Ethical and practical issues

The camouflage technique obviously presents some issues that need to be addressed if it is to have wider application and be considered a suitable process for use in the field of textile conservation. While it has credibility as a treatment for colour field paintings it is an unfamiliar and unconventional approach in the treatment of textiles.

In the context of most heritage settings the marks of time and use on textiles are usually considered acceptable by both custodian and audience. Textile conservators are also generally more tolerant of non-original marks than some other conservation disciplines. This may be because often it is the materiality and/or life history of the textile that is of greater interest and concern than the visual appearance. This is not the case with the artists' textiles - as far as the clients were concerned their current role was closer to fine art than to furnishings or fashion and as such the stains were seen to impact negatively on their visual qualities and design intent. This aspect of the relationship between what features of an object are considered authentic is one area of the current conversation on retouching. As Brajar (2015) notes:

'Our expanded views on authenticity … legitimize other aspects apart from historicity and artisticity such as respect for the authenticity of form and design (and even the object's 'spirit'), which can play a big role in the authentic presentation debate'.

Textile conservators have always used methods for disguising areas of loss and infilling elements of the design that are disrupted by these physical losses. These include brick couching and dyed and printed support fabrics. Overlays of dyed and/or printed net and crepeline are also used to make surface losses through fading or accidental damage less obvious. The conservation team at Textile Conservation Limited employs all of these techniques. In recent years the use of the in-painting method to blend in mismatched previous repairs in tapestries has been introduced into the field. This method has its origins in discussions between textile and paintings conservators about aesthetic compensation.

The very obvious key difference between the camouflage technique using the artists' pencils and the more established methods is that the colouring material is applied directly to the surface of the original textile fibres. Compared to conventional retouching processes in other disciplines the camouflage technique also omits the stage of adding a barrier layer between the old and new materials (although as noted above this stage does not appear to be used on raw canvas). The direct application of pigment to fabric raises concerns about authenticity, conservation versus restoration and reversibility. It is clear, therefore that the technique requires further scrutiny and analysis. There are also practical considerations about factors such as training, documentation and cost. Unfortunately, there are limits to how much of this research can be done by an independent studio.

The following questions suggest some further lines of enquiry:

- Is the technique appropriate and acceptable within conservation, and in what circumstances can and should it be used? Who decides?
- How should the technique be described and categorised?
- What knowledge and skills are required to carry out treatment?
- How should the use of the technique be recorded?
- Are the artists' pencils the only or best material to use?
- What are the chemical and physical effects of the pigments on the textiles?
- How does the applied pigment change over time and how do these changes affect the textile and camouflage effect in the short and long term?
- Is the treatment reversible and what methods are needed to reverse it?

Conclusions

The camouflage technique using artists' pencils was selected after careful consideration of all the relevant concerns as the most appropriate and effective treatment option for meeting the requirements of a very particular preservation situation. It provided a very satisfactory solution. The experience introduced the author to research into the concept and practice of aesthetic completion/compensation in other fields, and prompted many discussions within the conservation team about ethics and empirical research in conservation practice. The Icon Textile Group Conservation in Colour conference was the first time the author had discussed her use of the technique outside of the studio. As anticipated some reservations about the appropriateness of the method as a conservation treatment were expressed by colleagues. It is clear that a number of significant questions need to be answered before it might be adopted elsewhere. However, it is the author's belief that the technique has some merit and does provide an appropriate solution to certain problematic situations. It is always necessary to view the efficacy of treatment methods and approaches in relation to the alternatives rather than absolutes as all treatments result in some change to the object.

The use of the camouflaging technique at Textile Conservation Limited is still being evaluated, and it is the author's intention to continue to investigate its potential and include it as a treatment option.

It is hoped that fellow professionals will conduct trials of their own and share their observations, opinions and experiences.

Fig. 10. Detail of stain on Le Jour et La Nuit before treatment.

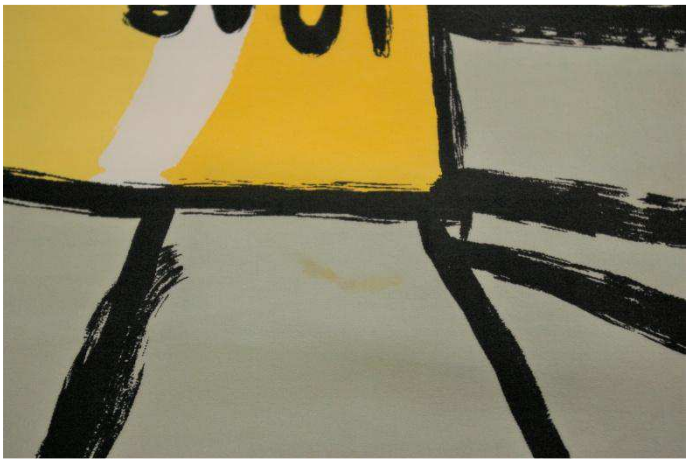

Fig. 11. Detail of stain on Le Jour et La Nuit after washing.

Fig. 12. Detail of stain on Le Jour et La Nuit after washing and camouflaging.

Notes

[1] Faber Castell. *Polychromos information leaflet.* (Date unknown). Germany: A.W. Faber-Castell.

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Materials and Suppliers

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