PAINTED TEXTILES

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INTRODUCTION

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Painted Textiles was the forum organised by the UKIC Textile Section to coincide with the Section's 1997 AGM.

That painted textiles are problematic is something of an understatement. They can be presented in many forms including banners, burial garments, costume and objects of decorative art. The paint medium and preparation of the fabric can vary considerably, as can the textile substrate to which they are applied.

Identification of the paint medium and knowing how it will react to any proposed treatment is often beyond the scope of the textile conservator. Input to a greater or lesser degree from a paintings conservator is vital, and yet, the accepted approach of the conservators from the two disciplines may be completely different. Even the terminology used by the two disciplines is different and can be confusing. Paintings are essentially presented as two dimensional objects with a limited degree of movement expected, by expansion and contraction of the materials. Painted textiles, in addition to this inherent movement due to climatic changes, are often intended to be draped, tucked or ruched into three dimensional forms, which must then withstand being worn, flown or repeatedly rolled or unrolled for ceremonial purposes.

Frequently the textile is not fully covered by paint medium allowing soiling, degradation and physical damage at a different rate and of a different nature to that of the painted areas. Invariably the paint surface is unvarnished and therefore unprotected. These factors are not unusual in modern painted works of art, providing a common starting point for dialogue with paintings conservators.

It is the intention of this forum with the combination of scientific papers, case studies and posters to open up some of these areas of common ground and to progress communication and collaboration between the disciplines.

THE CONSERVATION OF 'THE PINK LADY', A ROMAN EGYPTIAN PAINTED LINEN SHROUD

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The British Museum

Introduction

This paper describes a method of conservation developed in the Organic Artefacts Conservation Section for the treatment of a Roman Egyptian painted linen shroud. The 'Pink Lady' shroud exemplified many of the problems painted textiles present to the conservator. The shroud was structurally weak and required the application of support. However, large areas were solidly painted and could not be stitched through; it had an undulating, 3-dimensional surface which would make it difficult to achieve continuous bonding with an adhesive support; and it had fragmented textile elements, with individual fibres requiring securing. In addition, for inclusion in the current 'Ancient Faces' exhibition at the British Museum, the shroud needed to be mounted in a manner that would withstand near vertical display. The method of conservation developed aimed to address all of these issues.

Description of the Shroud

This shroud (EA 68509), painted with the portrait of an unknown young woman, affectionately nicknamed 'The Pink Lady' because of her distinctly coloured dress, is one of the most striking painted textiles from the Roman period in the British Museum Egyptian collection.

The portrait is painted on a rectangular piece of plain woven linen fabric, which originally would have been wrapped around a mummy in burial, and much of which is now missing.

Fortunately, most of the portrait remains. It depicts a young woman standing full length, face on, framed by a jewel encrusted arch and surrounded by protective deities. She wears a white underdress, with pink overdress and mantle draped in front. She also wears several items of gold jewellery; gilded traces remain of rings, a bracelet and a necklace. She holds a glass in one hand and a floral garland, traditionally carried by the deceased, in the other. From the style of clothing, jewellery and hairstyle, the shroud has been dated to the late second or early third century AD (AD 190–220)[1]. The exact provenance is unknown.

The portrait illustrates the rich amalgamation of cultures which characterised Egypt at this time. Roman authorities in Egypt, whilst maintaining strong ties to Rome, had adopted many Egyptian practices. At the same time an interest in classical Greek culture was very fashionable. The 'Pink Lady' was probably the wife of a Roman official; her dress is Roman

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[1] Walker, S and Bierbrier, M (1997), *Ancient Faces: Mummy Portraits from Roman Egypt*, British Museum Press, p118

in style, particularly with the vertical bands or *clavi*, but the Greek letter gamma is used as a decorative motif on the mantle. The icons surrounding her have their origin in Egyptian religious beliefs, for instance, the ibis-headed deity, and they are depicted in typical Egyptian style.

The quality of the painting of her face is considered to be exceptionally fine workmanship[2], although the background is clearly worked in a less sophisticated hand. Analysis identified use of the following pigments: madder (pink), gypsum (white/ground), Egyptian blue (blue/green), carbon (black) and jarosite (flesh). The presence of jarosite has been identified on a small number of Egyptian artefacts in the collection. The medium was not identified.

Condition of the shroud

The main body of the shroud was in fair condition with large areas where the linen ground fabric was strong and the paint layer remarkably intact. However, the bottom and the whole left side of the shroud were very badly damaged, with large areas missing, the surrounding linen ground fabric in shreds and the paint layer flaking or lost. There were several small holes elsewhere in the shroud, notably at the neck, and to the right of the right arm of the figure. Around the top and right side of the shroud, the linen had been cut leaving narrow unpainted borders extending around the painting. The condition of the paint layer was variable. In places it was uncracked and completely sound; elsewhere it had cracked although the paint appeared fairly secure. There were, however, some large flakes which were loosely attached to the fibre surface. In the lower section of the figure, the pigment layer was largely lost, but traces of colour had penetrated the linen ground fabric. There was considerable dark staining and discolouration of the paint and linen, particularly on the lower right side, where the linen was stiff and embrittled probably due to saturation by body decomposition products. There appeared to be earthy accretions over the painted surface as well as remains of black bitumenous matter. The shroud was very creased and cockled; these distortions being firmly set.

The shroud has been previously mounted onto a fabric-covered wooden board using metal pins. This mounting was felt to be unsatisfactory because it provided uneven support, leaving the fraying edges of the shroud particularly vulnerable. The pins were also likely to cause damage.

Developing a conservation strategy

The aims of conservation were identified: to stabilise the paint surface and prevent flaking; and, to strengthen the shroud by attaching it to a new backing. It was this second aim that presented the greatest challenge.

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[2] James, TGH, (1976), *The Classical Tradition: the British Museum Yearbook 1*, pp. 224–5

Survey of past treatments

A traditional stitched support commonly used for textiles could not be worked through the painted areas. A survey of treatments carried out on Egyptian painted textile indicated a range of treatment options.

Thermoplastic adhesives have been used in the past to adhere a backing fabric, heatsealed using a spatula iron, or a vacuum hot table.[3] [4] A cold vacuum lining method, using water vapour to reactivate a carboxy methyl cellulose and starch adhesive–coated paper backing, has been successfully used to support a more fragmentary and very degraded painted linen shroud of a much earlier date. [5] Singer and Wylie [6] describe the treatment of a fragmentary Roman period painted shroud, where the object was positioned onto a prepared fabric–covered mount, and held in place by an overlay of dyed fine nylon net, stitched to the backing material around every fragment and through all splits and breaks in the shroud. This sandwiching method proved appropriate for another painted shroud in the British Museum collection (shroud of youth EA 6709), since it was to be wrapped around a mummy and the loose edges of the fragments required additional outer protection.

The inherent condition of the 'Pink Lady' shroud meant that none of these techniques were immediately applicable. It was in a comparatively unified and sound condition and an overall adhesive support was felt to be excessive. In addition, vacuum suction adhesive techniques (hot and cold) only achieve an adhesive bond if the textile is flat, which was not the case here. The shroud was very 3–dimensional, and it might be difficult to make it more 2–dimensional without damaging the paint layer. It was felt that the high temperature required to heat–seal a support might also be too damaging for the linen. Large areas of the shroud were solidly painted and there were not enough points through which a net overlay could be stitched to a backing in order to support the shroud, without piercing the object.

Selecting a method for applying a support

It was decided that a backing held in place by a combined adhesive and stitched technique would provide a solution. An appropriate adhesive would be applied locally, attaching the painted areas of the shroud to the backing fabric only where contact was naturally made,

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[3] Hillyer, L (1984) *The conservation of a group of painted mummy cloths from ancient Egypt*, in Studies in Conservation 29, IIC, pp 1–9.

[4] Bilson, T (1992) *The conservation of a Roman Egyptian painted shroud fragment*, in The Conservator 16, UKIC, pp 3–11.

[5] Morgan, H and Cruikshank, P, (1995) *The Conservation of the Shroud of Resti: an 18th dynasty linen Book of the Dead*, in Conservation in Ancient Egyptian Collections, Brown, C, Macalister, F and Wright, M (eds), Archetype, pp 1–11.

[6] Singer, P and Wylie, A (1995), *The conservation of a fourth century AD painted Egyptian mummy shroud*, in The Conservator, 19, UKIC, pp 58–64.

and not where the object was distorted. A complete union between the shroud and backing fabric would not be forced, but the painted areas of the shroud would be adequately supported. In addition, 'traditional' couched stitching would be worked in unpainted areas or where the paint had been lost; in this way the fraying and split linen fabric at the bottom and left side of the shroud would be made secure. By combining both methods, the shroud would be sufficiently attached to the new support fabric to withstand vertical mounting, if necessary. This strategy provided a minimal treatment, that could be more easily reversed than a continuous adhesive backing.

Choice of adhesive

The adhesive chosen was Klucel G, a hydroxypropyl cellulose, used at a high concentration (15–25% w/v) in industrial methylated spirits (IMS). At these concentrations, Klucel G forms a thick gel, which can be applied directly to the object, very sparingly and in a controlled manner. It is instantly tacky, joining two substrates with little more than finger pressure and achieving a bond of sufficient strength. Using Klucel G in an organic solvent rather than water, as such a dry gel and in small amounts meant that there was little free solvent available to spread or wet the object thus reducing the risk of staining. This was particularly important as the degraded linen and the pink madder pigments were known to be prone to staining. The relative ease of reversibility, and the sympathetic affinity between a cellulose based adhesive and the linen and cotton substrates, were other reasons in favour of the selection of this adhesive system.

The Organic Artefacts Conservation laboratory have used Klucel G at this concentration to effect small repairs to linen bandage strips wrapped around Egyptian mummies. In these cases damaged areas of linen were secured by adhering them directly to the layer of linen below using small amounts of adhesive applied on a spatula inserted between the layers. The success of this kind of treatment prompted experimentation on a larger scale for this shroud. Tests were carried out using the adhesive to adhere samples of ancient linen to a cotton calico fabric.

Various tests have been carried out by the Conservation Research Group at the British Museum[7], which found Klucel G to be essentially a stable material with a good ability to retain its reversibility, colour, pH and flexibility. These tests did find that the Klucel G produced fairly weak adhesive bonds which failed under tensile strength testing equipment; but these tests were based on a 5% concentration in water, and it was concluded that Klucel G may require more concentrated solution than other cellulose ethers when used as an adhesive. Interestingly an earlier report[8] also indicates that when in solution in an organic

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[7] Shashoua, Y (1995), *Cellulose Ethers for Textile Conservation, in Starch and Other Carbohydrate Adhesives for use in textile conservation*, UKIC; Shashoua, Y, MacKay, C and Zhang, J (1990), *Evaluation of Starch Pastes and Cellulose Ethers used in paper conservation*, British Museum Department of Conservation, Conservation Research Group, Internal Report No.1990/16.

[8] Wilthew, S (1983), *Investigation of Cellofas B, Ethulose, Klucel L, Klucel G and Wheat starch for use as consolidants/adhesives for organic materials*, British Museum Department

solvent, Klucel G has improved adhesive properties – in tests a 2% w/v solution in acetone formed a stronger bond than equivalent 2% w/v in water.

The practical experiences of the conservators in the Organic Artefacts Section so far have indicated that this adhesive is suitable for use with textiles, in particular when used in conjunction with stitching. Other cellulose adhesives may produce stronger bonds, but they do not dissolve in organic solvents which can be a very useful advantage of Klucel G, where a water–based adhesive might result in staining.

Conservation treatment carried out

Initial preparation

The shroud was removed from the previous mount by carefully pulling the pins out and transferring the textile onto a sheet of Bondina (non woven polyester) as a temporary support. Various humidification techniques were used to relax the undulations, but the creases were not removed entirely. Following careful cleaning using a low powered vacuum suction unit, the condition of the pigmented surface was assessed. It was decided that consolidation was required.

Consolidation of the paint layer

The choice of consolidant was made on the basis of previous experience. Paraloid B72 (ethyl methacrylate copolymer) has a proven record of success with similar material[9]. It has good ageing properties, low sheen, and lasting flexibility. A 2.5% w/v concentration of Paraloid B72 in xylene was applied using pipettes. It was applied over all of the painted area to avoid risking a patchy appearance if applied locally. Work was carried out in a fume room, wearing solvent vapour masks, according to health and safety recommendations. The slow evaporation rate of the xylene encouraged full penetration to the resin into the pigments. When the solvent had evaporated there was no visible colour change, and an effective degree of consolidation was achieved with one application. It is worth noting that tests showed that when applied in other solvents (e.g. IMS, acetone), the same concentration of the same consolidant darkened the pigments considerably.

In addition, individual large loose flakes were adhered to the ground using flake–laying methods routinely employed in this studio. White spirit was first applied to the area of the flake to act as a wetting agent; then a tiny amount of Vinamul 3252 (polyvinyl acetate/ethylene copolymer emulsion) 10% v/v in distilled water was introduced on the tip of a fine sable brush. Capillary action drew the adhesive underneath the paint flake, which was gently tamped down with the brush. Any excess adhesive on the surface was

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of Conservation, Conservation Research Group Internal Report No. III 17.

[9] See notes 3, 4 and 5 above. Also Leach, B and Green, L (1995), *Removal of unsuitable linings from illustrated papyri – an investigation into suitable consolidants and facings* in, Brown, C, Macalister, F and Wright, M (eds)Conservation in Ancient Egyptian Collections, Archetype.

immediately removed with absorbent tissue. Although an aqueous adhesive, it was applied to such small areas that there was no staining noticed.

Applying the backing fabric: adhesion

A support fabric was prepared by dyeing cotton calico to a suitable neutral shade using Ciba Geigy Solophenyl dyes. The shroud was laid in position on the fabric in preparation for the application of the adhesive. A 20% w/v solution of Klucel G in IMS was made up the previous day so that it fully solubilised. Suitable points for adhering the shroud to the backing fabric were marked out in advance using a Melinex (polyester film) overlay. Areas where the shroud naturally cockled away from the backing were not be adhered. A network of contact points over the painted area of the shroud was planned. At these points, about 7 cm apart, the adhesive would be applied in small areas about 1 cm square. In order to apply the adhesive, long spatulas were made from Melinex strips. The adhesive was thinly spread onto the tip of the spatula, which was inserted between the backing fabric and the shroud until it reached the point corresponding to the mark on the overlay. The 'handle' of the spatula was previously marked to indicate how far underneath it should be inserted. Finger pressure was applied on the top surface of the shroud down onto the tip of the spatula, at the same time as the spatula was withdrawn. In this way the adhesive was deposited and the shroud instantly adhered to the backing fabric. This work started at the centre of the shroud and moved towards the edges.

Applying the Backing fabric: stitching

Wherever possible, the shroud was also secured to the backing using stitched techniques. The unpainted linen borders were held down with staggered rows of support lines in running stitch and the edges whip stitched. The weak linen at the bottom and left side of the shroud could be fairly extensively couched, with the stitches worked into splits and tears in the fabric and through the interstices of the weave where the paint was missing. All stitching was carried out using silk monofilament thread, dyed using Ciba Geigy Lanaset dyes.

Completion of treatment

The supported shroud was stitched onto a fabric-covered Aerolam board. It was displayed in the exhibition at a fairly steep angle.

Conclusion

Although this treatment was developed to meet the specific needs of this particular shroud, it was felt to have been very successful and could offer potential solutions in other cases, especially for the treatment of painted textiles in comparatively sound condition. There are two main issues to emerge from the treatment.

When used at such a high concentration as 20%, the adhesive power of Klucel G appears to be enhanced, although the role of the supplementary stitching was an important part of the treatment. Further work on the long-term strength and stability of high concentration Klucel G is needed.

Although the provision of a support attached by a discontinuous adhesive layer is not a new method and has been explored with other adhesives applied in dot-matrix systems, Klucel G was felt to lend itself particularly well to this application method. The location of the adhesive was determined directly by the condition of the object, rather than in a regular dot matrix pattern.

With this approach, the shroud was fully supported without piercing the paint layer, without having to alter the 3-dimensional character of the textile or causing possible damage to the paint layer, and all fraying textile fibres were secured. In addition, the treatment was felt to be consistent with the ethos of minimal intervention.

Acknowledgements

The authors would like to acknowledge their colleagues in Organic Artefacts Section, particularly Colin Johnson for his previous work using Klucel G, Allyson Rae and Pippa Cruikshank for their comments on this paper. Thanks are also due to Trevor Springett, Photographic Services for photography; Andrew Middleton, Scientific Research for carrying out the analysis of the pigments, to Susan Bradley for editing the paper and finally to Dr Andrew Oddy, Keeper of Conservation, for permission to publish.

Materials and Suppliers

Klucel G
Conservation Resources UK Ltd, Unit 1, Horsforth Industrial Estate, Cowley, Oxford OX4 2RD

Paraloid B72
Rohm & Haus (UK) Ltd, Lenning House, 2 Mason's Avenue, Croydon CR9 3NB

Xylene, IMS
Merck, R&L Slaughter Ltd, Units 11 & 12, Upminster Trading Estate, Warley Street, Upminster, Essex RM14 3PJ

Melinex
Hi-fi Industrial Films Ltd, Gunnels Wood Industrial Estate, 3 Babbage Road, Stevenage, Herts 5GI 2EQ

Cotton Calico
Wolfin & Sons Ltd, 64 Great Titchfield Street, London W1P 7AE

Health and Safety
COSHH regulations were observed when handling the solvents and resins. Xylene is an irritant and moderately toxic by ingestion and inhalation; it was used in fume room, wearing solvent masks, goggles and nitrile gloves. Paraloid B72 may cause localised irritation with frequent exposure, and gloves were worn.

ANALYSIS – AN AID TO CONSERVATION

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Abstract

The British Museum holds a number of painted textiles, which includes Ancient Egyptian painted linen shrouds, cartonnage, and Eastern art on cotton and silk. This paper will illustrate the benefits of analysis in identifying the nature of paints, both the pigment and binders, and associated materials. Obtaining the most beneficial outcome of analysis relies on an understanding of the object, careful sampling, and interpretation of results.

Analysis can be used to identify degrading areas, and when the mechanism of decay is elucidated, this can be an aid to deciding on the best treatments, or removal of the agents of decay. For example, verdigris becomes acidic with time; deacidification of the affected areas can inhibit further decay. Other pigments may be photochemically unstable and preservation of artefacts identified as having such pigments will involve careful control of light levels in their storage or display areas. A further, and equally important consideration, is the toxicity of pigments. Arsenic compounds have been used as pigments; orpiment is a yellow arsenic sulphide, and emerald green is a copper – arsenic compound. Again identification of the presence of such materials may influence the treatment of an object.

This paper will outline the analytical techniques which can be useful for examining painted textiles, and use examples from the collections of the British Museum to show how analysis has helped with their understanding and long term preservation.

Introduction

Scientific analysis of artefacts is an important function at the British Museum; there are two groups of scientists, those in the Department of Scientific Research who carry out archaeometric studies, and those in the Conservation Research group of the Department of Conservation, who, as a part of their work, carry out analysis which will influence the decision made on the conservation of artefacts. It is the work of the latter group which will be discussed here.

There are a number of reasons why an artefact may be subjected to scientific investigation before or during conservation treatment. In order to provide essential information towards decisions regarding appropriate treatments; it may be necessary to elucidate the nature of a

material, to identify whether it is degrading; whether it is a later restoration of the object; where it is an environmentally sensitive material; to highlight the presence of potentially toxic materials. The latter is infrequently approached *per se*, but results of analysis may prove the presence of a harmful substance.

Although on occasions, the scientist may observe a material of interest on an artefact undergoing conservation, it is normally the conservator working on the object who raises the request for analysis. This takes the form of a written request, and is followed by discussion over the object; this has advantages over receipt of samples "blind" through the post. Results of an analysis can more easily be interpreted if the artefact has been examined by the analyst.

Discussion can also highlight any known additions to the object, which may have implications for the outcome of the analysis.

Sampling

Sampling is restricted to taking the smallest sample which will practically reveal the relevant information. Clearly, damage must be limited when removing a sample; however, this must be offset by taking sufficient sample to yield useful results. Furthermore, a sample is most readily taken from a damaged area, but this may affect the outcome, for example because of contamination by dirt and dust in the damaged area. At the British Museum, sampling is often undertaken by adhering a small sample, in this case, paint, onto the tip of a gelatin strip; this is produced by softening a gelatin capsule at high humidities, cutting into thin strips, approximately 1 x 5mm, and drying whilst flat. The tip is wetted slightly before sampling in order to produce a tacky surface, onto which the sample is collected. The sample on the strip is then placed into a gelatin capsule for transportation. The gelatin contains no heavy elements and is non crystalline; it therefore does not interfere with many of the analytical techniques used. However, some materials are sampled as a powder and placed directly into the gelatin or glass capsule for later retrieval. This is more appropriate for samples which are to be examined for the presence of an organic component. The chosen method of analysis therefore can influence the method by which the sample is taken.

Analytical Techniques

A range of analytical techniques are available in the British Museum for investigation of samples; but where necessary other analytical techniques only available in other institutions may be utilised.

The four main techniques used are x-ray fluorescence (XRF), x-ray powder diffraction (XRD), polarised light microscopy (PLM) and Fourier transform infra-red spectroscopy (FTIR). XRF is used to identify the major elements in a sample. This is generally the first technique used for inorganic materials, for example pigments and grounds. X-rays are directed at the sample, often mounted on a gelatin slip; the sample absorbs the incident x-rays, and emits secondary x-rays, with energies characteristic of the elements in the sample. This data forms a spectrum of peaks, the position and intensity of which provide information about the types and concentrations of elements present. The elements detected by XRF are limited by their mass; elements lighter than magnesium (atomic number = 24) cannot be detected without a vacuum attachment, and elements such as aluminium, silicon, phosphorus, sulphur and chlorine will only be detected if present at substantial concentrations within the sample. However, XRF is non-destructive to the sample and offers a rapid method of gaining elemental information about a sample. If further information about the lighter elements in the sample is required, analysis can be undertaken in the scanning electron microscope using energy dispersive analysis (SEM[EDX]). However, the sample needs to be made electrically conducting for this technique, which involves application of a thin carbon film to the gelatin strip.

The next stage of analysis can involve identification of the crystalline components of a sample, using XRD. The sample on the gelatin strip is mounted in the centre of a Debye-Scherrer camera, with a length of photographic film around the inner edge. X-rays are focused onto the sample and diffracted at the crystal planes onto the photographic film. When the photographic film is developed, a pattern of lines is produced. The position and intensity of these lines is compared with reference patterns and can be used to identify the crystalline component(s) of the sample.

Polarised light microscopy is used mainly for pigment analysis. The sample, collected as a loose powder, is mounted onto a glass microscope lid, in a mountant of known refractive index; Meltmount, with a refractive index of 1.66, is used in the Conservation Research Group. When the sample is viewed under magnification in transmitted light, characteristic features such as colour, shape and size of the particles can be observed. Additional information can be gained by viewing the sample between crossed polars.

FTIR is a technique often used for identification of the organic components of a sample; however, it can also be a useful technique for providing information about inorganic materials. Infra-red radiation is passed through the sample; certain chemical groups in the sample selectively absorbs certain wavelengths, producing a spectrum. The shape of the spectrum can be used to identify components of the sample. A variety of sample preparation methods are available for FTIR; the diamond compression cell is particularly useful for analysing the small samples taken from objects.

The following case studies will be used to illustrate both the analytical methods used, and the application of the results of analysis on the subsequent treatment or display of various painted textiles in the British Museum. Examples are taken from objects in the Department of Egyptian Antiquities (EA) and the Department of Oriental Antiquities (OA).

A painted linen shroud, EA 1979 3-3.1

The first example shows the various ways that analytical information can be utilised. A painted Egyptian shroud, EA 1979 3-3.1, dating from circa 1500BC, is made of linen and is decorated with painted script and images on a gesso background. The fragmentary shroud had been backed onto a cellulosic fabric prior to its acquisition by the British Museum. A request was made to examine the pigments present, in addition to a white 'bloom' on the surface, which masked some of the decoration. A series of organic samples was also investigated; a pale brown adhesive, a black shiny deposit, and the binder in the pigment. Samples of each material were taken in the appropriate manner, and sampling locations were recorded using both a grid reference system designed for the conservation assessment, and by annotating a photograph of the textile. It is important to know the exact location from which a sample has been taken, and the method of recording the locations should be carefully considered; this may be difficult as the shape or size of a textile can change due to treatment. Using a combination of XRF, XRD and PLM, the pigments were subsequently identified as: blue was Egyptian blue, a synthetic calcium copper silicate; yellow was orpiment, As_2S_3; red was hematite, Fe_2O_3, black was carbon black, and the white background was identified as huntite, $Mg_3Ca(CO_3)_4$. The white 'bloom' over some areas was also identified as huntite. On further discussion, it transpired that the linen shroud had been folded during storage; the white 'bloom' was due to offsetting from the opposite face of the shroud which was in contact during folding, and it was therefore left in place.

The pale brown adhesive was analysed using infra red spectroscopy, and the spectrum closely matched with that of a gum. Due to the liberal application of this adhesive, it was

felt that attempts to analyse for a binder in the pigment layer would not yield useful results. The pigment layer was friable, and hence likely to contain little binding material; results of analysis would most likely be swamped by the combination of the adhesive used to attach the backing material. The black shiny material was identified as pitch, a tarry substance from wood. The shroud would have originally been wrapped around a body; pitch has been found associated with these types of burial, and is considered to be an original part of the shroud, and hence was not removed during conservation treatment.

The Shroud of Resti, EA 73807

A recent painted linen shroud, the Shroud of Resti, EA 73807, dating from *circa* 1450 BC, appeared to have suffered degradation due to the applied colours. Although the shroud was fragmentary, certain areas associated with an applied red had become extremely brittle and were suffering from loss. However, the reason for this was not fully identified. A sample taken from the remaining brittle red area contained iron; but other areas, also painted with an iron red pigment, had not suffered the same decay. Iron mordants are known to cause accelerated degradation of textiles; the binder, or subsequent treatment of the decayed areas may have contributed to the extreme decay now present. As the exact nature of the decay was unresolved, no specific treatment was applied to the degrading red areas.

The Cartonnage of Artemedoris, EA 21810

A recent investigation was undertaken into the cartonnage of Artemedoris, EA 21810, see Figure 1. Cartonnage is formed from layers of linen or papyrus, stiffened with a layer of plaster. The cartonnage of Artemedoris is from the Hawara cemetery in the El-Faiyum district of Egypt, and dates from the 2nd century AD. It was acquired by the British Museum in 1888, soon after its excavation. The cartonnage is decorated with a red and gold design, with a black wash over the surface. This cartonnage was undergoing cleaning for the Ancient faces exhibition, and the nature of the black surface layer was questioned; it was aesthetically disfiguring and found to be soluble in water, which was thought to be unusual. Samples of the black and underlying red, were taken directly into a gelatin capsule; the black was initially analysed using FTIR, with the diamond compression cell. The infra-red spectrum was found to be a good match with gum Arabic, a water soluble material known to have been available in Ancient Egyptian times, see Figure 2. The sample was retrieved from the diamond cell and the inorganic components of both black and red samples were investigated. Using XRF, the red material was found to contain iron; and XRD was used to identify it as containing hematite, FE_2O_3. The black material was found to contain mercury and sulphur, and was identified as metacinnabarite, HgS. This material has

been reported as the alteration product from red cinnabar (vermilion)[1]. The blackening is a result of a photochemical reaction, which induces a change from the red trigonal form of HgS to the black cubic form; this process has been shown to be accelerated by the presence of ions such as chloride and iodide, and high humidities.

The black form of HgS is a naturally occurring mineral, although no evidence has been found that this was used as a pigment, further research was felt necessary to determine if the cartonnage had blackened since acquisition by the Museum in the mid-nineteenth century. Reference to one of the first catalogues of Egyptian artefacts in the Museum, printed in 1898, ten years after the cartonnage was excavated, revealed that Artemedoris was "enclosed in a plaster case painted bright red, and gilded"[2]. This suggests that the blackened surface was originally red and had degraded since excavation. There is no known process to revert the blackened vermilion. It is proposed that the cartonnage was first coloured with the dull red hematite, a cheaper pigment, and a wash of the more expensive brilliant red vermilion was added. In this example, analysis has provided vital evidence to both the conservator, and the curator, and has lead to a greater understanding of the original appearance of this object. The cartonnage of Artemedoris was subsequently chosen for illustrating the poster and entrance to the "Ancient Faces" exhibition at the British Museum, and a further question was raised; this related to a pink area, to the lower right of the inset mummy portrait. This bright pink colour had been applied in an apparently careless manner; its surface was cracked and coarse, and hence it was considered to be a possible later restoration of the object. A gold line decoration had been applied over the pink area, in fitting with similar decoration on the lower left corner, which was over a red area. The gold on the pink had a patchy, discontinuous appearance, in marked contrast to the more uniform appearance of other gold decoration on the cartonnage.

Samples of the pink, and gold line were taken. A sample of the gold on the body of the cartonnage was taken for comparison. Elemental analysis of the pink sample identified the presence of calcium, later identified by XRD as gypsum, $CaSO_4 2H_2O$. As none of the common colourants for a red Egyptian pigment were identified, i.e. iron, mercury, arsenic or lead, this suggested that the pink colourant was organic in nature. Dye analysis was therefore undertaken to determine the components of the pink. Dye analysis does not always produce a good result, especially if the dye has degraded with time. Therefore the

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[1] Daniels, V., 1987, The blackening of vermilion by light, *Recent Advances in the Conservation and Analysis of Artefacts*, J Black (ed), Summer Schools Press, 280–1.

[2] Anon, 1898, *A Guide to the First and Second Egyptian Rooms*, British Museum, 78–9.

benefits of removing a sample for this type of analysis has to be carefully evaluated. However, in this case knowledge of the type of dye could reveal whether the pink area was restoration, and sampling was considered to be justified for this reason. A sample of the pink was first hydrolysed by boiling in a mixture of methanol and 10% sulphuric acid (2:1), to separate the organic dye from the gypsum base. Tertiary butyl methyl ether was shaken with the extract, and the nature of any organic colourant was determined by thin layer chromatography, using a methyl ethyl ketone/formic acid (7:3) eluent and an F1700 micropolyamide plate. The pink pigment was found to contain purpurin, consistent with a dye produced from the madder root, which is often absorbed onto a calcium sulphate base. The madder plant is indigenous to Persia and the Eastern Mediterranean region[3]; the use of madder based dyes has been reported on other Ancient Egyptian artefacts[4].

The gold decoration on the pink area and from the main body of the cartonnage were both analysed by XRF. They had similar compositions, with a small amount of silver, approximately 3 %, found in both. This is consistent with a partially refined gold, which is in keeping with gold in Egypt of the 2nd century AD[5]. The patchy appearance of the gold may be due to application of gold leaf onto the coarse surface of the pink area, resulting in non-uniform adherence of the gold, conversely it may have been applied as a paint in an organic binder, but there was insufficient sample available to analyse for the latter.

It could not be concluded that the pink area and applied gold decoration were definitely ancient, but there was no evidence to the contrary. It would seem unlikely that a restorer from last century would choose the expensive pigment madder, or indeed use gold consistent with ancient gold for an apparently carelessly applied repair. It has been proposed that the pink area may have been applied as part of the burial ceremony, as the area lies directly over the heart. It should also be borne in mind that the cartonnage was bright red, and the madder pigment may have originally been much brighter; therefore the inconsistency in the colours would not be as obvious as seen at present. As a result of the analysis, the black wash over the surface of the cartonnage of Artemedoris remains in place,

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[3] Cardon, D and du Chatenet, G (1990), *Guide des Teintures Naturelles*, Delachaux et Niestlé, Paris, 164.

[4] Perkin, A G and Everest, A. E (1918), *The Natural Organic Colouring Matters*, Longman Greeen and Co., 23.

[5] Lucas, A (1989), *Ancient Egyptian Materials and Industries*, Histories and Mysteries of Man Ltd, England, 228-9.

but the original colours can now be understood. Additionally, analysis of the pink area beneath the inset portrait has supported the argument that this area should not be removed.

Princes in the House of Timur, OA 1913 2-8.1

Another recent study revolved around an Indian miniature painting, from circa 1555, **Princes in the House of Timur, OA 1913 2-8.1**. This is an important Mughal painting due to its large size, approximately 108cm x 107cm, and its early date. It is painted in water colours, which have been applied directly onto cotton, and depicts various Mughal rulers seated in a pavilion.

There were several signs that areas of this painting were suffering from degradation. Most noticeable was the loss of the roof of the pavilion, one of many areas which had been repaired at some point in the past. This painting was the subject of a full scientific examination, details of which have been reported elsewhere[6]. Analysis was particularly useful in identifying areas which had already suffered from decay, and other areas which were liable to be unstable. The painting had been repaired on several occasions at unknown points in its history. Analysis was also helpful in determining whether these repairs had been undertaken in India, or at the British Museum, which employed a restorer trained in Japanese conservation methods when the painting was acquired, in 1915. By matching worm holes and areas of discolouration, it was possible to show that a cotton fabric used for repairs had first been a lining on the painting. The adhesive used to hold the repair patches in place was identified as a gluten-free starch, consistent with a traditional Japanese adhesive. This evidence supported the theory that repairs had been executed at the British Museum. This information assisted the conservator and curator in deciding the approach which should be taken; eventually, the repairs remained in situ, and are now considered part of the history of the painting.

As discussed, many areas of the painting had suffered from loss. Analysis of areas thought to have suffered from verdigris damage was undertaken. Verdigris is a term used to describe a range of copper pigments, containing copper acetates, and often additionally copper chlorides. Although the decay mechanisms of verdigris are not fully understood, the degradation is due to production of acids, and copper catalysed degradation of the support material, in this case cotton. When a paint is degraded, the analysis can become complex.

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[6] Lee, L R, Thompson, A and Daniels, V D, Princes in the House of Timur– Conservation and Examination of an early Mughal Painting, *Studies in Conservation*, in press.

Degradation products often contain a mixture of different phases, which may be only partially crystalline. However, a combination of analytical techniques, XRD, XRF and FTIR confirmed that copper acetate and chloride mixtures were present in several areas with associated degradation and loss. Malachite, $Cu_2(CO_3)(OH)_2$ was also identified in these areas, but it not possible to conclude whether this was intentionally added to the green verdigris, or whether it is a product of decay. Of note was that the degradation of verdigris had highlighted some of the overpainted areas. One of the seated figures had initially been depicted wearing a large feather in his headgear, this had subsequently been overpainted, probably during the useful lifetime of the painting. However, due to the decay of the underlying verdigris, the shape of the original feather had become visible. Areas with verdigris damage were subsequently deacidified using a saturated solution of magnesium bicarbonate (approximately 2%). Other green areas were found to be covered with a mixture of orpiment and indigo, described in Indian literature as "artificial verdigris"[7]; clearly such areas did not require deacidification, but as both indigo and orpiment are photochemically unstable, their exposure to light should be minimised. Orpiment decays on exposure to light due to loss of sulphur, and reaction with oxygen, to produce white arsenic oxide, As_2O_3. Areas of yellow orpiment were identified on the painting, and as these have retained their colour, it suggests that the painting has not be displayed for extended periods. It has been proposed that, when in use, the painting was hung in a dark tent. The presence of orpiment had potential repercussions; the sulphur emitted when orpiment fades, on exposure to light, could subsequently cause further degradation. Lead white, identified on the painting will react with sulphurous gases and blacken due to the formation of lead sulphide; there was no evidence of blackening of the lead white. However, silver foil used to depict cooking vessels had discoloured, probably due to the reaction with sulphurous air borne pollutants, and appeared black, an irreversible process. Other pigments which were identified included a red organic lake and vermilion; both these materials are liable to eventual discolouration if exposed to light.

Analysis of this painting had several applications; identification of later additions to the painting, identification of areas of degradation, and identification of colours which were prone to decay if incorrectly stored or displayed. In addition, it was advised that the painting should not be mounted in an enclosed frame; should there be any decay of the orpiment, the sulphurous gases should be allowed to escape, and not be trapped on the surface of the painting where they would cause further decay.

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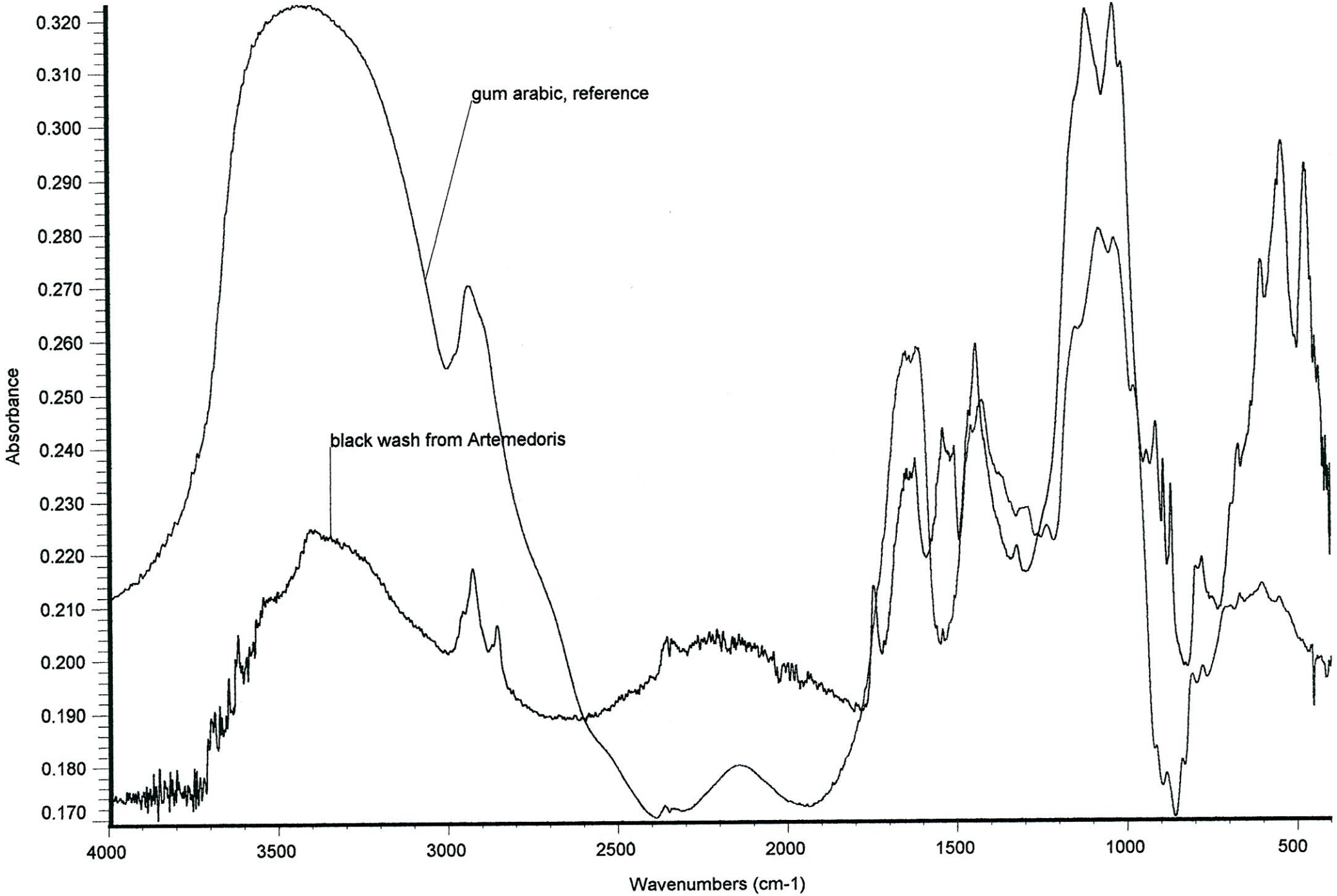
[7] Bukhari, Y K, 1963, Pigments, *Marg,* **16**, suppli ii–iii

Figure 2


gum arabic, reference
black wash from Artemedoris
Absorbance
0.320
0.310
0.300
0.290
0.280
0.270
0.260
0.250
0.240
0.230
0.220
0.210
0.200
0.190
0.180
0.170
4000
3500
3000
2500
2000
1500
1000
500
Wavenumbers (cm-1)

THE CONSERVATION OF A PAINTED SILK TAMBOURINE - AND TRI-AMMONIUM CITRATE

Vivien Chapman, Head of Organics Conservation, NMGM, The Conservation Centre.

Abstract

In the course of treating a late nineteenth century tambourine with a painted silk cover, tri-ammonium citrate solution was found to be an effective cleaner not only for the paint, but also for washing the silk. This prompted some thoughts about the effects of tri-ammonium citrate in a wash bath, and the differences between cleaning paint and silk.

The object and its treatment

The tambourine was basically a wooden drum with a parchment membrane, and metal jingles, but not much of the construction could be seen initially. The membrane was covered in dirty pale pink silk satin, with flowers painted on it in oil paint, and the silk was beginning to split round the sides; the underside was covered with cotton sateen, which was also splitting; the sides were wrapped in dirty ruched silk velvet, shedding its pile on the high points and showing signs of insect damage; and finally the tambourine was bound with silk ribbons and bows, which were also splitting.

The tambourine was stripped to its basic construction by softening the adhesive with a small steamer[1]. When it was reassembled the adhesive was softened again to re-attach the textiles, adding a little starch paste when necessary.

Loose dirt was removed from all surfaces with a mini-vacuum or with Dry Chem sponge[2] The velvet was solvent cleaned, the cotton washed, and the ribbons both solvent cleaned and washed, and the splitting textiles were backed as necessary using net or crepeline coated with Mowilith DMC2. Tracings were made to ensure that the circular textiles did not change shape as a result of wet cleaning.

The painted silk

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[1] Steamers (small scale): The model I used is obsolete. Similar steamers: *TruSteam* from Conservation Resources (UK) Ltd., Unit 1, Pony Road, Horspath Industrial Estate, Cowley, Oxford OX4 2RD, Tel 01865 747755. *SteamyPR-1* from Lascaux Restauro - Alois K Diethelm AG, CH-8306 Brüttisellen - PO Box, Switzerland, Tel CH-1-833 0786.

[2] *Dry Chem sponges*: Prochem Ltd., 122 Acre Road, Kingston-upon-Thames, Surrey, KT2 6EW, Tel. 0181 5490927, Fax 0181 5472403.

Previous experience based on **Dirt and Pictures Separated** (see Bibliography) had showed that tri-ammonium citrate often cleaned painted or varnished surfaces effectively[3] The paint was cleaned with a 5% solution w/v in de-ionised water, under the microscope, and the results were dramatic. Flowers in shades of tinted browns and greys suddenly became crimson, lemon, and cream. Unfortunately this made the silk ground look filthy. I tested white spirit, water, Synperonic, etc. on swabs on the margin, with blotting paper below. None of these seemed to have as much effect as where tri-ammonium citrate solution had accidentally been in contact with areas of unpainted silk when cleaning the paint, so I tested the tri-ammonium citrate in the same way. It released more dirt than the others so following Judith Hofenk's suggestions for using sodium citrate as a builder I decided to add 2% to the first wash bath (with Synperonic and CMC)[4] I worried about it and did a second wash bath without before rinsing.[5] The results were very good. The silk has faded, but the final appearance was clear and glossy, and an adequate balance to the vividness of the painted areas.

Dirt and paint and dirt and textiles

Orientation

In general paintings are stored and displayed vertically and textiles are frequently horizontal; this affects the nature of the soiling. Soiling on a vertical surface is more dependent on air streams, and on electric and thermal gradients, than on gravity. Heavier particles such as cement dust and fibres fall a metre in between a minute and an hour, so tend to fall on to horizontal surfaces rather than becoming attached to vertical ones. Very small particles like smokes, and carbon black, which may take as much as a month to fall a metre, will form a much higher proportion of the soil layer on a vertical surface than on a horizontal one – think of the difference in soiling between a ceiling and the floor or between a carpet and a curtain. There is a greater weight of dirt on the floor or in the carpet than on the ceiling or the curtain, but a higher proportion of it consists of large particles. Large particles are relatively easy to remove because the attraction between a particle and a surface varies inversely with its diameter . With a large enough particle the forces of attraction will be less than its weight – if there were no other forces of attraction it would fall off if shaken.

Surface texture

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[3]Chapman, V, Dirt and Masks Separated, *Conservation News*, 45 (1991) p38 and cover.

[4] Hofenk-de Graaf, J H, Some Recent Developments in the Cleaning of Ancient Textiles, *Science and Technology in the Service of Conservation*, IIC, (1982).

[5] More recently I've been bolder, and experimented with it alone as a first wash bath, and as a builder without a subsequent detergent bath – it should be less likely to bond with fibres than a surfactant is, and more readily rinsed out.

Paintings are not completely smooth, but they rarely have as complex a surface texture as textiles. Weave, twist, and the geometry of the fibre itself (scales, twists, etc.) mean that the dirt particle can penetrate much further, and that there is a far greater surface area available for it to lodge on. One gram of a cotton textile has an actual surface area of 40 square centimetres while painted surfaces have much the same surface area as its actual area. (Soil retarding finishes on textiles work by filling up the irregularities on the fibres.) Theoretically the dirt load on a textile could be reduced as some particles would fall straight through a textile but some of the large, easy to remove, particles which could be brushed or vacuumed from a smooth surface are likely to be trapped within the weave. If they had fallen on a smooth surface they could have been brushed or vacuumed away.

Cleaning methods

As discussed above the nature of dirt on a painting and on a textile tend to be different. The painting will have a higher proportion of very small particles, but a lower weight of dirt overall. The dirt will rest on or near the surface and the normal cleaning technique is to remove the dirt, and sometimes the varnish, which may have absorbed some of the dirt ,with solvent on a swab – dirt removal is the result of a combination of the loosening effect of the solvent and the mechanical action of the swab.

If a textile could be treated in the same way, that is if it could be wiped with a swab without the solvent suffusing the textile, the swab would only be in physical contact with an extremely small proportion of the actual surface area. Dirt particles which have penetrated both the weave and the twist of the yarns cannot be wiped away. Vacuum cleaning has been a popular choice as a precursor to wet cleaning or as a substitute to it, and it will remove larger particles from within the weave , but it won't remove the finer particles where the forces of attraction are greater than the particle weight.

There isn't a specific particle size that won't be removed by a particular method – it depends on the roughness or smoothness of both the particle and the surface, and on the other forces of attraction; intermolecular, electrical, capillary, the plasticity of the surface, Coulombic forces, etc. Particles with a diameter greater than 100 microns will, however, normally fall off a vertical surface. Unfortunately about 53% of street dirt consists of particles less than 4 microns across, and these are hard to remove even by laundering. When carpet sweepings are analysed less than 17% of the dust particles are so fine – the other fine particles present in the street dirt stay in the carpet. (For comparison purposes: degummed silk fibres have a diameter of 12–13 microns, most other fine fibres are 15 to 20 microns across,). The other problem with fine dust particles is that the same weight will cover a much larger area; imagine a brick compared with the same weight of brick dust. This means that if two textiles have the same weight of dirt on them, the one with a higher proportion of small particle dirt will look dirtier, since more of its surface will be covered by dirt particles, and it will continue to look dirtier after the large particles have been removed. Since neither a swab nor a vacuum cleaner will reach particles attached to the inner surfaces of a textile using a solvent (including water) will always result in much more effective cleaning. The solvent penetrates the textile and provides a medium for to carry away both soluble and insoluble soils.

Washing painted textiles

Picture restorers do not normally immerse paintings in water. Many textile conservators have done it – 74% preferred to wash painted flags and banners whenever possible according to a survey published in 1987[6] (The proportion might be lower now if the survey were repeated.) There are risks to washing painted textiles. Most natural fibres swell when wet. Silk increases its cross sectional area by 46% if the RH is increased from 75% to 100%. This may not appear so dramatic if considered as an increase in diameter rather than cross section area. The diameter increases by around 12–17% – roughly similar to wool. Cotton and linen increase in diameter by about 20%. The increase mostly occurs between 80 and 100% and this is relevant to humidification treatments and to surface cleaning with solutions and gels containing water[7] Depending on the type and condition of the paint binder, and on the way in which it has been applied, if the RH rises either the paint will constrict the expansion of the fibre or else the paint will deform or fissure.

Most fibres lose strength when wet – wet silk is only 75–85% as strong as when dry. It is not yet clear whether fibres are stronger or weaker when they dry again. Paint and varnish layers can blanch as a result of contact with water. This may be a consequence of a change in the optical qualities of the surface layer caused by the development of microfissures and voids, which is why it is .cured. when the voids are filled with varnish or wax.

Changes in the paint and varnish on the tambourine during washing were monitored by photographing representative areas about 5 mm. square before and after washing. The general appearance was unchanged but a triangular fragment of paint less than 0.5 mm. long was lost from a cracked area.

Tri–ammonium citrate and paint

Picture restorers at the Tate tried it on rust stains at the edge of a canvas, found out it cleaned the paint as well, and went on to test it . Alan Phenix and Aviva Burnstock wrote about it again in 1992, even I've written about its virtues for cleaning paint before (Footnote 3). It has also been used successfully to clean globes, wax, and gilded and painted bronze.

When Leslie Carlyle, Joyce Townsend and Stephen Hackney carried out the tests presented at the Dirt & Pictures meeting in 1990 they tried out all sorts of cleaning agents – from Vulpex to

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[6] Yates, N, *Results from a Questionnaire on the Conservation Treatment of Painted Flags and Banners*, ICOM 8th Triennial Meeting, Sydney, Australia (1987).

[7] If the RH rises above 80% and approaches 100% then the fibre and paint will undergo the stresses consequent on dimensional change. Applying water for a short time to a relatively impermeable paint surface will probably not raise the RH in the fibre sufficiently, but most humidification processes will.

Triton X, and including Synperonic N, on a naturally soiled 19th century primed canvas. The most effective cleaners, including the Vulpex, were all highly alkaline and caused surface damage visible at 40x magnification. Tri-ammonium citrate was rated as "very effective", on a par with tetrasodium EDTA but while this EDTA salt has a pH of 11 tri-ammonium citrate has a pH of 7. Sodium citrate, which has been suggested in textile conservation literature as a more ecological builder than the polyphosphates, came in the third group - "limited effectiveness" Synperonic was listed in the 4th group - "little or no effect" (Textile conservators might be less surprised than those working in other fields to find Synperonic alone so ineffective since we have been aware of the need to use builders and anti-redeposition agents in combination with surfactants since the early textile conservation conferences in the 1960s[8]. Later research showed that the builder and/or sequestrant, such as sodium tripolyphosphate (STPP), could be an effective cleaner in itself.)

Tri-ammonium citrate and textiles

When tri-ammonium citrate is added to a wash bath it acts in several different ways:

1. **In a buffer** - as it is the combination of a weak alkali and weak base. The ammonia mops up free hydroxyl ions, buffering acid soil, and the citrate attracts free H+ ions. Surfactants usually work better in neutral or alkaline conditions. Without the addition of polyphosphate or a sequestrant non-ionic surfactants only exceed their turbidity point above 40C. The addition of a builder allows them to form a true solution of micelles instead of a cloudy suspension of aggregates at lower temperatures. When cleaning a paint surface a neutral pH reduces the risk of saponification of oils.

2. **Acting as a chelate or sequestrant** - the tri-ammonium citrate forms links with metal ions, bringing them into solution. Citric acid is an effective chelating agent for most bivalent and trivalent ions, except alkaline earths. [In the order Fe3+>Pb2+>Cu2+>Ni2+>Co2+ ˜Zn2+>Mn2+>Mg2+>Fe2+>Ba2+˜Sr2+>Cd2+]. It completely sequestrates iron when ammonia is present, but is ineffective above 60 dec. This ability to bring metals into solution is significant because lead and iron are some of the typical inorganic constituents of airborne dirt . (Sulphur, aluminium, silicon, potassium, calcium are also likely to be present).

3. **Dispersion**, *(encouraging dissolved or suspended substance to remain on that state),* **deflocculation**, *(breaking up of aggregates into smaller units),* and **peptisation** *(bringing substances into colloidal solutions).* Sodium citrate is used in paint and pigment manufacturing as a dispersant, especially for clay type and other mineral particles - tri-ammonium citrate could replace the functions of CMC in the wash bath. Citrates and STPP have also been shown to deflocculate better than some organic surfactants.

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[8] Hofenk-de Graaf, JH, The constitution of detergents in connection with the cleaning of ancient textiles, *Studies in Conservation*, 13, IIC (1968).

Conclusions

Tri-ammonium citrate has been shown to be an effective cleaner for painted surfaces and is well worth considering as an additive for the wash bath for painted textiles. Caution should be observed with relatively poorly bound paints with a high pigment to volume concentration, where a high proportion pigment particles are exposed compared to those protected by medium. Those pigments for which citrates or STPP are good chelating agents are particularly at risk, i.e. most ochres, and earth pigments, because they contain Ferric (Fe3+), and cupric (Cu2+) ions. Unbound malachite, and azurite are doubly vulnerable because of presence of clay type minerals which are also susceptible to deflocculation and dispersion.

Further research is needed to show to what extent tri-ammonium citrate could fulfil all the "builder" functions in detergent formulations for textile conservation, since there are risks where iron or copper have been used either for weighting, or as a mordant, for instance when logwood has been used for dark colours.

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Scrivastava, ML, .Soiling of textiles and soil repellent/release finishes. *Textile Dyer & Printer Vol. 20, No. 13, July 1987*, pp. 17–22. BCIN Number 146289

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THE CONSERVATION OF A 'ONE SIDED' PAINTED COTTON BANNER

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Hampton Court Palace

A Scottish political banner associated with the Reform Act of 1832, 'Christopher North Under the Reform Pump'. Belonging to The People's Story Museum in Edinburgh it was conserved for short term open hanging display and long term storage. It is painted on one side of cotton fabric (995 mm x 990 mm) and has an edging of a wool fringe overlaid with silk ribbon.

Analysis of the paint

The paint is in an oil medium and in a poor condition, flaking and suffering severe loss. A paint cross-section was used to analyse the painting technique and materials[1]. A white ground layer and an original pigmented varnish layer were revealed that had not been evident in preceding examination. A ground layer provides a foundation for the paint to prevent it penetrating the fabric. The varnish is a protective coating for the paint necessary as the banner was carried outside.

Differential UV fluorescence indicated the lettering 'Carried in 1832' had a composition unlike the rest of the paint. It was felt to be a subsequent addition. This was confirmed by analysis of the pigments comprising this lettering, using scanning electron microscopy with energy dispersive x-ray spectrometry (SEM/EDX). Zinc white a pigment present in the paint was not available until c. 1850. This was after the banner was made.

Support of the banner

Support patches were adhered to torn areas of the cotton fabric using a thermoplastic acrylic adhesive, Lascaux HV 360/498. The friable condition of the silk ribbon necessitated an adhesive overlay. A solvent reactivated hydroxypropyl cellulose adhesive, Klucel G, was cast onto silk crepeline. This was applied to the ribbon via an industrial methylated spirit poultice[2]. By passing solvent vapour through a tissue paper membrane the reactivation process could be controlled to produce an adhesive bond appropriate for the very weak fibres and a matt finish.

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[1] Plesters, J (1956) Cross-sections and chemical analysis of paint samples, *Studies in Conservation,* 11, p110-132.
Tsang, J and Cunningham, R (1991) Some improvements in the study of cross sections, *Journal of the American Institute for Conservation (JAIC),* 30(2), p163-177.

[2]Boermsa, F and Gill, K (1996) Solvent Reactivation of Hydroxypropyl-cellulose (Klucel G) in Textile Conservation: recent developments. (To be published in the *The Conservator* during 1997)

Ketone resin 'N' was applied as an 'isolating' layer and as a final protective/aesthetic coating. Paraloid B–72 was used as a medium for inpainting.

A CO-OPERATIVE PROJECT BETWEEN PAINTINGS AND TEXTILE CONSERVATORS

Textile Conservator: Vivien Chapman
Paintings Conservator: Jacqueline Ridge
Technical Support from Catherine Hilditch, Roy Irlam, Peter Spinks, Ann Williams
NMGM The Conservation Centre

"Feedel, Child Prostitute" by Rodney Dixon
Painting, oil on canvas (WAG10771)

The painting, which measures 1745 mm high and 1065 mm. across, has no stretcher – the artist stored it rolled up, and intended it to be hung by stapling or nailing it to the wall. It was being stored flat in the museum but repeated display was damaging the corners, and there wasn't much room for the crate on the floor of the Picture Store.

A decision had already been made by the curators to show one side of the painting only – the accession number had been marked directly on the verso.
The paint was cracking badly as a result of rolling and the Paintings conservators consolidated it by running in Beva solution in xylene. No heat was used – it would have damaged the impasto, and care was taken not to stain the canvas.

The normal method for hanging tapestries was adapted to solve both display and storage problems. Velcro was attached to two stainless steel strips by sewing it to calico and making up tight calico sleeves. The loop part of the Velcro, also machine stitched to calico, was then sewn along the top and bottom edges of the painting using a variation of herringbone stitch – the aim was provide lots of small points of attachment which didn't show on the front. The Velcro was only attached to the lower edge where the paint on the front hadn't made the canvas too stiff. Fraying edges were stabilised with buttonhole stitch, without making them too neat.

The original crate was reused for vertical storage with the rest of the paintings by fixing hooks to the back and making a Perspex front for it. It was lined with Moistop to protect the painting from any acid vapours and battens were fitted across the back. To reduce any need to pull the painting away from the Velcro a Perspex template will be used to mark screw holes on the wall for display, then the painting, still attached to the steel strips, will be unscrewed from the battens and fixed to the wall. Acid free corrugated card between the battens supports the painting if the crate is placed flat on the floor.

Moistop: an polyester/aluminium/polythene barrier film from Protective Packaging, Dane Industrial Estate, Dane Road, Sale, Cheshire, M33 1BH, Tel. 0161 976 2006, & other suppliers.

THE CONSERVATION OF A PAINTED SILK HATCHMENT: COLLABORATION BETWEEN A PAINTINGS AND A TEXTILE CONSERVATOR.

Contributors:

Fiona Hutton and Frances Lennard
Textile Conservation
Ivy House Farm
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Jane Rutherfoord
Conservation and Restoration of Fine Art
The Chapel
Milton Lilbourne
Pewsey

The hatchment is made of black, twill-weave, silk fabric, painted in oil on the front side with the coat of arms of George, the 4th Duke of Dorset, on a black background. It is a rare example of a painted silk hatchment; the surviving examples are generally painted on canvas.

Before treatment the hatchment was in poor condition. It had obviously been in a very delicate state, with a number of tears and holes in the silk and losses or abraded areas in the paint layer, prior to a previous intervention. A lot of additional damage was caused by this misguided attempt at restoration; the hatchment was saturated with unbleached shellac in order to glue the silk onto a lining fabric and to regenerate the paint layer. However this left the silk very brittle and distorted, and as the shellac oxidised and yellowed it largely obscured the detail of the painting.

Cleaning and flattening

The hatchment was cleaned by the paintings conservator. As much shellac as possible, along with areas of repainting, were removed using IMS, taking great care in order to avoid further damage to the paint layer. The lining fabric was released simultaneously with the cleaning process. The removal of the shellac considerably reduced the distortion of the silk fabric and the buckling was further reduced under light weights.

The textile conservator carried out further flattening by contact humidification, using glass weights to ease out as much of the remaining distortion as possible.

Supporting

The hatchment was then supported onto dyed silk fabric using an intermediate layer of dyed silk crepeline impregnated with an adhesive, heat-sealed to the reverse of the silk. Four coats of 1 part Vinnapas EP1 in 4 parts deionised water were used. The adhesive-coated crepeline was cut away from the holes in the hatchment before the new silk fabric was heat-sealed to the reverse. The hatchment was also stitched to the support fabric around the edges.

The supported hatchment was then stitched onto a fabric–covered acid–free board so that it could ultimately be displayed in a glazed frame.

Varnishing

It was then returned to the paintings conservator; it was varnished with a very light application of Paraloid B72 in toluene, in a fine spray. It was retouched with Maimeri varnish colours, which would be removed with the varnish if the treatment were to be reversed.

It was important that the adhesive used to adhere the hatchment to the support fabric would not be affected by the solvent, toluene, which would be used if the varnish were ever to be removed. The Teas chart indicated that Vinnapas EP1, a copolymer of vinyl acetate and ethylene in water, would have different solubility parameters from the toluene, and tests were carried out on prepared samples to confirm that toluene could be used on the hatchment without affecting the adhesive bond.

Each stage of the treatment, and its effect on other areas, was discussed, and the project proved to be a challenging and enjoyable collaboration between two conservation disciplines.

DESIGNING A LOW COST THANGKA STORAGE SYSTEM

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The Antiquities Collections of the National Museums and Galleries on Merseyside include 35 Tibetan Thangkas which were stored in far from ideal conditions. Since the collection is an important one and there are many requests to view it, its re – storage was a priority.

The Thangkas were badly stored in a cupboard. They were hung by ties from their top edge, attached to poles which in turn were attached by hooks to bamboo rods. The system was unstable: the Thangkas were free to move; the painted surfaces liable to crack; and the already fragile veils had a tendency to catch on to adjacent hangings. The poles at the bottom of the hangings put additional strain on them. Moreover the Thangkas were difficult to access.

Criteria for their storage included a flat, dustproof, accessible drawer system. Initially it was hoped to use a system of metal cabinets with trays or drawers which since they needed to be 2 m. wide, would have to be purpose built. Quotes were sought from several companies for the construction of suitable systems and varied between £6850 and £14564. We were unable to meet the costs within our budget and plans went ahead to design an alternative with the aid of the Museum Joiners which would incorporate all the desired characteristics.

A cabinet was built with MDF board 2000 mm wide, 2000 mm high and 1200 mm deep; which contained 25 bottomless drawers of white pine, strengthened with slats but still lightweight and requiring the minimum of wood. The cabinet had folding doors and was coated with Dacrylate acrylic glaze varnish. The Thangkas were removed from their previous storage system and surface cleaned.

Correx, fluted polypropylene, 2 mm thick was chosen for the base as a lightweight, rigid and relatively stable material. A layer of polyester wadding was fixed to the Correx with pvac adhesive. This gave a soft layer to accommodate the different layers of the Thangkas. An envelope of Tyvek (spun – bonded polyethylene olefin fibres) was designed and stitched. The Correx was slid into the Tyvek pocket and the Thangka was laid on top and covered by the Tyvek flap. Four handles were stitched on to each Correx tray for ease of removal from the drawer.

The cost of the materials for the cabinet and the trays was £600, plus the cost of labour. The project took approximately 2 weeks to complete for two members of staff working full time with some help from interns and volunteers (Fig.1).

Suppliers:

Correx: *Henry Sutcliffe, Hume Street, Salford, Manchester 5*
Tel. 0161 736 1337

Tyvek: *Preservation Equipment Ltd., Shelfanger, Diss, Norfolk IP22 3DG*
Tel. 01379 651527 Fax. 01379 650582

Dacrylate: *Dacrylate Paints, Lime Street, Kirby in Ashfield, Nottingham N917 8AL*

Tel. 01623 753845 *Fax. 01623 757151*

Fig. 1 Completed cabinet