Conservation Journal V&A

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Front cover image: Swinging London (Photography by Nissen Richards Studio © Victoria and Albert Museum, London)

Editorial

Sandra Smith, Head of Conservation & Technical Services

Conservation Journal Number 64 (Autumn 2017) is the first to be created as a PDF to allow it to be downloaded and printed as a complete issue. For anyone who follows the Conservation blogs, you will have already seen these articles, which were posted to the Conservation Journal blog site throughout the year to coincide, in particular, with the exhibitions for which the collections have been prepared.

This year's exhibition programme has varied both in range and depth; *Opus Anglicanum: Masterpieces of English Medieval Embroidery*, a display of beautiful medieval embroideries from across the world, required careful movement (Bamforth) and expert mounting (Salt and Hartog) to highlight astounding complexity and workmanship as well as the powerful imagery of these irreplaceable, mostly ecclesiastical, works. Recreating the fun, free-spirited fashion and culture of the late 1960's and early 1970's for *You Say You Want a Revolution*? *Records and Rebels 1966–1970* involved innovative and playful costume mounting (Flecker and Lee) which contrasted strongly against the staid and rigid mannequins required to present the stifling corsetry in *Undressed: A Brief History of Underwear* (Tisdall). Materials, their uses, forms and finishes were the focus of *Plywood: Material of the Modern World* (Bamforth and Mostert) and *Lustrous Surfaces: Lacquer in Asia and Beyond* (Melchar). These and other articles emphasise the importance of understanding materials, original manufacturing techniques and technology when making conservation treatment decisions (Andrieux) and of sharing knowledge with others who are able to bring a different perspective to the works (Robinson, Stevens and Allen).

Two articles reflect on the creation of condition reports within the Museum from both a historical perspective, with an early use of photography to record the condition of the Raphael cartoons (Fleury), and the current use of digital photography to make information instantly accessible for touring exhibitions and loans (Battisson and Egan). The former technique is now part of the V&A archive and juxtapositioning the two articles makes one reflect on the importance of maintaining accessibility to digital information to allow work practice to be evaluated in the future.

The use and proliferation of plastics and its damaging effect on the environment is the top topic of discussion at present; scientists and manufacturers are focussing on creating biodegradable plastics and finding less damaging alternatives to single-use plastics. For museums we are swimming against the tide as we continue to explore ways to identify (Van Aubel), slow down the degradation and treat (Daskalaki-Mountanou) early plastics. As this research is realised, the challenge of preserving the history of twentieth and twenty-first century design, where synthetic materials are increasing incorporated in all aspects of our lives, from the clothes we wear to the furniture we use, will increase. We should anticipate that, in many instances, the opportunity to preserve this material is finite and short. It will be through effective and thorough recording, and the creation of an intangible, accessible record that a porthole to our synthetic world will remain.

Corset mounting for Undressed: the bones of the matter

Lilia Prier Tisdall, Textile Conservation Display Specialist

In her catalogue for the V&A exhibition 'Undressed: A Brief History of Underwear', Exhibition curator Edwina Ehrman writes how 'one of underwear's primary roles is to smooth, firm and mould the body in accordance with the fashionable ideal and to provide a substructure for the fashions of the day'.[1] Substitute 'body' for 'mannequin' and this might equally describe the role of the V&A's dedicated team of costume mounters, particularly when it comes to the subject of how to display corsets.

The Undressed exhibition features over 25 corsets from eighteenth-century whalebone stays to twenty-first-century 'waist trainers'. The majority of these are displayed on commercially available papier-mâché torsos known as dress forms. A key benefit of dress forms is that they are easily adaptable to the impressive array of fashionable silhouettes women have squeezed themselves into over the years. By 'easily adaptable' we mean they can be chopped up and stuck back together again, an exercise that can give a somewhat brutal insight into the effect these intimate garments can have on the body, illustrated within the exhibition by x-rays that reveal contorted ribs and squashed organs.

When faced with a flat corset it can be far from clear how it is supposed to be worn and the effect it will have on the body (Fig. 1). The ease with which top, bottom, back and front can be confused by the later observer is a testament to the inventiveness of corset designers throughout the ages, who were constantly developing new methods of construction and experimenting with new materials. This is evidenced by the great number of patents applied for; one of these that features in the exhibition is 'Brown's Patent "Dermathistic" Corset', which boasts of 'bones, busks and side steels protected by leather'.

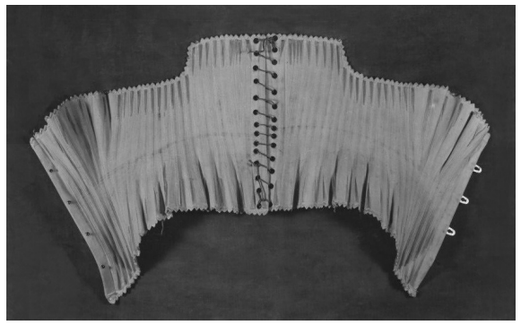


Fig. 1. Woven corset, Charles Bayer, Britain, London, 1879–85, Linen, silk and whalebone (baleen), V&A: T.114&A-1938
Given by Miss Sawand
Photography by V&A Photographic Studio © Victoria and Albert Museum, London

The obvious starting point when dressing the mannequin is the waist; the corset must fit at its smallest point. However, even this can be a bit of a moveable feast as the desired position of the waist varies according to the fashions of the day. The development in 2010 of the PETITE dress form by proportion>london Ltd, specially adapted for historical garments, has simplified the process somewhat and provides the foundation for the majority of corset mounts in the exhibition. The exaggeratedly tiny 17-inch (43cm) waist of the PETITE dress form means there is room to add layers of padding to provide a soft support while the elongated torso allows for a variety of silhouettes.

Once the correct circumference has been achieved, the actual shape of the waist itself must also be considered. Dita Von Teese's Swarovski-encrusted corset designed by Mr Pearl (2011) was a perfect 'fit' for the 17-inch PETITE dress form; however, after consultation with Mr Pearl, it was clear that it provided too cylindrical a shape. Because the corset was so close to the measurements of the mannequin it did not given any impression of the corset moulding and sculpting the mannequin body beneath it – an important element of 'tight-lacing' culture. The solution was to cut out the waist and fill in with polyester wadding (Fig. 2). This had the combined benefit of reducing the waist size and providing a soft core that would mould to the intended shape of the corset. As the luxury of direct contact with the designer is not available with the majority of corsets, contextual images are of paramount importance to achieve accurate historical silhouettes. Contemporary advertisements are of particular interest as they seek to promote the ideal body shape of the time.

One illuminating comparison of the extreme variations in corset styles women have faced is the respective mounting processes required for a cotton corset dated 1825–35 (T.57-1948) and an early



Fig. 2. Adapted PETITE dress form for corset designed by Mr Pearl, worn by Dita von Teese.
Photography by Lilia Prier Tisdall and V&A Photographic Studio © Victoria and Albert Museum, London

twentieth-century S-bend corset (Courtesy of The Hopkins Collection). The mounting of the 1825–35 corset first entailed the removal of the entire upper back of the mannequin before being reconfigured and reattached with buckram (linen strips adhered with conservation grade wheat starch paste) to accommodate the minute across-back measurement (28 cm!). The sloping shoulders fashionable at the time were created by taking a Fosshape mould from a standard dress form torso to which shaped and carved Plastazote breasts were attached, so achieving the wide separated bust shape deemed elegant in the early nineteenth century. Below the waist, the hips were extended widthways using carved Plastazote blocks (Fig. 3).

By contrast, almost the complete opposite was required for the Edwardian S-bend corset; to create the distinct S-bend shape the entire front of the lower torso was cut away and covered over with Fosshape to give a tilting effect. At the back a low, wide derrière was emphasised with layers of Plastazote. At the bust the chest was filled in and built up with Plastazote to create a forward-leaning 'mono-bosom' (Fig. 4).

Once the foundations for displaying a corset have been established the next thing to consider is, for want of a technical term, 'squishyness'. The mounted corset needs to give the illusion that it is moulding the body beneath it into the silhouette it has been designed to produce. In reality, the materials that are used to build these forms are distinctly un-fleshy – papier-mâché, Fosshape, Plastazote, and buckram – which are primarily chosen for their strength and ability to hold their shape. But corsets also need softness, both to give an illusion of flesh, and also to avoid strain on the object. To give the appearance of tight lacing, but without actually asserting undue pressure on the garment, the corsets are generally laced with a gap of between one and two inches (2.5–5cm).

While these garments are made to be sturdy they are also vulnerable – boning can snap, busks can slip, lacing can wear away eyelet holes, stitches can pull, fabric can stretch. Undressed is a touring exhibition – before display at the V&A in March 2016 it had already been to three venues in Australia and it is set to continue to others in Russia, the USA and Brazil after exhibition at South Kensington. This sustained travelling – some corsets might stay on their mounts for up to four years – is only possible with the high technical level of bespoke mounting discussed here, combined with specialist packing and crating. As well as providing an opportunity to develop new techniques for displaying corsets, the costume mounting process for Undressed gives an intimate insight into dress history and body shapes, and the extraordinary lengths women have gone to achieve them.



Fig. 3. (V&A: T.57-1948) Mounting process for 1825–35 corset, Britain, corded and quilted cotton, silk thread and whalebone.



Fig. 4. Mounting process for 'S-bend' corset probably Britain, about 1902–9, cotton, silk, whalebone (baleen), metal busk and machine-made lace trimmed, with replacement ribbon (Courtesy of The Hopkins Collection).

Photography on this page by Lilia Prier Tisdall and V&A Photographic Studio © Victoria and Albert Museum, London

Acknowledgements
I am grateful to Edwina Ehrman, Susanna Cordner, Albertina Cogram, Lara Flecker and Rachael Lee for all their help and guidance during the mounting of Undressed.

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1. Erhman, Edwina. Undressed: A Brief History of Underwear (V&A Publishing, London, 2016) p.41.

Sponsored by Agent Provocateur and Revlon.

The Resurrection of the Salisbury Cross

Alicia Robinson, Senior Curator, Sculpture, Metalwork, Ceramics & Glass
Donna Stevens, Senior Metals Conservator
Zoe Allen, Senior Furniture and Gilding Conservator

This three metre high cross once on top of the choir screen in Salisbury Cathedral was designed by George Gilbert Scott (1811–1878) and made by Francis Skidmore of Coventry (1817–1896) and erected in about 1870 (Fig. 1) . Scott and Skidmore collaborated on some of the most spectacular creations ever made in ironwork, including the Hereford Cathedral Screen (1862, now at the Victoria and Albert Museum) and the Albert Memorial in Hyde Park. When first installed, their cathedral screens were highly praised, but by the mid-twentieth century their ornate Gothic Revival style was out of favour and there was also a move to ensure clergy were no longer separated from their congregations by screens. The Salisbury Cathedral screen was dismantled in 1959 and sold to a metalworker nearby. The central gates from the screen were acquired by the V&A in 1979. The cross was retained by the Cathedral, and the Dean and Chapter generously presented it to the V&A in 2014.

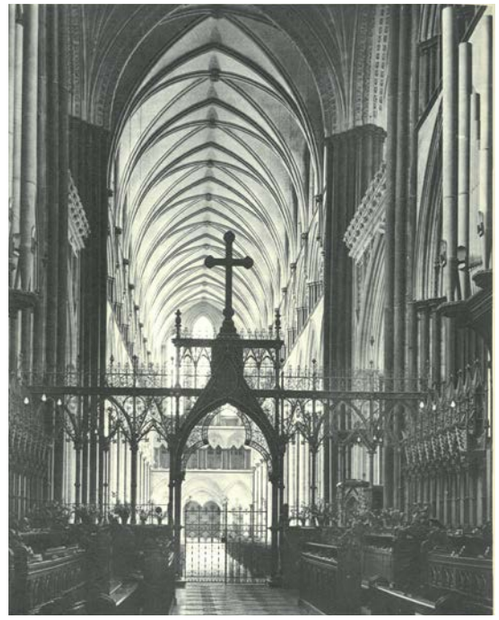


Fig. 1. First reproduced in Jeffrey Truby, 'The Glories of Salisbury Cathedral', 1948, reproduced with kind permission of the Dean and Chapter of Salisbury Cathedral.

Although the cross was structurally sound the surface had suffered from extensive corrosion with much of the original red and gilded decoration being lost. Different treatment options were discussed. As it would be displayed close to the Hereford Screen (restored in 2001 to show how it would have originally appeared), a similar approach was taken for the cross. It was decided to recreate the cross's original red and gilded appearance to give a sense of how magnificent the screen as a whole would have looked. However, the top sections of each arm would be left 'unrestored' as they were at the time of the acquisition, as evidence of the condition and appearance before treatment, enabling future researchers to have access to the original surface. This article describes a series of traditional and innovative techniques that were employed during the project.

The core structure of the cross is made of soft wood, possibly pine, onto which the decorative metal panels are screwed. On the front and rear, the panels are decorated with two hearts and diamonds. Those on the sides are decorated with a double heart motif. Lengths of beading surround the panels. Some of the panels are cast iron while others are cast brass. At the top, centre, base and end of each arm are two quatrefoils at the front and back. The cross was examined using Gamma radiation to establish whether these were screwed or riveted in position. The radiographs showed they are held in place with a metal rod, with a hemisphere of gilded metal screwed on each end.

Close visual examination and microscopy were carried out to the painted and gilded surface to understand the original techniques and materials used. The cross had been painted and gilded after assembly, evident by the fact that some areas which could not be reached with the brush, such as those below the central and end quatrefoils, were bare metal. Several areas showed the gold leaf overlapping onto the red painted background, indicating that it had been painted prior to gilding. The stratigraphy of the surface decoration showed a yellow oil-based layer directly on the metal; a probable primer, followed by a red/brown layer (mainly iron) and a translucent yellow layer (probable mordant) under the oil-gilded areas.

For dismantling, the metal elements were removed by unscrewing each screw, sometimes with the aid of a lubricant. Some screws had rusted in and required drilling out. Line drawings were created and a labelling system devised to allow a smooth re-assembly and enabling us to keep track of each part during treatment.

Cleaning methods for corroded metal can be time-consuming. The use of dry ice 'blasting' as a quicker option to clean some types of museum objects has increased in recent years. Following its successful use to clean gilt metal mounts at the Wallace Collection, V&A conservators had used it to clean the mounts on the Augustus Rex Cabinet (W.63-1977) in 2013. With this in mind, dry ice cleaning was considered for the cross and tests on a small area proved to be effective. The term 'blasting' is misleading as it is in fact a very gentle process. Dry ice cleaning involved solid CO_2 in powder form being directed onto the surface via the hired Cryogenesis dry ice cleaning unit and compressor. Upon impact, the dry ice immediately turns into vapor and rapidly expands. This expansion removes all the loose corrosion and dirt on the surface (Fig. 2).



Fig. 2. Loading the dry ice cleaner
Photography by Zoe Allen © Victoria and Albert Museum, London

After this process, each part was wiped with IMS prior to painting. An exact copy of the original paint colour was specially made by Craig and Rose. Areas with the most intact original decoration were coated with a barrier layer of Golden Fluid Matte Medium Acrylic prior to painting. The best match to the original leaf was found to be 23 3/4 carat. It was applied to a 12 hour size pigmented with yellow oil to enable the sized area to be visible for gilding (Fig. 3). Each of the quatrefoils had two brass leaves on each lobe. There were originally 64 and of these, only 10 heavily corroded ones remained. To make replacements an original leaf was scanned and a CAD drawing produced. This was used to make a new 3D leaf printed in plastic with a smoother surface than the corroded original. This leaf was used as the model for the new leaves which were cast in brass, polished and lacquered using Frigilene pigmented with a yellow dye to protect against tarnishing (Fig. 4). Due to its weight the cross was re- assembled in situ in the gallery (Fig. 5).

Acknowledgements
Grateful thanks to James Joll, John Scott, the Worshipful Company of Ironmongers, the Worshipful Company of Arts Scholars, and other supporters. Thanks to Katie Snow (ACON) and Aude Lafitte, Metals Conservation intern, for their help with the project.

Further reading

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Campbell, Marian; The Hereford Screen by Sir George Gilbert Scott, 1862: http://www.vam.ac.uk/content/articles/t/the-hereford-screen/



Fig. 3. Stages of process: uncleaned, cleaned, painted, prepared for gilding, and gilded
Photography by Zoe Allen © Victoria and Albert Museum, London



Fig. 4. Leaves in process
Photography by Donna Stevens © Victoria and Albert Museum, London



Fig.5 After treatment
Photography by Fiona Procter © Victoria and Albert Museum, London

Out on a Limb: the Fosshape revolution

Lara Flecker, Senior Textile Conservation Display Specialist
Rachael Lee, Textile Conservation Display Specialist

The costume mounting team were recently tasked with recreating the fun, free-spirited essence of the fashion and stage clothing of the late 1960s and early '70s for the V&A 2016 exhibition 'You Say You Want a Revolution? Records and Rebels 1966–1970'. Featuring items from flamboyant menswear worn by Mick Jagger to the youthful street style cultivated by British designers such as Mary Quant, it was important that the presentation of garments did justice to their iconic status. It was agreed with the exhibition designers from Nissen Richards Studio that standard mounting methods would not be sufficient to interpret the revolutionary themes of the exhibition, which include Swinging London and Woodstock festival. Something new and experimental would be required to animate the display figures.



Fig. 1. Live model photoshoot and printed 2D limbs
© Nissen Richards Studio



Fig. 2. Left the initial prototype figure. Right a finished figure before dressing.
Photography V&A Textile Conservation Studio
© Victoria and Albert Museum, London

Nissen Richard's design vision was to create a monochrome collage effect for all visible parts of the mannequin such as feet, hands and heads. These were not intended to look overly realistic but instead have a flat printed treatment that would complement the psychedelic aesthetic of the exhibition. The costume mounting team now faced the challenge of how to combine two-dimensional photographed limbs with a three-dimensional costume. This was by no means straightforward and mounting techniques developed for previous exhibitions such as Hollywood Costume were a valuable resource.

As the majority of garments selected for display from the V&A's collection were in good condition there was an opportunity to introduce more dynamic poses that would capture the character of the era. With this in mind a photoshoot was conducted using live models to provide a suitable stance for each outfit (Fig. 1).

As there were over 20 outfits that required individual poses it was necessary to create a mounting solution that could be easily adapted to support each object. Essential to the process was the development of a prototype figure to establish whether the design vision was feasible (Fig. 2). This provided an opportunity to discuss techniques, iron out problems as well as giving everyone involved the courage to proceed. At this early stage it was clear that with some fine-tuning and modification for each pose, the prototype could evolve into an exciting new mounting system.

Inexpensive papier-mâché dress stands were the ideal foundation on which to build and a suitably sized torso was selected for each outfit and customized with padding. With the body of the garment supported in this way, work could begin on the more complex limbs which were broken down into two components:

a) the three-dimensional limbs that would provide additional support and be hidden underneath garments
b) the flat photographed limbs that would be visible below the hems and cuffs of garments

Both of these elements had to be made from scratch. Whilst the designers began testing different black and white printing techniques onto Forex (5mm PVC rigid foam sheet commonly used as a printing substrate)

the costume mounting team worked in collaboration with lead V&A technician Stephen Warrington on the three-dimensional limbs. These were made out of Fosshape a non-woven, low-melt polyester fabric that hardens when heat activated. This versatile material has recently facilitated many new developments in costume mounting at the V&A and was ideal for use due to its free moulding abilities. To make the arms and legs, Fosshape was wrapped around existing fibreglass mannequin limbs, stitched roughly together and steamed with a hot iron or commercial steamer (Fig. 3). This causes the material to shrink and harden around the mould, creating a realistic shape. Once removed from the mould, the limbs were cut, adapted and re-stitched into different positions, mimicking the poses from the photoshoot.

The next stage was to introduce the photographed limbs. Unfortunately, inconsistencies during the photoshoot meant that the flat limbs had to be individually scaled to fit each costume so that the transition from 2D to 3D appeared seamless. This meticulous work was undertaken by graphic designer Amy Haigh who worked on site in collaboration with the mounting team.

With all the body parts now in proportion the different elements could be fixed together. The bottom of each Fosshape limb was capped off with a plug of 18mm thick PALIGHT (a very lightweight PVC rigid foam board), to which the flat limbs were attached. Additional fixings were inserted at the top of the arms and shoulders so that they could be easily removed during dressing.

With the printed limbs now attached it was important that any remaining visible part of the mount would tie in with the tone of the monochrome hands and feet. The necklines of the torsos were covered in a neutral fabric and sprayed with layers of acrylic paint to match the photographic finish of the flat limbs. Finally, to complete the mount a flat circular disk was attached to the neck of each figure onto which a graphic was printed or a moving image could be projected. Learning from mistakes made in Hollywood Costume, the brightness and animation of these were carefully gauged to minimize distraction from the objects.

The decision to adapt and customise commercial dress stands in combination with Fosshape, to simulate specific poses, successfully brought a sense of animation and personality to each outfit (Fig. 4). This new mounting system was achieved without the use of high-tech or expensive materials, although the production of each mount was time-consuming. The final effect in some ways did not fully realise Nissen Richards's initial concept of creating a quirky cut and paste collage mannequin as the flat limbs looked more realistic than first anticipated. However the mix of photographed limbs matched with three-dimensional supportive Fosshape did create something entirely new and opens up a world of possibility for the future.

Acknowledgements
We are grateful to Pippa Nissen, Amy Haigh and Candy Wall from the Nissen Richards Studio for their collaborative work on this project. Special thanks go to Lead Technician Stephen Warrington and Exhibitions Manager Robyn Earl.

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Fig. 3. Moulding Fosshape around existing fibreglass limb
Photography V&A Textile Conservation Studio
© Victoria and Albert Museum, London



Fig. 4. Swinging London
Photography by Nissen Richards Studio © Victoria and Albert Museum, London

Logistics of moving a thirteenth-century cope chest

Dr Nigel Bamforth, Senior Furniture Conservator

The York Minster cope chest, one of only seven surviving semi-circular cope chests in English cathedrals and a fine example of medieval timber and ironwork, was requested for loan by the Victoria and Albert Museum from the Dean and Chapter of York Minster for inclusion in the 'Opus Anglicanum: Masterpieces of English Medieval Embroidery' exhibition (Fig. 1). The chest was used for storing a cope, a liturgical vestment, which was folded in the middle and laid flat inside. To initiate the loan, the Chapter required a full method statement to include packing specifications, exiting the Minster, transport to the V&A, and the route the chest would take through the Museum to its final destination. Manipulating an object of this age and size (1900mm deep and 790mm high) poses challenges and can be a risky procedure; therefore, a full assessment of the chest was undertaken at the Minster by the author to determine whether it was stable enough to move, travel and be rotated to go through the doorways at both the Minster and the V&A, which were too narrow. Previous experience working with similar objects ensured every eventuality was considered and the loan was recommended by the author with confidence.

Packing was timed around the Minster's 7:30am service. Constantine Ltd made a customised crate for the chest and brought it into the Minster through the North doorway on its narrow edge. The crate had four removable sides and lid and additional bracing to enable it to be tipped onto one edge. Its base platform was lined with LD24 Plastazote foam and an 18 mm plywood 'load-spreader' inserted on top to stop the feet compressing the Plastazote. Teflon strips were placed in the platform bottom to ensure smooth removal.

Six Constantine technicians manually lifted the chest away from the wall to give full access to the object and allow its lids to be opened. As one of the two lid's hinges were broken, it was decided to remove this lid in its entirety. The interior of the chest was vacuumed and soft brushed to remove dust then additional supports and wedges of Plastazote-covered blocks were inserted to run diagonally across the interior to support the remaining lid and reduce flexing. The fixed lid was secured and Tyvek-wrapped and the detached lid was wrapped and placed back in its original location. The chest was then manually lifted onto the base platform. The chest side, when vertical, was deemed structurally stable without stressing the fixed lid's hinges. The whole chest was Tyvek-wrapped to protect from abrasions, with cotton ties and corner pads securing it in place. Plastazote blocks were inserted to fill the voids within the crate.



Fig. 1. Cope chest in York Minster



Fig. 2. Crated chest exiting York Minster

Photography on this page by Nigel Bamforth © Victoria and Albert Museum, London



Fig. 3. Cope chest on display at the V&A © Victoria and Albert Museum, London

Once packing was completed, the crate was moved on skates to the North door, gently tipped onto its side and placed on more skates. A ramp was built over the external steps to exit the crate through the doorway and on to ground level where the crate was re-orientated to the horizontal for transporting in the climate-controlled air-ride truck (Fig. 2). On arrival at the V&A, the process was reversed and the object followed the pre-planned route through the Museum and onto a plinth for the exhibition (Fig. 3).

Acknowledgments

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Mounting Opus: an in–house solution

Thomas Salt, Museum Technician
Frances Hartog, Senior Textile Conservator

The Victoria and Albert Museum's exhibition 'Opus Anglicanum: Masterpieces of English Medieval Embroidery', held from 1 October 2016 to 5 February 2017, is the first time in two generations that so many of these exquisite embroideries have been brought together for display. To ensure the safety of the magnificent but fragile copes and chasubles during the exhibition, including loans from the Museo Arquéológico Nacional, Madrid and the Metropolitan Museum, New York, a total of nine bespoke three-dimensional mounts were required.

Previous experience from the redisplay of the Medieval & Renaissance Galleries (M&R) proved that displaying medieval vestments on individually shaped, properly fitting three-dimensional mounts minimises the necessity for interventive conservation. For objects that have survived for over 600 years and undergone generations of repair, this is an invaluable asset. The three-dimensional mounts that were commissioned for the M&R galleries were produced by an outside supplier specialising in sheet metal work. Though well executed and beautifully finished, having tailored mounts made off site was difficult and time consuming. It was also costly, which though acceptable for permanent galleries, could not be afforded for a short term display.

When commissioning mounts for Opus Anglicanum, Conservation's brief for the Technical Services Team was to produce mounts individually fitted to the nine vestments. They should be unobtrusive, lightweight but stable while providing maximum support. Conservation would provide calico toiles (exact copies of the garment) for each object. The toiles could then be used by Technical Services to fashion the customised shapes, avoiding the necessity of handling and trying on the original vestment. Conservation would also produce thin, padded covers for the mounts. The cotton-covered pads would be attached to the mounts using Velcro. The fixed, non-slip pads and the shape of the mounts would negate the need for the objects to be secured, they would simply lay over the mounts.

Technical Services decided early on to separate production of the mounts into two halves: the fabrication of ridged, hollow shells to support the vestments for display, and the fabrication of stands onto which the shells would sit. The units would then be fitted together to create the final mount. This decision enabled the team to focus on the element of most concern for Conservation, the fit of the shell, and to outsource the more generic stand construction.

To attain the correct shapes, any solution would need to rely on translating the flat geometry of the toiles into bespoke three dimensional support shells. This could only be achieved by deconstructing the toiles back to garment parts, from which accurate pattern templates could be made. These component shapes could then be transferred onto sheet material, cut, bent and joined – in much the same way as pattern pieces are cut from fabric and sewn together in the making of a garment. This approach had the great advantage of fidelity to the original throughout the making process; if the assembled pattern replicated the vestment in the form of a calico toile, it stood to reason that the same theory applied to the construction of the support shells.

The decision to work from flat patterns meant that a sheet material capable of being bent in multiple directions, neatly joined, and possessing the necessary rigidity, needed to be found. While sheet metal was the obvious choice from the outset, we resisted exploring this option because of a lack of sheet metal working experience within the team and the assumption that mechanical rolling equipment, panel beating experience, and tungsten inert gas welding would be required. To mitigate these reservations, an initial attempt was made to reduce the complex curves to a faceted geometric model, folded from a net of the solid. The two-dimensional pattern was cut in aluminium composite sheet (Dibond) and bent along a series of V grooves routed in the surface. This proved unsuccessful because the aluminium composite became brittle through stress and fractured along the bends. This experiment was invaluable however, because while ultimately proving unsuitable, it required the marking out of radial lines approximating the direction and intensity of the final curves across the pattern pieces, and the joining of the bent components using cold rivets (Fig. 1). These techniques simplified and directed the bending process and removed the need for skilled welding operations.



Fig. 1. Cope mount with marked-up radial lines showing when bends in metal are required



Fig. 2. Cope mounts in workshop after painting and fitted to their stands

Photography on this page by V&A Technical Services
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More serious thought was now given to the use of sheet metal products; initially considering thin gauge, perforated aluminium sheet or mesh because of its apparent bending and stretching properties; and then solid aluminium sheet of different gauges, eventually selecting a 1.5mm sheet. In tests this thickness proved to combine the right balance between ease of working and rigidity, being lightweight and strong once the desired bends had been achieved.

Positioning joins in the patterns presented the next challenge; this required deviation from the textile patterns because it was apparent that seams running across the shoulders would weaken the chasuble support shells and exacerbate problems with achieving satisfactory bends in these problematic areas. Instead, seams were placed transversely on the chest and up the line of the sternum. Cold riveting was used to secure the joins, made with a shaped joining plate also cut from aluminium sheet. In these positions the additional material increased the strength of the shell and knitted the components together; importantly the joins were also discreet in the final mounts. Seams were placed in the cope support shells with the same consideration: to achieve maximum strength without disrupting or weakening the curve.

Each support shell was made in the following sequence. After receiving a toile from Textile Conservation, paper templates were made of the pattern pieces, with adaptation to reflect the altered join configuration. A network of radial lines representing the curvatures in the finished shell were drawn on the paper and then this information was transferred onto the sheet aluminium. The individual components and joining plates were cut out using a Jigsaw and a rail guided circular saw, mounted with aluminium cutting blades. The edges of the shapes were then finished using hand files. The components were cold bent by hand (according to the regularity and direction of the prescribed line configurations) over, or clamped underneath, wide diameter steel tubing and then joined at the seams using the cold rivets. Once assembled, further cold bending and adjustment was carried out using steel tubes as jigs, and a small panel-beating kit containing a selection of hammers and dollies; however this proved necessary only on the neck line and in the transition between the shoulders and chest, removing the need for a significant level of metal working experience. The finished support shell was attached to a temporary stand and delivered to Conservation for the fitting of the toile, and further adjustments suggested if required.

One problem encountered was the lead time for outside metal fabrication, which required an order to be placed for the stands before all of the support shells had been made, and therefore before detailed measurements could be taken. This was overcome by designing three basic stand configurations covering predicted variations in the size and shape of the shells, and by oversizing supporting members to be cut and ground down to marry up later in-house. Technical drawings were produced in CAD to clearly communicate requirements to the external contractor and provide lenders to the exhibition with a schema for their approval. Due to their size once completed, the support shells were sent out to be sprayed (with a two pack polyurethane paint with cellulose base) and returned along with the powder coated stands.

The two elements were then fitted up and finally attached together using machine screws (Fig. 2).

Technically the success of this method came from its relatively simple logic, breaking the work down into repeatable steps, and by imaginatively employing the equipment and skills available. A good fit was consistently achieved with the objects; this was the fruit of time spent in advance developing a workable system, without which the present solution could not have been reached. The final appeal of any mount is in part due to the application of abstract aesthetic ideas; what makes a mount look 'right', or one object appear to sit 'comfortably' and another not, is a matter of personal sensibility. However, one advantage that mounts commissioned in-house have over a more commercial solution is that a dedicated workshop develops a culture of sensitivity towards the visual aspects of mount design alongside the technical skills necessary to realise them. The chasuble and cope mounts made for Opus Anglicanum satisfied the conservation brief and the design aesthetic, enabling these fragile medieval vestments to be displayed safely and beautifully (Figs. 3 and 4). As one lender attested of their mounted object, "That's amazing, I have never seen it look so good".

Support generously provided by The Ruddock Foundation for the Arts. Supported by Hand and Lock.



Fig. 3. Dressing a shaped pad onto a chasuble mount
Photography by V&A Technical Services © Victoria and Albert Museum, London



Fig. 4. The Butler Bowden Cope, T.36-1955, on display in the exhibition
Photography by V&A Photographic Studio © Victoria and Albert Museum, London

The use of lasers in the conservation of museum objects made from plastics

Dafni Daskalaki-Mountanou, MSc Student, Imperial College / V&A

The predominance of polymers in everyday life is obvious. They have become an integral part not only of everyday objects but of cultural heritage objects as well. A survey held in the 1990s at the Victoria and Albert Museum showed that a large number of artefacts were partly or completely made of plastic polymers and had already 'lived' longer than was expected when they were produced. Consequently, the demand on plastic restoration has increased significantly.

Scientists and conservators have been developing various techniques for preserving polymers and cleaning their surfaces for many years. This is a promising but complicated field because it depends on the type of plastic that needs conservation and the condition of the object, and polymers present a diverse range of properties and degradation profiles. Scientists and conservators have been working extensively on conventional cleaning treatments such as mechanical or solvent-based cleaning. The potential damage caused by those means and the growing opportunities of cleaning with lasers gave rise to this project.

The successful use of lasers in different fields (medicine, industry, cosmetics etc.) has now extended to the field of cultural heritage. Lasers have proved to be a highly efficient tool for cleaning artworks. Additional advantages include higher accuracy than traditional cleaning methods, the ability to control removal rates and to select precise spot sizes up to micrometres. Numerous studies have been conducted in order to investigate the potential and limitations of lasers for cleaning artefacts. This collaborative project between the V&A and Imperial College of London investigated the interaction of an Er: YAG (erbium-doped yttrium aluminium garnet) laser with plastic objects. Er: YAG lasers are the most recent lasers used in conservation, and they have presented promising results in various materials such as stone, marble, metals and contain many advantages when compared to different laser types. This research was carried out in two parts. The first focuses on estimating the permanent physical or chemical damage induced by the laser (Fig. 1ii). The second part includes some preliminary trials of cleaning polymer samples (Figs. 1i, 1iii and 2).

A series of experiments took place in order to investigate the efficiency of cleaning different types of polymers under different experimental conditions (e.g. exposure times and surface conditions such as wet and dry) and if any damage occurred in the process. Results were different for each polymer and each experimental condition. Polystyrene (PS) and Plexiglas (poly methyl methacrylate, PMMA) presented the most promising results whereas laser treatment proved inadequate and even catastrophic for nylon and fibreglass.

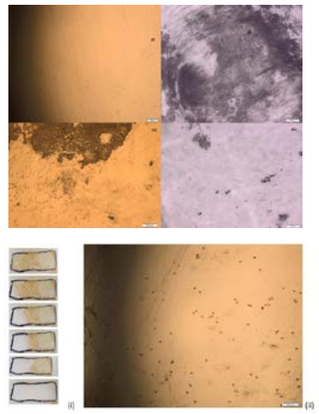


Fig. 1. Optical micrograph of the PS: (i) untreated (ii) damaged by the laser operating at extreme conditions (iii) after mechanical cleaning from adhesive residue of paper tape (iv) after trial for laser cleaning from adhesive residue of paper tape.

Fig. 2. (i) Photograph of gradual laser cleaning of Plexiglas covered with duct tape residue. (ii) Optical micrograph of the laser cleaned surface of the Plexiglas.
Photography by Dafni Daskalaki-Mountanou © Imperial College London

The preliminary experiments carried out during this project revealed some interesting information about the interaction of an Er: YAG laser with polymers. PS and PMMA samples contaminated with residues of tape adhesive were cleaned by laser and compared with traditional mechanical cleaning (Fig. 1iii). It was found that the laser cleaning was more efficient and did not cause damage to the samples. These results have underlined the necessity of investigating further the nature of plastics and how they interact with the laser. It is now the time to explore the possibilities of the use of the laser further.

Acknowledgements
I would like to thank Brenda Keneghan and Boris Pretzel for guidance during my project.

Identification of plastics by looking, touching and smelling

Carien van Aubel, Conservation Science Intern, University of Amsterdam

Collections with objects dating from the late-nineteenth-century onwards often include a variety of plastics. As there are numerous different types of plastics it would be hoped that specific identification would be stated in the records but it is not easy for those not experienced with plastics to identify them. For unambiguous identification it is necessary to carry out technical analysis, mostly time-consuming, costly and not always accessible for every collection. Plastics that are easy to identify often already show degradation signs, like a specific smell, crazing or discolouration. By knowing the nature of materials in a collection, better care can be taken of objects.

The Museum of Design in Plastics (MoDiP) at the Arts University Bournemouth (AUB) developed a flowchart to identify plastics for curators and others with little knowledge of plastic materials.[1] It was written in collaboration with experts from academia, industry and museums. Many of the contributors to the MoDiP identification were experts from the Plastics Historical Society (PHS) with an industrial background. Conservators and curators sometimes had difficulties identifying plastics using this resource, possibly because the properties of plastics identified by industry professionals are not completely relevant to the plastic objects in collections. The aim of this project is to identify any weak points in the flowchart when looking at a museum collection and to improve this scheme.

Identification of more than 200 plastic objects from the handling collection in the Conservation Science laboratory was attempted using the flowchart developed by MoDiP. In addition to the identification with this chart, a list of questions a conservator would ask when looking at a plastic object was created. The first three questions are focused on the smell, specific characteristics and if there is a brand name or sign present.[2,3] The purpose of starting with these questions is that plastics that are easiest to identify are also immediately identified. The outcome of both methods (MoDiP and questions) was verified by analysis of the plastic with Fourier Transform Infrared (FTIR) spectroscopy.

After analysis the objects were placed in groups of the same plastics. By looking at the characteristics of

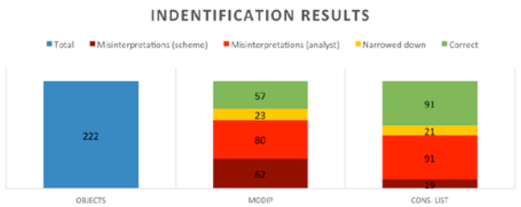


Fig. 1. Results of both identification methods after being verified with FTIR analysis

the objects in each group some similarities could be found. Every step of identification was recorded, which helped trace back where possible misidentifications were made. It was not easy to identify all plastics. Some objects did not show any style to date them, or there were no production signs visible. Also some definitions in the MoDiP scheme were not clear, e.g. when is an object translucent or flexible?

The identification of plastics by the list of questions in the MoDiP flowchart resulted in quicker identification when a plastic had specific characteristics. When this was not the case, it was sometimes impossible to present a list of possibilities. Misidentifications were divided into those made due to weaknesses in the scheme and those made by incorrect interpretation of characteristics of a plastic. When the flowchart resulted in a group of less than four plastics, including the correct one, the identification result is categorised as being 'narrowed down' (Fig. 1).

More than half of the objects were incorrectly identified with both methods. The list of questions resulted in more correct identifications of plastics. However, misidentification using the MoDiP flowchart was often a result of errors in the charts or because the specific plastic was not included in the scheme. For example, poly vinyl chloride (PVC) is not considered to be transparent or translucent.

When examining the groups of objects made of the same material, some specific characteristics became more obvious. For example objects made of melamine formaldehyde were often quite colourful, felt cold, hard and often showed an orange peel texture on the surface. Objects from cellulose nitrate were often pale

in colour, smelled like camphor or showed the specific cubical crazing when degrading (Fig. 2).

The methods and results were discussed with Colin Williamson, specialist in the manufacturing and development of early plastics and a founding member of the PHS. He emphasized the importance of the date of production (the style of an object) and signs of manufacturing processes (Fig. 3). Coming from the industry, he also approaches an object by asking: 'What material would they make it from; what was cheap and easy to use?' For conservators not specialised in plastics this requires unfamiliar knowledge in plastic manufacturing techniques.

During this project strong and weak points of the MoDiP flowchart could be defined. Plastics with very specific characteristics or ones that already showed degradation were very easy to identify (Fig. 4). With the list of questions it was mainly the combination of characteristics that helped in the identification. Even when a specific characteristic of a plastic could immediately be identified, other identification marks helped make a more secure identification. With these outcomes, misidentification in the MoDiP scheme can be adjusted and missing plastics can be added. The advantage of a flowchart for conservators that are not familiar with plastics is that it gives a good and clear overview of the different questions and characteristics.

Now that the basis of information and questions for identification has been developed, a suitable package will be developed to enable conservators to approach the identification of plastics with more confidence, focussing on what is essential to know while not being overwhelmed with unnecessary information. For the V&A collections this will mainly focus on plastics used in fashion and furniture.

Acknowledgements
I am grateful to Brenda Keneghan for her guidance during my placement, Bhavesh Shah for instructions using the FTIR spectrometer and Colin Williamson for his help and advice on plastics identification.

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Fig. 2. Example of groups of plastics made from melamine formaldehyde (left) and cellulose nitrate (right)

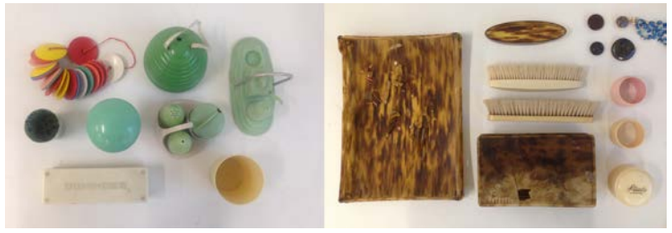


Fig. 3. Examples of signs of manufacturing: sprue pin (left), ejector pins marks as circles (middle) and mould lines (right)



Fig. 4. Different degradation issues that are present: white bloom on hard vulcanised rubber (left), discolouration and weeping on poly vinyl chloride (middle) and cubical crazing on cellulose nitrate (right)

All Photography by Carien Van Aubel
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Lustrous Surfaces collaborative conservation project

Dana Melchar, Senior Furniture Conservator

Currently, the Victoria & Albert Museum is preparing for an exciting display opening on 1 October 2017 entitled 'Lustrous Surfaces: Lacquer in Asia and Beyond'. The display will focus on Asian lacquer and lacquer-inspired European objects within our permanent collection and will include objects made in Burma, China, Indonesia, Japan, Korea, Thailand and Tibet as well as objects made in Middle Eastern and European countries emulating the Asian tradition. Not surprisingly, each culture has its own unique traditions in the craftsmanship, forms and decoration of lacquer, as well as sources of the raw material. Preparing our objects for the display is providing conservators with a unique opportunity to work on lacquer from various cultures simultaneously, enhancing the Museum's expertise in Asian lacquer.

V&A conservators have been well prepared to work on Japanese lacquer; over the past ten years, significant research, collaboration and conservation has been conducted focussing on Japanese lacquer, especially within the Mazarin Chest project. The V&A received a grant from the Overseas Korean Cultural Heritage Foundation (OKCHF) to fund a one-month exchange on Korean lacquer and current conservation practices in Korea, to help inform us on the best way to treat the Korean lacquer objects included in our display.

The conservation project was divided into two phases; an initial one-week phase in September 2016 followed by a three-week session in November. In September, Mr. Yang Seok Joong, a lacquer and furniture master (with the title of Korea's Important Intangible Cultural Property Successor for Furniture), and Mr. Kim Kyoungsu, lacquer conservator at the National Museum of Korea, visited the V&A together. The week was focussed on an introduction to Korean lacquer traditions, techniques and conservation approaches for the V&A conservators as well as an introduction to our Korean objects for our guests. Three presentations were given by Mr. Kim to V&A furniture conservators, conservation scientists, and curators from the Far East Asian Department, as well as conservation colleagues from the British Museum. Mr. Kim's presentations included the conservation and scientific analysis of a Goryeo gold-painted inlaid box, Lacquer ware from the Joseon Dynasty and conservation approaches, and a case study on the restoration of a red lacquer ink stone box decorated with bamboo from the Joseon Dynasty. The V&A gave presentations on the conservation treatment of an eighteenth-century German japanned bookcase as well as on our approach to sampling our lacquer collection and some of our findings. During the week Mr. Yang and Mr. Kim were shown the collection on display at the V&A and given a tour of our Asian lacquer storage area. We also visited the British Museum where we had a special tour of the conservation facilities and a visit with the Korean curators where we had the opportunity to examine several Korean objects. Mr. Yang and Mr. Kim also assessed the eight Korean objects for the Lustrous Surfaces display to be treated in the second phase of the project. At the end of the week we discussed the objects and agreed a treatment to be carried out in November.



Fig. 1. Mr Yang working on mother-of-pearl replacements
Photography on this page by Dana Melchar © Victoria and Albert Museum, London



Fig. 2. Tristram Bainbridge making a pattern for replacing mother-of-pearl



Fig. 3. Korean side dish laquer box (W.43-1938)

During the second phase of our project, Mr. Yang worked exclusively with V&A Furniture Conservators Tristram Bainbridge and Dana Melchar over three intensive weeks. Mr. Yang's contribution to the V&A highlighted both practical approaches to lacquer conservation using Korean materials and techniques and sharing knowledge regarding the art historical context and original methods of manufacture of our eight Korean objects. He sourced Korean lacquer, known as ottchil, to use during the conservation treatments and brought a number of Korean products with him including hide glue, clay powder, rice powder, and mother-of-pearl.

Conservation began on the black lacquer objects, with Mr. Yang sharing his methods for consolidation, re-building areas where lacquer had been lost, and replacement of lost shell decoration with practical how-to treat instruction (Fig. 1). He taught approaches to shell choice, pattern-making, sawing, engraving and attachment methods. In all instances, after he demonstrated a technique, both conservators were able to practise the method under his supervision (Fig. 2). During the second week of the project it became clear that some of the V&A Korean objects had been altered with the addition of western varnishes (Fig. 3). Attempts were made to remove these varnishes using solvents and/or solvent gels, especially on a Joseon period tiered-box. However, varnish removal proved to be too damaging, especially to the mother-of-pearl decoration, and was therefore abandoned.

After treatment of the black lacquer objects was well established, conservation of the red lacquer objects commenced, focussing on the consolidation of lifting mother-of-pearl and filling large cracks in the lacquer. Traditional materials were used including rice starch paste, wood dust and clay powder (Fig. 4). Additionally, Mr. Yang shared his adhesive delivery and clamping methods (Fig. 5).

At the end of the three week collaboration a number of treatments were well established for all objects and several were complete. The contribution Mr. Yang made to the treatment of these eight objects was significant. He provided an art historical and manufacturing context to all the objects and shared insights to the Korean decorative tradition and sensibilities. The practical knowledge he shared was even more valuable. Handling and using uncured lacquer is rare for western conservators. The lessons he gave on using ottchil for consolidation, a fill material and a coating were very informative. As a result of the time Mr. Yang spent with the conservators, they now have more knowledge in recognizing Korean lacquer and are able to better approach treatment of Korean lacquer objects. Professional filming of the collaboration was also carried out and a video of the project is currently in production.

With thanks to the generous support of the Jorge Welsh Works of Art, London – Lisbon; Overseas Korean Cultural Heritage Foundation; and Toshiba International Foundation.



Fig.4. Rice starch paste, wood powder and clay powder ready to be mixed into paste



Fig. 5. Mr Yang applying clay and rice starch paste to fill crack in lacquer surface
Photography on this page by Tristram Bainbridge
© Victoria and Albert Museum, London

Back to the Future: revisiting Richard Redgrave's condition reports

Clair Battisson, Senior Preservation Conservator
Louise Egan, Condition Report Liaison



Fig. 1. Charles Thurston Thompson photograph of the Raphael Cartoon 'Paul and Barnabus Rejecting the Sacrifice at Systra' annotated by Richard Redgrave (Museum No.76597) © Victoria & Albert Museum, London



Fig. 2. Detail of Figure 1 showing Redgrave's annotations © Victoria & Albert Museum, London

There have been several previous articles and comment made on what is thought to have been an early use of a photographic image in checking and monitoring the condition of an object at the Victoria & Albert Museum (formerly known as the South Kensington Museum). By employing the latest available technology as a practical tool, in 1865 Richard Redgrave (then Inspector General for Art at the Science and Art Department at the SKM) was able to produce effective reports for the Raphael cartoons when moved from Hampton Court Palace to the SKM. Redgrave's reports consist of large format photographs and the efficient use of simple annotations and concise statements to describe surface and structural concerns (Figs. 1 and 2). For reference, Redgrave's report images measure approximately 640 x 790mm with the corresponding cartoon dimensions approximately 3400 x 4400 – 5600mm, which demonstrates just how economical he was with his observations. Documenting object condition through images and annotations is still in use today internationally; though the markings and statements are often far more elaborate and subjective than the prudent comments found in Redgrave's reports: '...it is only the most noteworthy injuries that could be registered, and that extensive injuries of minute nature – such as abrasions of their surface or scaling of tints – could hardly be included, although using the photographs as the basis of the registry has been a great aid...'.[1]

There was also valuable accompanying documentation that provided an insight into the forward planning essential for the safe shipment of the cartoons. This was overseen by Captain Fowke of the Royal Engineers and includes clear communication, the logistics of transportation and the necessary employment of skilled specialists to advise and carry out the move, as described by Captain Edward Festing of the Royal Engineers in the extract below (Fig. 3).

> The removal of the Raffaelle cartoons from Hampton Court Palace to the Museum took place at the end of April 1865, under the direction and superintendence of Captain Fowke. The first operation in moving the cartoons was taking them out of their frames, which occupied two days. A large van carrying, by India-rubber slings, a case of sufficient size to hold all the cartoons was specially made from the designs of Captain Fowke; it was bought down by night to the palace, and soon after daylight the following morning we commenced work lowering the cartoons from a window of the room in which they were, and packing them in the van. Captain Fowke superintended the latter part of the operation, having stationed me on the scaffolding outside the window to see that they were carefully taken down. We both accompanied the van on its journey by road to London, which was performed without the smallest accident, and by four o'clock in the afternoon the cartoons were all safely lodged in their new gallery without having sustained the slightest injury, the whole of the work having been done under the direct supervision of Captain Fowke and myself, and every precaution taken that the faces of the cartoons should not be touched. The extent of this work may be judged from the fact that the case for cartoons measured 18 feet by 12 by 4 and the van was 20 feet long by 8 wide and 18 feet high to the top of the framing, and was drawn by eight horses. About 40 workmen were employed in the work.[2]



Fig. 3. The case and van transporting the Raphael Cartoons from Hampton Court to South Kensington in May 1865 (Museum No. 44413) © Victoria & Albert Museum, London

This meticulous organisation and planning by Henry Cole (then Director of the SKM), Redgrave and Fowke is similar to that undertaken by an experienced project team (consisting of Exhibitions, Conservation and Technical Services) in relation to the installation, deinstallation and subsequent touring of a V&A exhibition. And, as Fowke and Festing demonstrate, the ability of the experienced team to plan, resource, oversee, execute and document complicated projects under challenging deadlines should not be underestimated.

The V&A's ambitious public programme (exhibitions, displays, loans and tours) demands the continual review and improvement of processes. In order to minimise the risk of damage during transit, installation and deinstallation, an object will be accompanied by some or all of the following:

- Crate packing notes
  (produced by Technical Services)
- Object packing notes
  (produced by Technical Services/Conservation)
- Condition Reports
  (produced by Conservation)
- Installation/desinstallation notes
  (produced by Conservation /Technical Services)

Given their legal status (necessary to fulfil Government Indemnity obligations) and as recognition of the Museum's duty of care, a hierarchy has evolved between condition reports and other supporting documentation. The procedure of checking an object has gained significant status but it should be noted that when it comes to duty of care and safe handling, all supporting documents provide equally relevant information, and are interdependent. Democratising supporting documents presents an opportunity for far greater consistency and efficiency. An experienced courier will always work with the project team, communicating issues and concerns prior to any handling. They will examine the object in an overall way at the outset, investigating the immediate area/packing/crate prior to display or packing. Unless there is specific new damage or change to an object where handling, packing or display issues are causing damage, adding an annotation of obvious previous wear to a condition report is redundant. On occasion there can also be a marked inconsistency in the time ratio allotted by couriers to the process of condition checking one or two straightforward items in comparison to the expedience of installing several complicated or multi-part objects. This varying approach is also sometimes evident when dealing with high value art items as opposed to objects which have a less significant status.

With the public programme ever increasing while resources remain the same, efficiencies are constantly being sought. The traditional approach is to push for results through change in processes. New technologies are helping and efficiencies are being made but the most important change is a more pragmatic attitude to documentation and approach. As Redgrave pointed out '... extensive injuries of minute nature ... could hardly be included'.[3]

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Mattering: Richard Redgrave and the curious practice of drawing on museum objects

Simon Fleury, Senior Preservation Conservator

'Delicate things become objects late on: That is what they have in common with numerous seemingly self-evident things that only mature to the point of conspicuity once they are lost.'[1]

Richard Redgrave, the first curator of the South Kensington Museum (SKM) as the Victoria & Albert Museum was then known, produced groundbreaking work via his 'condition reports'. These reports exposed strange, intimate secrets behind the creation of some of the greatest artworks within the Museum but did so by interpreting these material analyses via a utilitarian approach to conservation and institutional commerce. It is testament to Redgrave's groundbreaking work that the conventions he employed in his painstaking cartographies are easily recognisable; many are still used today by museum conservators throughout the world. They also represent one of the earliest and most ambitious uses of the photograph, in a museum, to document the condition of works of art – a nascent experimental manifestation of the symbiotic relationship between technology and cultural practice at the V&A.

Redgrave was tasked with assessing the condition of the Raphael Tapestry cartoons at the time of their move from their home at Hampton Court Palace to the South Kensington Museum. Their arrival at the SKM in 1864, on loan from HM Queen Victoria, set in motion a complicated relationship between the artwork and its corresponding documentation in the Museum. In response to these concerns for the material condition of the cartoons, Redgrave took up a pen to annotate a photograph. By inscribing directly on the photographic surface, he created a new form of material history of the object, the first photo-based condition report. In his official report on the cartoons, as the Inspector General for Art, Redgrave wrote, 'It was necessary to take careful notes of the state of the whole on their arrival, in order that what injuries they have heretofore suffered maybe carefully noted, as well as the natural decay of age.'[2]

One of Redgrave's condition reports of the cartoons (there are seven in the series) was first discovered by the author while working on the preparation of objects for a re-display of the V&A's Photography Gallery. The albumen photograph (Museum Ref. 76.601), mounted on a secondary paper support, in need of minor repairs – not surprising given what we know of its past utilitarian use. Over time the conventions Redgrave laid down in his reports have morphed into a sophisticated means of encoding the material condition of objects (see Battisson and Egan article in Journal 64).

Evidence of the cartoons' past life is visible in the fine detail of the albumen print and Redgrave's painstaking annotations. Although long past its original instrumental function, it is still possible to make out the object's complex structure. Redgrave's concerns for the stability of the cartoons were not only directed at the frailties of their original construction, his report also gives a sense of their past life. It is easy to forget that these rare examples of Renaissance history painting were themselves once designs, instrumental to the making of tapestries.

A research question in the making: aside from the concerns with its condition it was intriguing that this object, once essential to institutional commerce, was soon to be exhibited in a gallery dedicated to the canon of photography. As museum conservators, we are attentively attuned to the vagaries of the objects in our care. One develops a pragmatic intimate knowledge of their shifting materiality. However, this object seemed to suggest that it is not only materials that are in a state of flux at the Museum. Why was the condition and treating of an object made as a condition report of another object now being assessed for exhibition? Redgrave's once instrumental photographs had returned, reconfigured as museum objects in their own right. The images documenting recent minor repairs and interventions, which included the high resolution object image downloaded from the V&A's digital database, had also become entangled, caught-up with Raphael's 'original' design for a tapestry (cartoon).

To make sense of this pragmatic contingent mechanism, the author's practice-led PhD (AHRC/M3C, Birmingham School of Art and Design) follows the genesis of the condition report at the V&A.

By concentrating on the informational material that has crystallised around the Raphael tapestry cartoons while at the Museum, it traces a lineage of practice that runs from Redgrave's early work through to the latest, and no less innovative, digital iterations (Fig. 1). By fabricating new hybrid museum objects this experimental research aims to counter the normative 'neutral' understanding of conservation and techno-cultural production, and by so doing, make a significant contribution to the fields of contemporary art and museum research.

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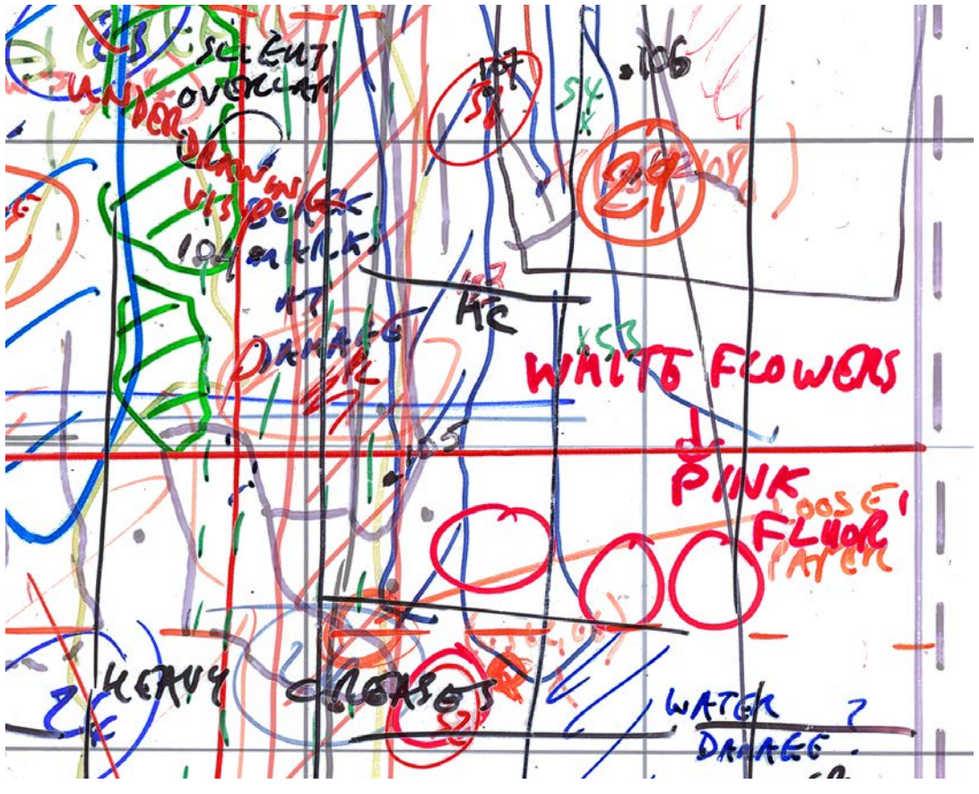


Fig. 1. Detail of *Condition Report: encountering the museum-object*, Simon Fleury, 2016.

Challenges of treating a Mosquito drop tank

Dr Nigel Bamforth, Senior Furniture Conservator
Janna Mostert, Furniture Intern



Fig. 1. Drop tank fractured with major losses.
Photography by Janna Mostert © Victoria & Albert Museum, London



Fig. 2. Janna Mostert and Nigel Bamforth adhering Reemay with hide glue.
Photography by Zoe Allen © Victoria & Albert Museum, London

In preparation for the 'Plywood: Material of the Modern World' exhibition at the Victoria & Albert Museum, the Furniture and Wood Conservation Studio treated an auxiliary aviation 'drop' tank, a supplementary fuel tank carried by aircraft, loaned by the de Havilland Aircraft Museum for display in the exhibition. Drop tanks were developed to extend the operational capacity of fighter aircraft and bombers. These were extensively employed by the RAF, the German Luftwaffe, the US Airforce and the Imperial Japanese Air Force during World War II.

The de Havilland Mosquito drop tank is constructed of diagonal moulded plywood but many thousands were produced in papier-mâché. Not many of the drop tanks have survived and those that did were adapted after the war for other uses such as side cars for motorcycles and small racing cars, so it is rare to find an example that has not been refurbished. The drop tank, consisting of two large sections and four smaller sections, was in poor condition. It was warped, distorted and the body was fractured, with a major timber loss at the tail (Fig. 1). The plywood surface was discoloured with general staining, accretions and surface dirt. Therefore, extensive conservation treatment was needed to enable the tank to be displayed.

Different combinations of backing materials and adhesives were tested on a 3mm birch plywood sample board to ascertain their stability for joining the sections and supporting the detached parts and fractures. Two different weights of Reemay (71gsm and 34gsm), a non-woven fabric made of 100% polyester, were tested in combination with animal glue in a traditional mix of two parts bone glue and one part hide glue. Solutions of 50% Paraloid B72 in acetone and 50% Paraloid B48 in 50/50 acetone and industrial methylated spirits were also tested on Reemay. All showed potential but the animal glue proved to have better adhesive properties and resistance against tension, and is easier to remove from the surface with warm water or a mild solvent. Linen, fully saturated with animal glue and adhered to the birch ply surface, was also tested. As linen is a woven material, it has more stretch and is less stable than the non-woven Reemay.

Nomex 410 (0.38mm), a calendered insulated paper, was tried in combination with Beva Tex, a non-woven polyester fabric coated on one side with Beva 371 film. The Beva sheet was ironed onto the surface with a hot spatula in order to melt the glue. After heating, the Nomex was ironed on top of the Beva and plywood. Nomex is a hard but flexible material that neither stretches nor rips. Since the object is curved and the fractured sections are warped and in some cases hard to align with the rest of the drop tank, the technique for applying the Beva and Nomex laminate could have been problematic so this was ruled out.

Reemay and animal glue proved to be the most effective combination of materials to use as a support





Fig. 3. Veneers laid onto the Plastazote mould.
Photography by Janna Mostert © Victoria & Albert Museum, London

Fig. 4. Tail reconstruction attached to the body of the tank.
Photography by Nigel Bamforth © Victoria & Albert Museum, London



Fig. 5. Drop tank completed and ready to be hung in the exhibition.
Photography by Janna Mostert © Victoria & Albert Museum, London

for joining the plywood. The fractured sections were carefully aligned and held in position with lightweight deep-throated C clamps. The Reemay was cut to the required size, coated with animal glue and applied to the inside of the tank (Fig. 2). Trigger clamps, weights and tape were used to keep the Reemay in contact with the wood surface while the adhesive dried. In areas with small wood losses, Reemay was stained with acrylic paint and adhered to the inside so that losses to the original plywood could still be seen while giving the impression that the object was complete. The tail was reconstructed for the same reason.

Cherrywood veneer (0.8mm thick) was used for the tail reconstruction. The build-up of plywood was replicated by applying three layers of veneer with the grain direction of each layer perpendicular to the last: cross-grained. A mould was made out of Plastazote foam, a high-density material with good carving properties. The mould was built up into the general shape of the tail then carved to an exact profile with a large knife. An MDF board was attached to the mould to serve as a base. The mould was then covered with a layer of packing paper and a barrier of Melinex film to prevent the veneer sticking to the mould. The first sections of veneer were laid in the mould following the direction of the original plywood drop tank (Fig. 3). The second layer of veneer was laid over the first layer and again cut in sections to follow the correct profile, then the third and final layer was laid in the same direction as the first and adhered with cold set Canadian fish glue applied to the surface. The tail piece construction was held in place with kitchen foil and a self-adhesive bandage, which is ideal for use when adhering round curved materials as it has good stretch and will not tear. After the replacement section had dried it was taken off the mould and sanded, then trimmed to fit into the tail location within the original tank.

The tail reconstruction was attached to the body of the tank by placing a layer of Reemay on the inside of the tail to act as an barrier and to protect the original plywood, then the reconstruction was placed on the inside of the tail and glued in place with animal glue (Fig. 4). The veneers were stained with watercolour wood stain and the original completed tank shell was surface cleaned with cotton wool swabs dampened in deionised water.

The tank is now stable enough to be displayed suspended from a steel support (Fig. 5). Restored from a shattered shell, visitors to the exhibition can appreciate an unusual use of plywood and understand more of its potential.

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Technical examination and conservation of a reverse glass painting by Thomas Gainsborough

Marine Andrieux, Student Placement, Paintings Conservation

'Wooded Moonlight Landscape with Pool and Figure at the Door of a Cottage' (P.33-1955) was painted on a 31 x 37 cm sheet of glass by Thomas Gainsborough in 1781–2 (Fig. 1). This oil transparency is part of a series of 10 reverse glass paintings created by the artist in his late career, between 1781 and 1786. They were made to be backlit and viewed from the unpainted side in a showbox he designed with illumination provided by five candles (P.44-1955). Gainsborough's major inspiration for this work was the mechanical theatre named 'Eidophusikon' invented by Philippe de Loutherbourg, for which he had a great admiration.[1] For two years De Loutherbourg gave representations of dramatic and illusionistic scenes painted on paper. Gainsborough was inspired to create his own private Eidophusikon. The showbox he designed can be described as a mixture between a camera obscura and a magic lantern; instead of an image projected through a lens, the viewer looks inside the box and sees the transparency backlit.

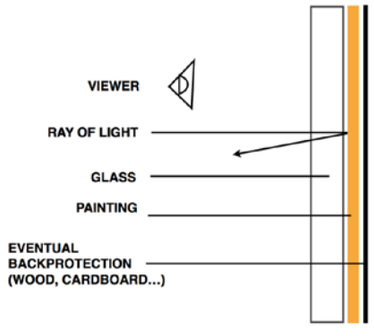
Traditionally, reverse glass painting consists of several layers of paint applied to one side of the glass while the painting is viewed from the other side. In creating such a painting, the sequence of paint application is reversed (Fig. 2). The foreground and highlights are painted first and must be correct, then the layers are built up, with the background applied last. With these paintings, the glass can be said to have several functions: a painting substrate, a protective layer of plain glass and a coating which performs an aesthetic function by making the colours more saturated.[2]

The painting was examined under a microscope, using UV lamps and with x-ray fluorescence (XRF) in order to learn more about Gainsborough's technique and the painting's condition (Fig. 3). It is not easy to distinguish the different layers. In contrast to normal practice, there is no ground between the support and the paint layers, although a mordant is usually applied to improve adhesion. A deeper study of Gainsborough's technique revealed that he applied a red colour as an initial layer where he wanted a warm and opaque effect; this can be seen in the lower left of the painting. In some areas the paint is very thin and translucent while others are more opaque. As the painting was created to be seen in transmitted light in the showbox, Gainsborough used a sgraffito technique, scraping away the paint to create the brightest highlights and to depict the moon, cottage window and door. He also worked on the fresh painting to draw some shapes. XRF analysis of the glass sheet showed the presence of calcium (Ca), potassium (K) and silicon (Si). XRF analysis of the paint in the sky indicated the presence of iron (Fe) and lead (Pb). This is consistent with the possible presence of a mixture of Prussian blue and lead white and is consistent with Gainsborough's



Fig. 1. *Wooded Moonlight Landscape with Pool and Figure at the Door of a Cottage* (P.33-1955) Thomas Gainsborough, 1781–82 © Victoria and Albert Museum, London

Fig. 2. General sequence of the different layers on a reverse glass painting © Marine Andrieux



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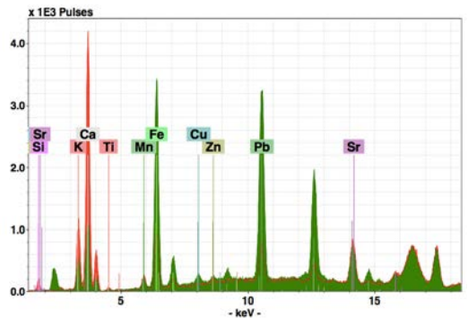


Fig. 3. X-ray fluorescence spectra from the glass sheet (red trace) and paint in the sky (green trace).
Conservation Science © Victoria and Albert Museum, London

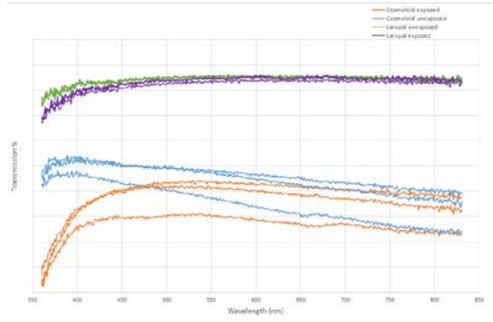


Fig. 4. Comparison of spectra between Laropal A81 adhesive (above) and Cosmoloid wax H81 (below). The Cosmoloid shows greater yellowing after aging.
Conservation Science © Victoria and Albert Museum, London

known pigment use.[3] The analyses provided a better understanding of Gainsborough's late technique and useful information about the general technique of reverse glass painting in the eighteenth century.

The painting was not in a suitable condition for exhibition or transport as paint was lifting in the sky and many other areas. This lack of adhesion was visible through the glass as air gaps between paint and glass and had a grey appearance. The objective of the proposed treatment was to secure the paint to the glass substrate and enable the painting to be displayed. With that aim, research into various adhesives was conducted. The first criterion for an adhesive is to have good aging properties. In this particular intervention it was essential that the adhesive aged well and would not yellow with time as it would be between the painting and the glass, and consequently the viewer.

A selection of adhesives were chosen for testing including Lascaux Medium for Consolidation (4176), Paraloid B72, Regalrez 1094 and Laropal A81 in solvent solutions. Wax-resin mixtures were also tested, using the last three resins together with Cosmoloid H80 wax, as suggested in the specialist literature on the treatment of reverse glass paintings. Samples of these adhesives were aged in a daylight box for 720 hours and then analysed by a spectrophotometer. The results showed that the most stable adhesive was Laropal A81, a synthetic aldehyde resin (Fig. 4). As the wax-resin mixtures yellowed more in the ageing tests, they were rejected.

Application methods were tested on artificially aged paint samples. For the wax-resin mixtures, these included a hot needle and spatula, and for the adhesives in solutions, brush, weight, spray and Leister (pressure and hot air diffuser). The spray application of the adhesive was the most effective method as it allowed a deeper penetration of the adhesive in the air gaps between the glass and the paint.

Following experimentation with three different concentrations, a 10% solution of Laropal A81 in Shellsol A100 was selected and sprayed on to the areas with lifting paint. After the solvent had evaporated, the paint was reattached to the glass using a heated spatula (60 to 80˚C) while working under a microscope. The heat helped to spread the adhesive and at the same time pressure helped to reattach the raised paint. The process was repeated in order to improve the adhesion. The air bubbles between the paint layer and the glass are now minimal. Retouching was carried out with Gamblin Conservation Colors (pigments bound in same resin) on the lower left corner to three small losses and two in the blue area. After years of being stored flat to avoid paint loss, Gainsborough's 'Wooded Moonlight Landscape' can once again be displayed.

Acknowledgments
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'Wooded Moonlight Landscape with Pool and Figure at the Door of a Cottage' was bequeathed by Ernest E. Cook through The Art Fund.

Clothworkers' Fellowship

Frances Hartog, Senior Textile Conservator

In the Victoria & Albert Museum's collection there is a core of 124 carpets that were on semi-open display for several decades in the Textile Study galleries. Many have a grey cast of surface soiling commonly found on textiles that have been exhibited uncased for several years and will require cleaning before redisplay. The common characteristics of rugs and carpets can make them daunting objects to wet clean because they are often large in size, measured in metres rather than centimetres, and relatively heavy in weight due to their three-dimensional structure. The knotted weave, composed of a base structure and vertical pile, can be made from both cellulose and protein fibres, sometimes in combination. Commonly they exhibit generations of repairs, often carried out with materials that have unstable dyes.

The condition, size, structure and history of each carpet has to be evaluated before undertaking a cleaning treatment. The most common method of wet cleaning, full immersion, requires significant amounts of space and time for both the washing and drying stages. As the work programme of the Textile Conservation Studio has become more ambitious, the availability of both these essential criteria has reduced. This posed the question of whether full immersion was necessary or even desirable and if not, was there an alternative method.

The V&A was awarded the 2016 Clothworkers' Fellowship, which enables a senior conservator to pursue a research project that not only develops the conservator's knowledge but also benefits the wider profession. The author's one year research project to survey and evaluate the cleaning practices employed in museums and collections around the world on their historic and contemporary carpet collections began in November 2016 (Fig. 1). Methods used by commercial restorers and dealers are also being explored. Particular attention will be paid to alternatives to complete immersion in water and to investigating the possibilities that portable cleaning appliances, such as those used for domestic carpets and upholstery, might offer.

The research falls into two parts. The first is to find out what methods are currently in use by contacting Textile conservation colleagues with rugs and carpets in their collections and asking if they wet clean them, and if they do, what methodology they use. Commercial facilities are also being approached and their protocols explored. The results will be evaluated to determine if there are more efficient immersion processes already in use.

The second part of the investigation is to carry out trials of any promising methodologies. Already, some tests have been undertaken using microfibre cloths and portable upholstery cleaning equipment. Where appropriate, trials on rugs in the collection are planned. Other tests will be carried out on non-collection carpets which have been externally sourced for this purpose as these will offer more comparable scale and soiling than 'pre-soiled' samples.

The aspiration is to develop practical protocols that can be adopted for future treatments. It is already evident there is no single solution but several possible options. By concentrating on the delivery and removal of the wash solution, it is hoped to settle on methods that are reasonably straightforward to implement. At the end of the Fellowship in November 2017, the findings will be drawn together and evaluated. A concise report of the results will be produced and shared with the textile conservation community.

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Fig. 1. The author examining carpets in store at Blythe House
Photography by Moya Carey © Victoria & Albert Museum, London

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