Partial treatment of an 1880s Australian Wedding Gown using a vapour activated adhesive lining technique

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Abstract

An internship for Masters of Arts (Cultural Materials Conservation) in the textiles conservation laboratory at the National Gallery of Victoria involved the treatment of an 1880s Australian wedding gown. The gown is an ecru coloured wool basque with a matching long-lined skirt with a short train, bordered with lace. Ecru Liberty silk forms a two part bustle on the back of the skirt, a false pleated bodice and side highlights on the skirt. The silk exhibits desiccation, most worrying on the bustle which was almost completely detached on one end. After testing with Lascaux™, BEVA™ and Mowilith™ adhesives under both heat and vapour activation, a vapour activated method was selected as the most appropriate. A vapour activated lining treatment with Sympatex™ was carried out using Lascaux 360:498™ (1:2) adhesive and Sefar Tetex™.

Introduction

An internship with the National Gallery of Victoria, involved the conservation treatment of an 1880s Australian wedding gown. The wedding gown was worn by Mrs Ethel Phillips (Nee Francis) on her wedding day in 1889, to Mr David Phillips and remained in the family for many years (Figure 1). Suffering severe silk desiccation on the bustles and silk details it was decided, upon its acquisition by the National Gallery of Victoria, that it would need extensive conservation before being stable enough for display. There were also questions about whether the artificial flowers, which are orange blossom on the basque, and jasmine on the skirt, are all original to the gown. The internship began the conservation process by forming a testing program for lining treatments for the silk and treating a component of the gown.

Figure 1: Mr and Mrs David Phillips on their wedding day

Problems associated with conservation treatment of fragile wedding dresses

Fragile materials in wedding gowns, especially weighted silk components pose specific problems for the conservator. As the textile industry developed in the eighteenth and nineteenth centuries, chemicals chosen to treat silks, cotton and wool were often not suitable for the textiles to which they were applied. As a result the fragility of these textiles is problematic not only for their storage but also for treatment options.

Silk poses the most obvious challenge as weighting agents became problematic within a few years after their first application to material. In collections today, silk deterioration of eighteenth century silks is a huge challenge and its treatment is extremely time consuming. Weighting of fabrics has been in practice since the end of the seventeenth century and involves adding from 30% to 300% of the fabrics starting weight through a process of treatment with inorganic salts (Brooks & O'Connor 1997). Conservation writings suggest in its conception, weighting was designed to recover the weight lost by degumming the silk. The degummed silk is void of sericin, a protein, which cements together the twin fibres of silk secreted by the silk worm (Timar-Balazsy & Eastop, 2004). It is likely to have later been perfected to add additional weight to make the silks fold and scoop properly once constructed into clothing. Originally these weighting agents were glues, sugar and tannins, but as sugar was highly impermanent, and these agents were only possible for light coloured silks, the inorganic salts were used as more permanent solutions.

Weighting agents are usually tin, iron, aluminium, magnesium and zinc and to a lesser extent tungsten, barium, titanium, antimony, chromium and molybdenum were also used (Timar-Balaszy & Eastop 2004). These salts are all highly acidic and as silk is naturally prone to acid, the weighting agents damage the silk irreversibly by dissolving the peptide bonds within the silk polymer. In addition to adding weight to the fabric itself the weighting agents also enlarge the silk fibre itself, changing the structural behaviour of the silk.

A significant problem posed by white wedding gowns is the wedding gown remaining white. While bleaching the gown again is an obvious suggestion, it is unlikely a conservator will ever come across a gown in stable enough condition to carry out a bleaching treatment. It is more than likely a bleaching treatment would cause additional damage making it far too risky to even consider on a fragile textiles. There are some bleaching agents such as sodium borohydride which are accepted within conservation as less damaging, however for most wedding gowns, as they are constructed from fragile materials, the only viable option is acceptable storage methods accompanied by preventative conservation methods.

Oxidation reactions are the main causes of problems exhibited by these gowns, most commonly seen in the yellowing of the materials and the desiccation of the silk. Yellowing is caused by a number of factors. Many materials were considered not stiff enough to fall or pleat properly when used in eighteenth and nineteenth century costume, as a result, many materials were treated with weighting agents and starches to stiffen and weigh down the fabric and in so doing change the natural properties of the fabrics behaviour.

One common additive used to starch fabrics is animal glue which was applied to stiffen and glaze materials (Horie 2003). During application, the polymer in animal glue is relaxed and glides on easily, coating the material, however when it dries the polymer shrinks. Through time, it continues to shrink and fabrics with animal glue on them often show signs of cracking or crazing, often resulting in the shearing of the fabric itself underneath the glue layer. Those fabrics which do not exhibit crazing, but which have been impregnated with glue are most noticeable for their severe yellowing or in some instances browning (Timar-Balazsy & Eastop 2004). Insect damage is also common in textiles treated with glue or starch as the protein based material in glue is particularly attractive to insects.

Artificial flowers are an unchartered area of textile conservation where in-depth research has not yet been fully explored. The painted and gilded leaves and artificial flowers on the basque and in the bouquet of the Phillip's wedding outfit, are brittle and fragile. While many of the wax flowers are reasonably stable others which are comprised of paper and textile have become brittle due to the glues and gums used to stiffen the flowers during construction. Moisture and oxidation reactions are problematic for the artificial flowers causing damage to the paper and metal components. The reaction from this damage can also be detrimental to the textile components of the gowns.

The Phillips Wedding Gown

In late 2004 the National Gallery of Victoria acquired the wedding outfit of Miss Ethel Florence Francis, who wore the gown and the matching adornments on the day of her wedding to Mr David Phillips. The wedding took

place on January 30th 1889 at the Brunswick Wesleyan Church, two years before Mr Phillips was elected as the Mayor of Brunswick. The gown was widely reported by the newspapers at the time especially for the orange blossom details (Whitfield 2005). The gallery also acquired the matching shoes, bouquet and head-dress garland.

The outfit consists of an ecru fine wool skirt with cotton lining and a basque constructed from the same ecru fine grade wool (Figure 2). Ecru Liberty silk satin is used for the bustle, the bust of the jacket and the right side of the skirt. The basque has been highly tailored with a series of darts and whale boning to closely fit the body. It has a high square collar and wide lapels, joining at diaphragm level to give way to a series of ten small cream buttons which secure the basque. Liberty silk then sits over the breast, vertically box pleated to give the illusion of a shirt. The sleeves of the basque have small elbow darts and a double folded cuff reaching mid-forearm. The basque is slightly V- shaped at the front and back so as to reach beyond the waistline of the skirt and hide the cream binding which forms the skirt waist.

The skirt has been constructed from five pieces of the same fine grade wool as the basque and is lined with a smooth ecru cotton, which by its slight sheen, suggests it has been starched for stiffness or perhaps weight. The skirt has a front length of 1070mm, with the back extending a further 690mm in a large rounded train which has been lined with starch coated netting and hemmed with cream cotton machine made lace. Given the length of the skirt it is likely it was worn with either a small crinoline or a hoop, popular in the 1880s, to emphasize the shape of the skirt. The skirt has been pleated and gathered from the waist and falls into deep cascade folds, secured with small catch stitches, to ensure a fullness and drapery fashionable in the late 19th century (Figure 3).On the proper right side a long pleated line of silk runs from waist to floor and is adorned with two small patches of wax flowers. On the proper left side an off-white silk ribbon bow is attached to the hip and extends to approximately knee level, from the waistband and is also adorned with wax flowers. At the back of the skirt two silk lengths, approximately 280mm wide, run from the middle of the train, 1475mm, up to the waistband where they are gathered, then fold over and run

Figure 2: Front view of the Phillips wedding gown showing pleated silk bodice and artificial flowers

approximately 800mm back down the skirt (Figure 4). These are designed as a bustle, to give fullness to the back of the dress.

The petticoat is constructed from cream cotton with trimming pleats and a secondary straight trim, around the hem, made from the cream wool. These two trims are designed to add to the fullness of the skirt around the hem.

Both the skirt and basque are adorned with artificial flowers, mounted onto wire supports and bound with gummed paper ribbon. The flowers on the proper left shoulder of the basque are identical to those contained within the bouquet and are therefore thought to be original, and consist of small orange blossoms, 'cumquat like' fruit, a white unknown 'daisy like' flower and paper leaves in mottled grey, orange, green and gold. The three flower adornments on the skirt are artificial jasmine flowers with vibrant green leaves and stems and are thought to be secondary additions because of colour differences compared to the shoulder mounted flowers and the bouquet.

Despite being displayed in a shop window for many years the ecru wool is in excellent condition and comparisons between the exposed wool and that within the folds of the skirt reveal the colour has changed little. It is therefore

Figure 3: Side view of the Phillips wedding gown showing the bustle profile

Figure 4: Bustles on the Phillips wedding gown

reasonable to assume that the gown was not in direct sunlight but was instead displayed in a more protected area. The dress is understood to have been displayed on a wire mannequin but appears to have suffered no ill-effects from direct contact with metal. The oxidation problems exhibited on the cotton petticoat and lining of the gown are understood to be a result of the starch or stiffening agent oxidising through other environmental conditions and not the metal mannequin because of their overall coverage. The silk details bear typical signs of silk deterioration with serious splitting and desiccation shown in areas of folding, high wear and areas prone to damage by outside sources. These areas are concentrated around the folds of the bust, folds of the bustle, the bottom of the bustle's train and folds of the ribbon.

Treatment of the Phillips wedding dress

During examination of the Phillips wedding dress it was evident that the biggest problem presented was the deterioration of the silk components due to desiccation (Figure 5). As the internship was to be conducted within a time limit, there was also the issue of how much work could be achieved within the two week time span, and allow the gown to be in a stable enough position to return to storage.

Desiccation, caused by the loss of moisture in a fibre is shown in the Phillips wedding gown. Given the damage exhibited by the silk and the small particles which disintegrated when the silk was moved, it was assumed the silk damage was caused as a result of desiccation, weighting agents, wear and perhaps mechanical damage from being stepped on at some stage in its life. In consultation with the textile conservators at the National Gallery of Victoria, Bronwyn

Figure 5: Damaged silk on the Phillips wedding gown

Cosgrove and Kate Douglas, it was deemed necessary to detach the silk and treat it separately from the rest of the garment. It was also decided that the bustle would be treated first (Figure 6).

Thorough construction diagrams were created and careful marking of all areas of stitching relevant to the bustles attachment to the skirt were marked with red Guttermann Skala™ thread then the bustle was detached from the skirt. As the bustle was constructed in quite a specific order of gathers and folds, these were also carefully stitch marked with blue Guttermann Skala™ thread (Figure 7). While the stitching to secure the gathers and folds may have been potentially damaging to the silk it was

Figure 6: Damaged end of the Phillips wedding gown bustle

deemed necessary to mark these areas to ensure the bustle could be returned as accurately as possible to its original position on the dress. The gathering stitches and hooks were removed, as was the machine stitching which bordered three sides of each strip of silk. It was discovered during examination that at the back of the proper right length of silk a large rectangular patch had been cut out at some stage during its life. As such this would require special care to ensure this area did not distort during treatment.

The bustles were then individually flattened with deionised water. This was liberally applied with fine-mist spray bottles, then using a layer of Mylar™, any bumps, folds or air bubbles were smoothed out to ensure the silk was completely flat. The wet silk was then blotted gently and left to air dry. As the two strips of silk were approximately 580mm wide and 2430mm long two tables were joined and the gap bridged by stretching out polyethylene sheeting.

Adhesive and lining treatment testing

Adhesive testing was carried out to ascertain the best way to line the bustles in order for them to still exhibit their sheen and most of

Figure 7: Guttermann Skala™ thread markings on the bustle

their flexibility once treated. BEVA™ 371, Mowilith™ DMC2 and Lascaux™ 360:498 (1:2) were tested in both heat and vapour activated testing.

For heat testing, small patches of adhesive coated Tetex™ were attached to an underlying silk with a heated spatula to 60°C and 75°C. Adhesive concentrations were; 10% to 25% for Mowilith™ DMC2, 10% for BEVA™ 391, and 15% and 20% for Lascaux™ 360:498.

For vapour activated lining, the same concentrations were used and a weighting system was calculated based on weight per square centimetre. The weighting ratio was based on information in Karsten & Down 2004. After testing, it was decided a weight ratio of 3.1grams per square centimetre was the most suitable (Karsten & Down 2004).

This process involved the use of Sympatex™, a laminate product like Goretex™. Sympatex™ works by allowing the vapour of the chosen solvent to pass through its pores, without wetting the textile. This allows the adhesive to activate, and adhere to the textile, without the problems which can be associated with moisture solvent treatments. Testing was carried out with weights applied between 1g/cm^2 and 5g/cm^2 for all three adhesives. Lascaux™ and Mowilith™ were both activated with ethanol and BEVA™ was activated with petroleum spirits. The testing was carried out in increments of five, ten, fifteen and twenty minutes.

The results of the tests revealed that the heat method flattened the underlying textiles fibres. Therefore it was decided that a vapour activated adhesive treatment would be undertaken. The

best method for vapour activation was a 15% solution of Lascaux™ 360:498 (1:2) with an activation time of fifteen minutes under the equivalent of 3g/cm^2.

Sefar Tetex™ (Stabiltex) was selected as the most suitable lining fabric as it is chemically stable, was available in a suitable colour and is lightweight and flexible enough to conform with the mechanical properties of silk.

Vapour activated lining treatment

The two lengths of Tetex™, one for each of the silk lengths were brushed out with a 15% solution of Lascaux™ 360/498 (1:2) on polyethylene sheeting and left to dry. With the combination of both it provided a workable adhesive, able to be brushed out onto the Tetex™ with deionised water as the carrier. Careful manipulation was needed to make sure the 'grid' of the Tetex™ fibres were square before the adhesive was dry.

After the adhesive was fully dry, an adhesive 'sandwich' was then created in the following order; a layer of polyethylene plastic, the silk, outer side down, the adhesive coated Tetex™, a layer of Sympatex™, blotting paper soaked with ethanol, a protective layer of Holytex™, (Holytex™ is a polyester interleaving fabric) then a weighted wooden board. The total weight of the board was 58 kilos. The process was allowed to activate for fifteen minutes and then the overlying layers of the weight, Sympatex™, Holytex™ and blotter were removed and the lined textile allowed to dry. The result was effective adhesion between the silk and the Tetex™ with no flattening or distortion of the textile weave occurring.

The areas within the silk lengths, which were particularly damaged and ripped, were carefully couched back onto the Tetex™, as well as the frayed ends of the lengths which would be later folded in and contained within the bustle seam line. A pale pink Guttermann Skala™ thread was used for the couching, which was carried out using a random pattern to lessen disruption to the aesthetics of the bustle once replaced on the gown.

Due to the time constraints of the internship, it was not possible to fully treat the rest of the gown, however there are plans to treat the silk on the basque and dry clean the wool body of the gown. The two lengths of silk were carefully rolled and returned to storage (Figure 8). After reattachment of the fully conserved silk components to the gown it will be suitable for display.

Figure 8: Bustle lengths after partial treatment

Conclusion

The problems presented by the Phillips wedding gown are not unusual occurrences for textiles conservation. The treatment of the gown was a new procedure for such damaged silk and can offer an important alternative to the more widely practiced heat lining treatments. While the benefits of this process are stable silk, which is able to be stored and displayed safely, there are some limitations to this type of treatment.

Following the methods which were undertaken on the Phillips gown requires the silk to be able to lie flat. This would mean that the silk, or other damaged fabric, would need to be detached from the rest of the outfit or be manipulated enough to create a flat surface. In some cases this will not be possible and while it could be carried out on confined areas of damage it would not provide an overall protection for the damaged fabric. Patching could cause areas of weakness in the future, which is not advisable for weighted fabrics.

Reversibility of lining treatments is also an issue. It is unlikely that the silk on the Phillips dress could now be removed from the Tetex™ lining. In theory it is possible, with the use of ethanol, however treating a whole length of silk in this way would damage it further and is therefore not ethically viable. While Lascaux™ adhesives and Tetex™ are both said to be

chemically inert and conservation grade, it is possible in the future that they could cause problems to the mechanical properties of the silk. The only elements which would need to be monitored are the protection of the lined silk from dirt, dust and heavy handling. While the combination of the two Lascaux™ adhesives ensures a good bond, the 'tackiness' of the Lascaux™ 360 needs to be monitored in the future.

While the discoloured oxidation damage on the Phillips' dress is limited only to the cotton petticoat of the skirt and lining within the basque, this is unusual. Many gowns have far more advanced problems, especially silk desiccation due to radiation exposure, especially through heat and ultraviolet light as well as problems associated with weighting agents. While the Phillips wedding gown is able to be treated, some of the silk is in such an advanced state of disrepair they can only be stored, with little chance for treatment.

While relative humidity levels and temperature levels are important the materials in which the textiles are stored should be primary concerns because they are in direct contact with the textile at all times. Acid free paper, chemically inert polyethylene boxes or acid free boxes and if necessary Mylar layers for support, could only be beneficial for all. If storage materials are of suitable quality and are not reactive with the textile itself, then a significant portion of preventative conservation is already addressed.

For silks and other materials which are able to be manipulated enough to gain a flat surface vapour activated lining is an important treatment option and should be carefully considered as a viable and beneficial process.

Keywords

wedding gown, adhesive lining, Lascaux™ adhesive, Sympatex™, Tetex™, silk deterioration

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Materials

Sympatex™ is a German made product with a closed hydrophilic layer of expanded polytetrafluoroethylene attached to a layer of calendered polyester.

Sefar Tetex™ is manufactured in Singapore and made from a polyester multifilament yarn to a thickness of 85 microns.

Lascaux™ adhesives are thermoplastic copolymer butyl-methacrylate dispersions, thickened with acrylic butyl-ester. Lascaux™ 360 HV is permanently tacky and Lascaux™ 498 HV is hard when dry.

Holytex™ is an interleaving protective layer used as a supporting material in treatments. It is 100% polyester, has low lint and a smooth texture.

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About the Author

Skye Firth has recently completed the Master of Arts (Cultural Materials Conservation) course at the University of Melbourne. After beginning volunteer work at the National Gallery of Victoria in 2004 she has begun developing her skills in the area of textiles conservation for what she hopes will be a long and fulfilling career. She is currently on a short term contract with International Conservation Services in Sydney.