

# Modern Materials in Fashion Collections: A conservation issue for the National Gallery of Victoria

**Bronwyn Cosgrove**  
National Gallery of Victoria

## Abstract

Over the past three years, several works in the textile collections of the National Gallery of Victoria (NGV) containing modern synthetic materials have presented conservators with challenges, and many questions. Case studies discussing the deterioration of 1950s evening gowns with decidedly unpleasant odours, to flaking synthetic leather surfaces on Courrèges outfits, and the diverse works of Australian fashion designer Jenny Bannister highlight some issues in a collection containing a myriad of modern synthetic materials. The need for a long-term project examining these issues has been identified and is currently in development. By undertaking a survey of works in the collection to identify the presence of synthetic materials and their condition, conservators will enhance current collection data, and in conjunction with curatorial staff, hope to develop appropriate storage, display and treatment plans.

## Introduction

The holdings of the National Gallery of Victoria's (NGV) collections of textiles number over eleven thousand items. The collections include flat textiles such as tapestries, carpets, curtains, fabric lengths, lace and embroideries, as well as fashion garments, clothing and accessories such as hats, shoes, gloves, handbags, fans, parasols, hat pins and buckles. Two thirds of the collection falls into the categories of costume or fashion garments and accessories.

Major redevelopment of The NGV occurred between 1999 and 2003. During this time, the 1965 Roy Grounds designed building was extensively renovated by Italian architect Mario Bellini to display the NGV's International art collections, and a new campus for the display of the Australian collections, The Ian Potter Centre: NGV Australia at Federation Square was built. Prior to the redevelopment textile works from the collection were displayed in major temporary exhibitions every two or three years for three to six months.

As part of the redevelopment, permanent galleries for the display of fashion and textiles were incorporated into both sites, and the gallery now runs an ongoing program that produces between three and four textile based exhibitions each year. In addition to this program, the collection also provides textile works for rotation in the permanent display galleries for Asian, Egyptian and Decorative Arts. These programs have significantly increased the use and profile of the NGV Fashion & Textile collections.

The increase in textile exhibitions has resulted in curators accessing the collection on a much broader scale, and many works not previously conserved or exhibited are coming to the attention of conservation staff. Over the past three years, several works have presented textile conservators with challenges relating to modern polymeric materials such as synthetic rubbers and plastics. This paper presents four case studies that highlight these issues.

## 1950s Fashion

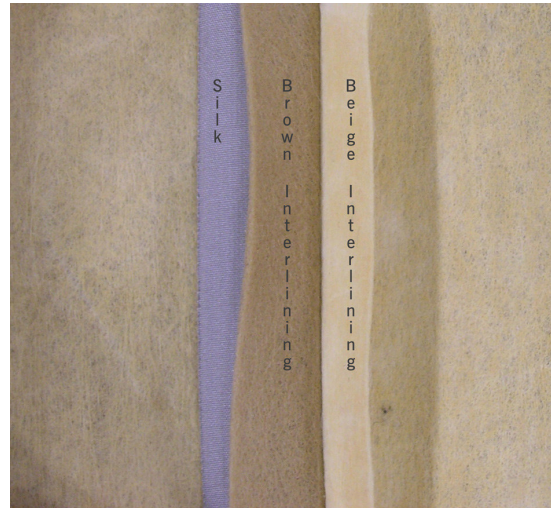
In 2003, *Swish: Fashionable Melbourne of the 50s* was installed in the Fashion & Textiles Gallery at NGV Australia. The exhibition examined the influences and inspiration behind the creation and wearing of fashion during this popular decade. Key Australian designers and labels from the NGV's collection were showcased including Le Louvre, Hall Ludlow, Linda Suchestow, La Petite, Georges and Lucas (Somerville & Whitfield, 2003).



**Figure 1:** *Swish: Fashionable Melbourne of the 1950s*

The 50s silhouette of full skirts was achieved with voluminous petticoats, combined in some cases with the use of newly developed interlining materials. An evening gown of grey silk and lace by Le Louvre was of particular interest to the conservators preparing this exhibition. The gown had not been displayed since its acquisition in 1975. The skirt of the gown is lined with two layers of interlining. Both layers are constructed from a random matrix of fibres embedded in a carrier. The innermost layer of interlining is brown in colour, while the second layer is yellowish/beige. On accessing the gown, a strong aroma was noticed in the polypropylene storage box, and cellulose based packing materials of tissue and cotton stockinette were noticeably discoloured, having gained a pink tinge.

The gown was examined by NGV Conservator of Textiles, Kate Douglas. Microscopic examination of the brown interlining indicated the presence of cotton fibres embedded in a carrier of an unknown material. The beige lining was found to be of a similar construction, with flax fibres rather than cotton. Close examination of the interlinings revealed a brand name 'Vlieseline' on one edge of the innermost brown coloured lining layer.



**Figure 2:** Interlining layers, Le Louvre Gown 1956

Vlieseline was developed by Freudenberg, one of the first European companies to develop chrome tanning processes for leather. The process reduced tanning times considerably, and Freudenberg became one of the largest tanneries in Europe. Relying heavily on exports, the company suffered post WW1 and investigated options to diversify its operations (Freudenberg *The Tannery*). Working with the newly developed butadiene synthetic rubbers, the company manufactured rubber shoe soles, floor coverings and synthetic leathers. Initially produced as a base for synthetic leather, Vlieseline was first sold as a non-woven interlining in 1948. (Freudenberg *Diversification*).

Samples of both interlining layers were analysed by Deborah Lau, CSIRO Analytical and Conservation Scientist. Fourier Transform Infra-Red Spectroscopic (FTIR) analysis indicated that the innermost brown interlining layer was composed of cotton fibres embedded in butadiene nitrile rubber. The beige interlining was found to be flax fibres suspended in a carrier of polyvinyl alcohol. The results of the analysis confirmed suspicions that the strong aroma of the gown could be attributed to the presence of butadiene nitrile rubber in the interlining materials.

*Swish* was deinstalled in January 2004 and the Le Louvre gown was padded with fresh acid-free tissue and placed in a polypropylene costume box for storage. The gown was inspected in July 2006. On opening the storage box, a strong aroma was noticed, and the packing tis-

sue was again found to be discoloured – after just two and a half years.



**Figure 3:** Discoloured storage tissue against a new tissue control. July 2006, Le Louvre Gown 1956

### Courrèges Outfits

The NGV collection holds several outfits by French designer André Courrèges spanning the years 1969 to 1973. The majority of works are made from, or contain components that consist of a synthetic coating on a fabric support, and have an appearance similar to leather. The condition of these works is variable; several are displaying signs of deterioration such as crazing and the synthetic trim of one outfit, a pantsuit in brown wool dated to 1973, is in poor condition. The trim consists of a base layer of plain weave white cotton. A thin, dark brown glossy coating is attached to the cotton carrier by a transparent, slightly yellow adhesive layer. The care label describes the trim as 85% cotton, 15% spandex. The coating is cracked, and actively flaking from the adhesive coated cotton substrate.



**Figure 4:** Detail of deteriorated trim, Courrèges Suit 1973

When this outfit was selected for display the question of how to stabilise this coating was paramount. While it was clear that consolidation of the trim surface was required, selection of an appropriate adhesive and solvent system proved difficult without understanding the materials involved. Solvent testing indicated that the coating layer was stable in ethanol, acetone, and petroleum spirit; however the adhesive layer was found to soften in acetone. A sample of the trim was taken from a seam allowance for FTIR analysis. Results of the analysis undertaken by the CSIRO concluded that the brown coating on the trim was polyester polyurethane, and that the fabric substrate was composed of cotton sized with a starch. Identification of the adhesive layer between the two was not possible due to sampling restrictions. In cases such as this, the benefits of portable FTIR instruments that do not require destructive sampling are immediately clear.

Polyurethane (PU) is commonly produced in two forms, polyether PU, and polyester PU. These forms are damaged by different agents of deterioration. Polyether PU is susceptible to photo-oxidation and acid hydrolysis, while polyester PU is easily degraded by alkali hydrolysis, releasing acids and alcohols (Paulocik & Williams 2002), and microbial attack by fungi. When new, PU is resistant to a wide range of solvents, however care should be taken when dealing with coated fabrics and aged PU films. The adhesive bonding layer attaching PU coatings to their underlying fabric substrates may be more readily soluble in commonly used solvents such as acetone, and aged, photo-oxidised PU coatings have been noticed to soften or delaminate during dry cleaning processes (Kerr & Batcheller 1991).

While consolidation of PU coatings has been successfully undertaken using Plextol B500™ (van Oosten 2005), a water based acrylic dispersion, current studies into the use of PU dispersions for the consolidation of PU foams are being undertaken by Thea van Oosten of the Netherland Institute for Cultural Heritage (van Oosten, 2005). A similar material has been used to consolidate PU coated upholstery on furniture from the 1960s (Bechthold 2005). Given this development, treatment of the trim has been postponed pending the publication of these studies.



## Jenny Bannister Collection

In 1998 Jenny Bannister presented over twenty of her designs to the NGV as a gift. A number of these outfits date to the late 1970s and contain a variety of plastic materials. Punk Collage Mini Dress, 1978 is described as being made from vinyl, plastic, paint and metal. The structural basis of the dress is a plain weave dark blue cotton fabric coated on one side with a black faux leather surface. A large section of transparent plastic is stitched to the front of the mini dress. White, red, blue and purple paint has been applied to the underside of the plastic sheeting before it was sewn to the base layer of the dress. Two pieces of slashed plastic sheeting, one white, one red sit on the surface of the painted plastic sheet. These are secured with stitching that passes through all layers of the mini dress. White plastic tubing is threaded through metal loops at the waist and shoulders. The tubing crosses over at the centre back, passes through the metal waist loops and is knotted at the proper right front.



Figure 5: Punk Collage Mini Dress 1978

Examination of the dress today reveals several issues relating to the variety of synthetic materials present and their deterioration. On close inspection, drops of clear viscous liquid, possibly plasticiser, are visible on the outer surfaces of the white plastic tubing. This liquid appears to be more prevalent in areas of the tubing that are under stress such as the knotted area at the proper right front. In exposed areas, the black coating on the cotton substrate displays cracking at points of stress such as the armholes and shoulders. The surface of the coating is noticeably dull in several areas, however discreet areas of high gloss appear to relate to direct contact with the white plastic tubing. The interaction of the coated fabric surface and the overlying transparent plastic sheeting is also concerning. In areas where the coated cotton substrate is in direct contact with the transparent plastic sheeting, the two layers appear to have bonded.

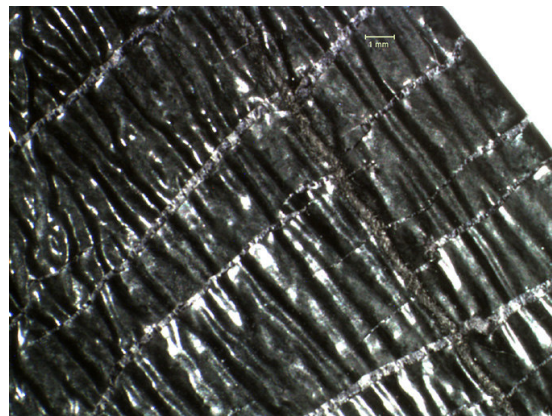


Figure 6: Punk Collage Mini Dress: detail of coated fabric deterioration

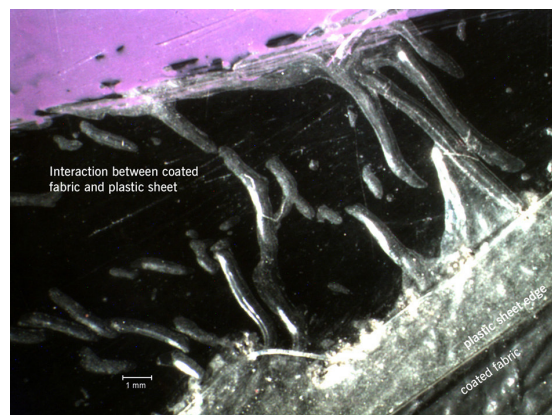
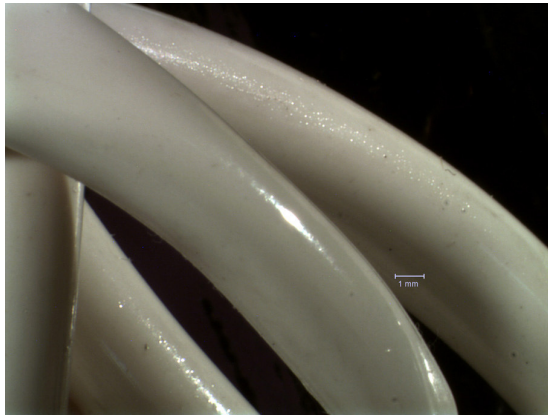


Figure 7: Punk Collage Mini Dress: detail of interaction between coated fabric and sheet plastic



**Figure 8:** Punk Collage Mini Dress: detail of droplets on surface of plastic tubing

Jenny Bannister used a range of modern materials in her work. While the ‘plastic dresses’ are synonymous with her work of the late 1970s, in the late 1980s she began working with polycaprolactone (PCL), a biodegradable thermoplastic polyester. Acquired as part of the 1998 gift, Golden Beach Girl, an outfit made in 1989 consists of a bikini top, pants, bathing cap, pair of cuffs and sandals. According to cataloguing information, all seven components are made from PCL coated with gold spray paint. PCL has a low melting point of 58-60 degrees Celsius, and is known to degrade in very short periods of time. In Sweden, attempts to market PCL bags were foiled when the bags degraded before reaching the customers. Curatorial staff recollect that this outfit was flexible at the point of acquisition in 1998. Four years later, conservators found it to be severely embrittled, with several fractured areas. Whether this rapid deterioration is attributable to the natural ageing qualities of the polymer, or to processes undertaken during the manufacture of Golden Beach Girl by the artist is unknown. It does, however raise concerns for the future of other Jenny Bannister outfits constructed from this material.

### Identifying the Issues

While these case studies highlight several deterioration issues involving different modern synthetic materials, their shared theme, the need for the identification of materials is clear. In their 1999 paper, *From “91” to “42”: Questions of Conservation for Modern Materials*, Grattan & Williams highlight the importance of materials identification:

‘...with unknown plastics or

polymers one cannot recognize danger, judge the importance of taking any conservation measures, or decide whether to take measures such as segregation, refrigeration or removal of oxygen’ (Grattan & Williams 1999).

So what methods are available to conservators wanting to identify modern materials in textile based collections?

While the period and physical properties of garments containing synthetic materials can guide conservators towards a broad identification, the useful identification tool of trademark and registration stamps found on mass produced rigid plastics (Williamson 1999) aren’t available on many items in fashion collections. Conservators at the NGV have found that care labels, if present can provide a very useful starting point. The care label on the Courrèges pant suit identified the synthetic leather trim as 15% Spandex. While this incorrectly indicated the presence of PU fibre rather than a coating, it did provide conservators with a starting point, and assisted in ruling out the presence of a PVC synthetic leather film.

Curators can also provide a wealth of information relating to materials. In the case of Jenny Bannister’s Golden Beach Girl outfit, cataloguing information detailing the presence of PCL gave conservators the vital information that provided an insight into its rapid deterioration. Today, curators gather as much information as possible when acquiring works directly from contemporary designers, design houses, artists and practitioners.

Where these forms of information and documentation are not available, the work of conservators becomes more complex. Visual examination of physical properties, and the manner in which deterioration is manifested can provide a level of determination, and several well documented chemical tests can be used to identify synthetic materials. Unfortunately, these tests are destructive and often return ambiguous results. Due to these factors, it is recommended that these tests be used only as a last resort (Grattan & Williams 1999). FTIR has been successfully used to identify modern organic materials in collections for the past two decades.

While in the past sampling has been required for analysis, the development of portable instruments and remote sensing fibre optic accessories has resulted in a method of identification that is non-destructive, and can be taken directly into collections (Grattan & Williams 1999, Van Oosten 1999, Paulocik & Williams 2002, Garside & Wyeth 2005).

### The NGV Collection

These case studies highlight some important issues for the NGV textile collections, curators and conservators. Considering the extensive holdings dating from the late nineteenth century through to the current fashion seasons, it would be safe to say that they represent the tip of the iceberg. In an attempt to address these issues, the gallery is developing a long-term project focussing on modern synthetic materials in the fashion and textile collection. It is proposed that the project start by undertaking a survey of works in the collection. The collection management system will be used to identify works that are likely to contain materials of interest, and by surveying these in groups according to their period of manufacture, it is hoped that common materials and deterioration indicators will be observed. The second phase of the program will address materials analysis and identification. This will provide conservators and curators with a more thorough understanding of the collection, its potential, areas of concern, and will enable long-term storage, display and treatment planning.

### Conclusion

In addressing issues involving modern synthetic materials in collections, the need for accurate identification of materials is clear. While identification of these polymers can be time consuming, ambiguous or expensive in the case of instrumental analysis, conservators are fortunate that the body of work relating to the deterioration and preservation of modern materials in collections has grown steadily since the early 1990s. Information on storage practices for different synthetic materials is readily available in conservation literature and when combined with conclusive identification, provides conservators with an understanding of the visible and potential deterioration of works in their care, and allowing them to implement appropriate long

range preservation plans, and devise informed treatment plans.

### Keywords

Synthetic materials, Modern materials, Identification, Survey, Preservation

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range of 20th C. textiles and costume that included Hollywood gowns worn by Greta Garbo and Marlene Dietrich.

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## **About the Author**

Bronwyn Cosgrove is the Senior Conservator of Textiles at the National Gallery of Victoria. Previously, she has worked at the National Gallery of Australia, the Australian War Memorial and the Australian National Maritime Museum. She travelled to Cyprus in 1997 as an archaeological site conservator, and in 2000 was awarded a one-year Mellon Fellowship in Textile Conservation at the Los Angeles County Museum of Art. During her time at LACMA, Bronwyn completed a Masters' unit in the history of 20th century fashion and worked on a