Preserving silk: Reassessing deterioration factors for historic silk artefacts

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Silk can be found in numerous examples of costume, flags and banners, tapestries, upholstery, etc., in collections worldwide. These objects are unique records, offering invaluable evidence of political, economic, and social histories. However, silk is susceptible to ageing, and the preservation of such artefacts is of significant concern.

The deterioration of silk causes embrittlement of the textile leading to splits and tears, and eventually a powdery and very friable fabric. Interventive conservation treatments, to consolidate silks, may radically alter their appearance, dramatically affecting the way in which visitors see and interpret the objects. Alternative preventive conservation methods are being sought to improve the longevity of silks in cultural heritage collections, by optimising the display parameters.

Light has long been considered the major cause of damage to silk objects, which has lead to lower light levels for displays. However, recent research on medieval tapestries casts doubt on this. Unfaded silks on the reverse were found to be in a similar deteriorated condition to the faded silks on the front. Other environmental factors are important, and circumstantial evidence implicates raised humidity (RH), although there has been little research on this factor.

Here we report the results of preliminary experiments in which we have investigated the effects of RH, as well as light, on the deterioration of new silk; relative humidities were chosen to reflect a variety of typical display conditions. The temperature and RH dependent kinetics of silk ageing were determined, by assessing the changes in mechanical properties and silk fibroin molecular weight. Initial results confirm that light (with the UV component excluded) is not necessarily the critical factor causing damage to silk objects. This has implications for the collections management and display of historic silks, leading to a reassessment of the most appropriate environmental parameters for the preservation of silk objects.
Poster papers

New Zealand alpaca fibre diameter: 1998-2007

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A large sub-set of fibre diameter measurements from the New Zealand alpaca flock (~5798 test results over the ten years (1998-2007)) was examined. The results show that fibre mean diameter decreased, was similar to that reported for Australian-grown fibre, and was finer than that reported in 2000 for fibre from a New Zealand test flock. Fibre over 27 µm still accounted for more than a third of fibre for which results were available, and this may be of concern if fibre is destined for next-to-skin end uses. This work updates published information on New Zealand grown alpaca fibre from that of almost 10 years ago.

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References
Using what others toss out to dye wool

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Wool is a complex natural fibre that absorbs moisture, repels water and absorbs dye. Natural dyed wool could provide an ethical wool brand and create market differentiation. An enhanced appreciation of environmental concerns and dye processes provides a foundation for sustainable contemporary design. Today it is widely recognised that the use of less harmful mordants increases both the safety and colour range of natural dyes. This paper presents an alternative approach to textile design colouration, whereby wool was dyed with natural dyes in the context of contemporary concerns for sustainable economic and cultural development. Carefully managed experimentation and light fast testing determined which dye sources were more successful.

The use of natural dyes has regained significance and a revival of interest as increasing worldwide awareness of the pollution resulting from the production and use of some synthetic colorants. Dye plants can/could be renewable resources, unlike the fossil materials, oil and coal used to produce synthetic dyes. Waste products and invasive weeds are other dye sources. Inspiring projects for sustainable and environmentally friendly dyeing have developed throughout the world over the last decades. In France, a Euro research and development project Spindigo investigated the industrial revival of natural dyes and pigments; indigo production has revived in El Salvador and in the Netherlands Rubia Pigmenta Naturalia has focused on madder development, to mention a few (Cardon, 2006).

Textile designers, like other product designers, face many changes in the shift to sustainability. The natural dye approach for wool allows a holistic view from the beginning of the design process aiming to include sustainability in material design, use and aesthetics. Thus function, user needs, durability and environmental impacts and resource use can be considered and addressed. A shift in thinking that embraces variations in dye colour and altering light and wash fastness is required.

As Bruce Sterling claims the large scale production methods today are unsustainable as they use archaic forms of energy that are finite and toxic (Sterling, 2005). The question remains: how does sustainability sit in the fashion and home ware business that prides itself on consumer desire for the new and whether eco-design can match the high levels of style, glamour and excitement the consumer has come to expect. Fast throwaway items at ridiculous prices will not be easy for over 80% of consumers to give up. Sustainable products cannot compete with the economies of scale on offer today, but the market is more ready for wool eco-products than ever before.

References
Sustainable innovations in natural cellulose fibres for art practice

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One of the key innovations in contemporary natural fibre art practice is an increased focus on sustainability from artists, curators and patrons. Some key elements of this move to sustainable art are presented for consideration. This focus extends beyond art that is about the environment or environmental issues to art that is of itself sustainable (Bower, 2008). This means that artists must address the impacts of their materials, the impacts of their art making and exhibiting. The community wants more of this (McCullagh, 2000), but are uncertain about what they are seeking and what artists are providing. Natural fibre art making is well placed to meet this challenge, given that the primary materials and media are naturally derived.

Building a sustainable art practice in natural cellulose fibres requires seasonal collections of fibres, fibres collected from weed species (such as Gomphocarpus fruticosus); acceptable sources of native plants and horticultural or nursery waste (banana trunks).

One of the significant challenges in using primary collected fibres is identification. The bulk of writing on the use of alternate and sustainable natural cellulose fibres has been derived from northern hemisphere sources that have little or no reference to Australian natives or conditions. (Bell, 1980) The challenge exists to extend sources of information on useable fibres to include native Australian plants. Some work has been done regarding the use of fibres for weaving and basketry based on re-collection of indigenous knowledge (West, 1999), but much more could be done for fibre suitable for papermaking.

Processing factors for cellulose fibres are also a key area to be addressed in building more sustainable art practices. Fibre fermentation methods (retting) are chemical and energy free, but not entirely suitable for urban artists and difficult to teach or demonstrate in contemporary settings. Fibre cooking methods are more controlled, but begin to introduce caustic chemicals that raise both work health & safety issues and cooking liquor disposal problems.

Determining fibre suitability for sustainable art works also includes addressing adhesives, pigments and sealers and developing new art practices for certain fibres (pulp painting). There is also a real challenge in promoting the durability of these media. There is a need to raise awareness among contemporary art gallery professionals about the durability of works using natural cellulose fibres.

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Under the microscope — The use of field emission scanning electron microscopy in textile science

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Field Emission Scanning Electron Microscopy (FESEM) is a technique widely used in textile science. Applications include fibre and fabric characterisation and identification, forensic studies of damaged fibres and fabrics, and Energy dispersive x-ray analysis (EDS) of artefacts and paintings.

A number of technological advancements by FESEM manufacturers have made the imaging of textiles easier. The introduction of low voltage FESEM has enabled users to image very delicate and beam sensitive samples successfully.

This poster will introduce some recent textile based projects completed at the OCEM in which FESEM has been used.
Blunt force impact and laundering of fabric for forensic evidence

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Blunt force assault is a global problem and in many cases the assault victim will be wearing clothing, yet the use of clothing as a form of forensic evidence in these cases appears to have been, in some ways, overlooked. There is little evidence in the literature of any rigorous scientific research into what evidence clothing, itself, may hold in such situations.

The aims of this research are to establish i) if a recognisable pattern of damage is caused by blunt weapons in clothing, ii) a chronology of the fabric degradation process according to different mechanisms of degradation, and iii) whether evidence in clothing will be preserved or destroyed under different environmental conditions over time.

A 100 % cotton, single jersey knit fabric (t-shirts are commonly made from) was impacted using a circular impactor (representative of a hammer head) to investigate if recognisable fabric damage was observed. A guided free-fall impact rig was used and force transmitted through the specimens (n=5) was measured. Laundering and impacting was completed cumulatively to establish the effects of impact damage on new, stable and aged fabric, and the effects of subsequent laundering on impacted specimens. Five sets of six laundering cycles were completed. Statistical, photographic and microscopic (optical, SEM) techniques were used to analyse the resulting fabric changes and damage.
Modified leaves for garment manufacture: A 19th century Māori cloak made from the leaves of the mountain daisy Celmisia (tikumu)

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This poster presents a rare, and perhaps unique, Māori rain cloak made from the leaves of the mountain daisy, Celmisia (tikumu) and fibres of Phormium tenax. It was donated to the Economic Botany Collection (EBC), Royal Botanic Gardens, Kew, UK in 1858 by Walter Mantell (1820-1895), who worked as a land surveyor and land purchaser on the South Island of New Zealand on behalf of the British government (1848-1855). The EBC accession number is: 51440. Conservation of the cloak formed the subject of recent MA research at the Textile Conservation Centre, UK (Dovgan Nurse 2008). The cloak was displayed until 1993 in the former Museum at Kew (Desmond 2007), with the primary aim of demonstrating the uses of the daisy family (Compositae); its significance as taonga Māori was explored in this research. The conservation of this cloak may provide a way for communities in the UK and New Zealand to share the cloak in new ways, perhaps serving as an example of the decolonisation of collections and conservation (Sully, 2007).

The cloak exhibits unusual ageing properties: although more than 150 years old, the Celmisia leaves feel soft, pliable and suede-like to the touch. Characterisation of the cloak’s technology and condition formed one aspect of the MA research and the poster illustrates the way the leaves have been modified. Unlike some of the fibres that are extracted from plants and are part of either phloem, sclerenchyma or xylem cells of the plant tissues, the leaves of Celmisia in this cloak were used in a near intact state, which probably contributed to the cloak’s functionality as waterproof garment. Processing of the leaves was restricted to cutting out of the midrib, and removal of the upper layers of the epidermis on the uppermost side. It is likely that this modification of the leaves prior to weaving contributed to the pliable fibre-like qualities suitable for twining, and to the cloak’s preservation. It is hoped that the poster will facilitate further research and discussion of Celmisia artefacts in museum collections and inspire textile practitioners to experiment with the techniques illustrated.

References
Artefacts from the Island of Malekula: Conservation of an organic fibre paste used to create ceremonial objects

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Objects from Malekula, an island in the archipelago of Vanuatu in the south Pacific, are part of the significant Melanesian collection held by the Rautenstrauch-Joest Museum in Cologne, Germany. This particular collection differs from others due to the modelling paste used to create the puppets, masks and life size totem figures. Due to the size and fragility of this particular collection, most of the objects are in storage and are inaccessible by the public or researchers.

The Museum was looking for conservation guidelines to preserve this collection. Information about materials and construction of those unique objects has been published by a small group of anthropologists. No published conservation literature relating to treatment or analyses of the fibre paste was available. The research was divided into three tasks: I) compiling a list of plant materials, pigments and binders as possible ingredients ii) contacting conservation departments for information about unpublished research and treatment reports and iii) identifying original ingredients.

Information available was limited and previous treatments relied purely on materials described by anthropologists (Speiser, 1913; Deacon, 1934; Girard, 1957) to create this paste. No analyses of the paste have been undertaken previously. Written communication with conservators concluded it was difficult to find appropriate adhesives and consolidants without causing unacceptable change to the surface appearance of the paste.

Analyses of the paste did not identify the materials described by anthropologists as being the original ingredients. Testing the paste did not confirm presence of oils, tree saps or inorganic components. These findings have opened up new approaches and treatment options. Conservation materials and application techniques have already been successfully applied to one mask in the collection. Results are unpublished.

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References
**New directions — Artist statement**

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My recent work is the result of a two year project undertaken in the Master of Fine Arts Degree programme with the Textiles section of the School of art at Te Kura Matatini ki Otago / Otago Polytechnic.

In this work I have focused on the translation of traditional off-loom hand woven garments, into a contemporary art practice in floor loom and computer-aided loom weaving of kakahu [cloaks] using whitau [flax fibre].

The unique qualities of the harakeke [phormium tenax] fuelled my desire to experiment and to push the possibilities of the fibre even further using western technology.

I refer to this fibre as Te Aho Ora—the thread of life.

Not only has Te Aho Ora clothed our people for generations, it has been instrumental through its form in maintaining the adaptability and preservation of our art and our people.

"Tihei Aho Ora"

My Māori art viewpoint is paramount in my work as I look to my culture for inspiration and sophistication. Traditionally, on-loom weaving requires continuous spun threads to weave a body of work. I need to develop my own technique to use individual strands of whitau on loom. A stick and rubber band technique, a version of “number eight wire” technology was the key to success.

In addition to my on-loom weaving of cloaks I have translated the traditional tāniko, finger weaving, technique into computer-aided loom weaving using whitau to adorn loom-woven kaitaka. [A specific type of tāniko-bordered cloak].

One of my contribution to the art of weaving is in the development of innovative techniques of weaving kakahu on floor looms and computer-aided looms.
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