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TEXTILE CONSERVATION NEWSLETTER

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Disclaimer

Articles in the Textile Conservation Newsletter are not intended as complete treatments of the subjects but rather notes published for the purpose of general interest. Affiliation with the Textile Conservation Newsletter does not imply professional endorsement.

The Textile Conservation Newsletter, published twice yearly is a forum for textile and costume news from around the world. Submissions related to textile conservation, history, technology and analysis, information regarding recent publications, supplies and equipment, health and safety, employment opportunities and upcoming courses, conferences and exhibitions are invited. They should be typed and, if possible, accompanied by a disk using IBM Wordperfect 4.2, 5.0, 5.1, Microsoft Word or ASCII formats.

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FROM THE EDITORS

I read with great interest John Slavin's letter "Rome is Burning" in the September 1999 Bulletin (Vol. 24 No. 3) of the Canadian Association for Conservation of Cultural Property (CAC). In it he describes the precarious state of conservation in the Toronto area and calls for Canadian professional organizations to lobby the government on the behalf of the conservation profession. I'd like to take that a step further and suggest that conservators everywhere support our colleagues by writing or calling the Heritage Minister (Sheila Copps) and/or their local MP to protest the continued "streamlining" of conservators in cultural institutions in this country. Please read John Slavin's letter, he is very clear about the situation, a situation that is evident throughout Canada.

The Spring '2000 issue of the TCN could be the last issue to be published as we have yet to be contacted by a willing new editorial team. If that proves true, back issues and Supplements will remain available for a further six months, until September 2000, after which point the TCN will be archived. Perhaps this is the natural life cycle of the TCN, after all, when it was started, we did not have the immediate access provided by computer technology. Ah well...

It's been fun.

Helen Holt
Editor



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Preservation Issues Concerning Contemporary Costume

The Costume Institute has been actively acquiring contemporary costume at a voracious rate. Recent large donations such as the Giorgio di Sant'Angelo Archive of 1,190 pieces and numerous garments from the Todd Oldham collection, have presented a major contribution to the contemporary segment of our collection.

Recent exhibitions at the Costume Institute such as Haute Couture, Versace, and Christian Dior have also focused on contemporary designers. Our upcoming show "Rock Style" is already presenting a wide range of diverse and problematic materials. Examples range from a leather jacket worn by Alice Cooper covered in rusty protruding nails, to a David Bowie pair of wings constructed of polyurethane foam and delaminating metal with Mylar. These shows have highlighted many issues that are now challenging conservators not only because of the use of new materials, unusual coatings and sophisticated alloys but the current philosophy that "fashion is all about the Moment" and that deterioration is hip.

Today, anything and everything may be incorporated into a fashion garment. Designers are no longer restricted to 'traditional' materials; they might incorporate paint, rubber, plastic, holograms, Mylar, metallic mesh or electronic components. This experimentation with materials has coincided with technological advances in the textile industry with experimental clothing further pushing the structural possibilities of materials. Has the use of so many diverse materials changed our perception of what art is and whether or not we need to preserve it?

In February of 1998 the Costume Institute hosted "Care and Preservation of Modern Materials in Costume Collections". This symposium provided a forum for curators, scientists, designers and conservators to discuss issues of treatment and preservation of these modern materials.

The following is an outline of a few of the issues encountered with in the conservation of contemporary fashion.

1.1 FASHION ISSUES

Fashion defines the moment and is constantly in transition, made up of sequential diverse phases, "the techno look...the grunge look...the punk look". Many of these garments are composed of ephemeral elements riddled with inherent vice and were never intended for long-term use. Often costumes are prepared for runway shows without any intention of being produced commercially. As one designer explained to me, "It just has to get down the runway."

This one of a kind, "for the moment" item is increasingly ending up in designer archives or collections around the world. An example of this problem was a Romeo Giglio glass ball outfit that was exhibited at the Costume Institute. The garment was decorated with strings of hand-blown Venetian glass balls overall. As you might expect it arrived with a number of the glass elements broken. The balls were adhered back together in a time consuming process by an objects conservator here at the Metropolitan Museum of Art. Further difficulties were encountered when the costume had to be dressed and undressed on a mannequin and transported for installation in the gallery. Each string of glass balls was individually wrapped in bubble pack in order to prevent further breakage when installing the costume.

Unusual materials, some of which are unstable, are being included in collections across the country. Do we have an obligation to the future to provide a comprehensive record of 20th century fashion even if the costume was not intended for longevity? Will the work produced by contemporary designers be around for the future to understand and appreciate?

1.2 Artificial decoration of fashion

Another issue for conservators to consider is the “intentional deterioration” of garments. This is the moment of “Anti-Fashion” fashion looking for the imperfect as a rejection of past values.

Some designers will intentionally degrade a garment to make it appear old or used, called “special effects”. I was amazed when I spoke to a person who actually does this for a living for some of the most prestigious fashion houses in Europe. I learned that techniques can range from wiping the floor with the materials to achieve that lived in look, burning the fabric to give it that “singed appearance”, or using an over-the-counter stomach remedy to fade fabrics. Tulle is shredded and rewoven. One well-known American designer was trying to achieve the degraded look for a line of beaded gowns. Unable to find suitable old beads at the flea market, she had new beads intentionally degraded by soaking them in Draino. Unfortunately her seamstresses were less than happy since the beads had not been thoroughly rinsed after the “artificial degradation” process and several seamstresses sustained burns to their hands from the alkaline lye content in Draino.

What’s a conservator to do when the artifact is already chemically or mechanically deteriorated before it even appears in a collection?

1.3 Popular culture hero worship

Conservators also have to deal with garments that have become “icon” pieces due to their association with famous people. Recent interest in clothing worn by the late Princess Diana, the Duke and Duchess of Windsor, rock ‘n roll personalities or movie stars has created quite a considerable market and interest in the preservation of this type of material. I routinely receive calls from Hard Rock Café, Planet Hollywood or movie stars who are seeking conservation advice. There seems to be this mistaken idea that we can make pieces look new again!

1.4 Living designer

Designers have been realizing the importance of their earlier work and establishing archives. Retrospective exhibitions by Givenchy, Scassi or Valentino have provoked a closer examination of garments that may have been stored under less than ideal conditions for the past 50 years.

Of course everyone wants the costumes to look “fresh” and as pristine as possible. Designers often ask that we renovate and make these pieces look new again. Improvements that I have been asked to do include removing panels, shortening skirts, or other major renovations. I have learned to be diplomatic and explain that these garments are now accessioned pieces in a museum. We do not interfere with the historic integrity of the piece.

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Designers are becoming increasingly interested in preservation issues. A number of design houses also purchase vintage costume as inspiration for new collections. When I began to discuss issues of deterioration and preservation with various designers I was interested to hear their perspective on the problem. Generally they wished to express their artistic vision by experimentation with materials and techniques and were not interested in long term care and preservation. That was until they started examining their archives and discovering problems. Therein lies the dichotomy: on the one hand they want artistic freedom, but yet they expect that when the garment is retrieved 20 years later that it will not be deteriorated.

2.1 COLLECTION COMPOSITION AND POLICIES

Complex is perhaps the word that best describes modern objects. Engineered textiles combine fabric with glass, metal or carbon to produce lightweight hybrids with incredible properties. Sophisticated finishes, such as silicone coatings and holographic laminates, transform colour, texture and even form.

Many of the objects contain a substantial plastic component. These multi-layered artifacts are now in museums and private collections that represent a new field for the conservator, one in which research is just beginning.

How do we choose what to save? Who makes the choices? And how do we save what we have chosen?

Conservators are expected to stabilize and conserve artifacts from all periods in history. We have concentrated on studying past technologies and only recently devoted time to modern materials.

Conservators have to cope with these objects using an ethical code conceived with more traditional artifacts in mind.

Although modern materials are generally perceived as being more stable than traditional substances, nothing could be farther from the truth. Many 20th century artifacts are unstable and present new problems to conservators, such as "polymer degradation". Plastics can vary widely in their reaction to factors such as heat, light, cleaning agents and other environmental conditions, and can affect each other.

2.2 Rubber

Problem areas of the collection include numerous examples of rubber that have lost their elasticity, become dry and brittle and crumbling to the touch. Rubber components on boots, corsets and undergarments have lost their elasticity.

Later on we see rubberized coatings on garments popular in outerwear during the 1960-70's. One rubberized Givenchy suit is now able to defy nature by standing upright on its own and is given a wide berth due to the exuding obnoxious odours.

2.3 Unvulcanized Latex Rubber

During the MMA Costume Institute exhibition "Bloom" we were forced to explore the problems of contemporary garments constructed of inherently unstable materials such as unvulcanized rubber. The process called vulcanization was introduced in 1843 and involved heating the rubber with sulphur

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in order to harden it or cross-link it. In his experimentation of this media, designer Koji Tatsuno chose not to cross-link the latex for artistic reasons. Since the latex rubber that he used for the construction of these garments was not cross-linked it could take any new shape.

The instability of unvulcanized latex rubber is further enhanced by light. There is sufficient energy in light to cause thermal oxidation at room temperature. The rubber would revert back to its natural flow properties, becoming sticky and gooey, crispy and brittle. We sought advice from the designer for handling these fragile garments. His recommendation to use talc only removed some of the tackiness but did not stop the process of deterioration. Only by slowing down the rate of oxidation will the garments be less crispy or sticky.

The deterioration of the Koji Tatsuno latex rubber dresses embedded with real leaves and flowers prompted a week-long consultation with Scott Williams, a conservation scientist at the Canadian Conservation Institute (CCI). The prognosis for these pieces was poor due to the extreme instability of the material. If anti-oxidants had been added to the rubber mix at the time of manufacture the latex would be more stable. Based on Scott's recommendations, sections of Teflon coated fibreglass were inserted between the layers of rubber to prevent further adherence of the rubber to itself. Scott's advice was to get the artist (Tatsuno) to add a cross-linking agent to the latex in order for this not to happen again.

2.4 Polyurethane

Another segment of the collection that is being examined is those artifacts composed of polyurethane. This applies to a diverse range of materials that could include fibres, adhesives and consolidants. We see the use of polyurethane foams in bonded and leather look fabrics. It was used in various forms as a material popular with fibre artists during the 1960-1970's.

Degraded artifacts composed of polyurethane are often in terrible condition, many outgassing volatiles with degradation in the form of stickiness, discolouration and delamination. We have de-accessioned a number of these artifacts, which are now used for teaching.

3.1 ADDRESSING COLLECTIONS ISSUES

Since many of the issues with contemporary fashion revolved around plastic and rubber, we called in Scott Williams, (Conservation Scientist, CCI) to consult on our 20th century collection at the Costume Institute. He worked with us to evaluate the potential problems associated with these materials.

Our brainstorming session allowed us to:

- Identify our problems.
- Establish simple methods of identification of different plastics and other materials (i.e. diphenylamine and beilstein tests).
- Outline guidelines for their treatment and storage.

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- Made us reassess our collection policy regarding certain materials.
- Removal of pieces that were inherently unstable to the Room of Doom.
- Initiate a long-range plan for identification, segregation, or removal of harmful materials.
- In order to supplement information on our holdings of degrading contemporary costume, we are documenting these pieces with pertinent fashion videos or photographs that exhibit the clothing's original design.

Research included a field trip to the Issey Miyake showroom. We were able to examine that year's current collection of holographic and iridescent materials and discuss their care and handling properties with representatives of the designer.

We also spent time examining what was available at fabric stores and purchased a selection of current materials that Scott could use as resource material to sample.

3.2 Identification Techniques

Scott spent several days examining artifacts at the Costume Institute using the portable FTIR (Fourier Transform-Infrared Radiation Spectrometer). This instrument permitted a fast and precise identification of the components in the objects and possible cause of degradation.

The Costume Institute houses a superb collection of costumes from the designer Schaparelli. Known as a very innovative designer her garments were embellished with unusual buttons, sequins and other ornamentation. Since the flammable characteristics of cellulose nitrate were well known at that time, the 1930's, we were expecting to find most of her ornaments to be fashioned from cellulose acetate. With FTIR, we were able to examine a comprehensive range of her costumes and were rather surprised to find that many of the decorations of the jackets were composed of cellulose nitrate.

Fortunately most of the pieces appear to be in very good condition without signs of deterioration of these elements. Information gathered by our tests will be added to the card catalogue entry on each costume.

3.3 Cellulose Nitrate Project

An ongoing project that resulted from our session with Scott was the identification and assessment of the cellulose nitrate in our collection. Semi-synthetics such as cellulose nitrate have been around since the mid 19th century. This material had a diverse range of applications: everything from collar and bodice stays, fan and parasol handles, purses, ornaments for hats and clothing, sequins, jewelry, buttons, and coatings on fabrics and mannequins.

We have located artifacts in the collection that have shown characteristic signs of cellulose nitrate degradation. Deterioration includes embrittlement, sweating, crazing, crizzling,

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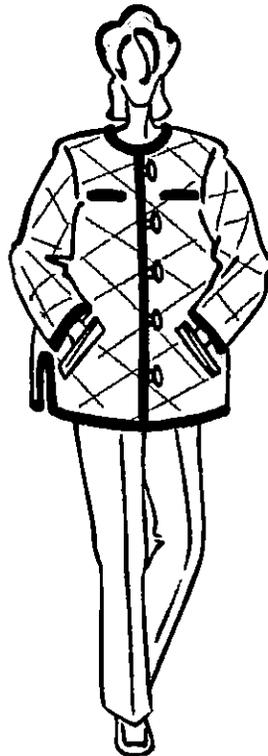
discolouration or sugaring. Since cellulose nitrate is a very flammable material it must be isolated from heat and ignition sources and constantly monitored.

We have been systematically working our way throughout our collection of 70,000 artifacts to first identify the cellulose nitrate material, segregate it, and then isolate the deteriorating pieces. We began with the artifacts that contained the largest volume of this type of material such as fans, haircombs and purses.

CONCLUSION

Addressing these issues has impacted our collection policy. Now, when we look at potential acquisitions we are better able to determine possible future problems and their impact on the collection. We are certainly more selective in what we acquire. As we continue to work our way through the collection with the cellulose nitrate project, segregation and removal is ongoing. The final solution for artifacts that have completely disintegrated is de-accessioning.

*Chris Paulocik, Conservator
Costume Institute
Metropolitan Museum of Art*



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Speculation on The Effect of Gunshot or Explosive Residue on Silk

Introduction

This paper was originally presented on November 3, 1989 as an informal lecture at a one day working session on Weighted Silk Research at the Conservation Analytical Laboratory (now the Smithsonian Center for Materials Research and Education). The discussion centered around the effects of gunpowder (explosives) residue on historic silk flags used on battlefields. This lecture was intended to provide background material and speculation on effects of this phenomenon.

Black Powder and Its Residues

Black powder was introduced into Western Europe around the 13th century and was used in military applications from the 14th century. It was the universally used explosive until about 1870 being in part replaced by nitroglycerin and/or nitrocellulose in various forms. Black powder is still used in large quantities even today.

Other propellants and explosives were developed in the 19th century, cellulose nitrate (guncotton) was introduced by Schultze in 1864 and dynamite (nitroglycerin based) by Nobel in 1867.

Black powder is a mechanical mixture of potassium nitrate, charcoal and sulfur. There are many formulas for this mixture but in general they fall into the following weight ranges:

potassium nitrate	70 - 80%
sulfur	5 - 18%
charcoal	9 - 19%

Sodium nitrate was used in some formulations as an explosive in mining.

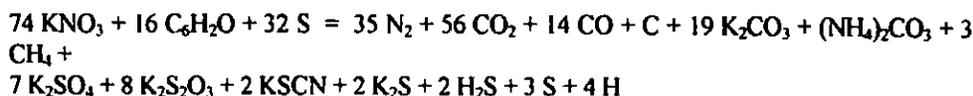
By the mid-19th century the "ideal" composition was potassium nitrate, 74.9%, sulfur, 11.8%, and charcoal, 13.3% [Watts, 1875]. The volume of gas produced by this mixture was 296 times that of the unexploded powder. British Government powder in the early 19th century was composed of potassium nitrate, 75%, sulfur, 10%, and charcoal, 15% [Braddock, 1832].

Black powder was used in propelling projectiles from both small arms and cannons and mortars. It was used as well in rockets, handgrenades and in bombs.

On detonation the black powder mixture produces about 45% gaseous products with the remainder as solids in the barrel of the weapon or as particulates in the air. The bulk of the gases are carbon dioxide, carbon monoxide and nitrogen with some hydrogen, methane, water and hydrogen sulfide as minor constituents. It should be noted that charcoal may contain substantial constituents other than carbon. For all varieties of black powder, the largest volume of gas produced is carbon dioxide, followed by nitrogen and then by carbon monoxide.

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A complicated and impressive empirical formula for ignition of black powder is given in the Kirk-Othmer Encyclopedia of Chemical Technology:



The principal solid constituents of black powder residue are:

potassium sulfate	ammonium carbonate
potassium carbonate	carbon
potassium sulfide	
potassium thiocyanate	
potassium thiosulfate	

with some unconverted potassium nitrate, sulfur and charcoal. With moisture and time these residues may be converted to other compounds.

Large amounts of black powder were often used in 19th century combat. In the Napoleonic Wars, at the siege of Ciudad Rodrigo (Jan. 1812) cannons and mortars consumed 74,978 pounds of powder in less than 31 hours. Similarly at Badajos an enormous 228,830 pounds of powder were used. At the first and second sieges of San Sebastian 502,110 pounds of powder were consumed [Scoffern, 1854]. Battlefields were often clouded with these gunpowder particulates which weighed thousands of pounds.

Metal/Metal Ions from Projectiles

Historically lead has been the metal used in projectiles from small arms while iron and steel were used in larger weapons such as artillery and mortars. Copper, nickel, and steel covered lead projectiles are also known. Oxidation of many of these metals along with moisture or liquid water can lead to discoloration at best and decomposition of the fibers at worst.

Heavy metal salts have been used in percussion caps and cartridge primers since the 19th century. Some of the compounds used were:

- antimony sulfide
- barium nitrate
- barium carbonate
- barium peroxide
- calcium silicide
- copper sulfocyanide
- lead sulfocyanide
- lead trinitrorescorinate
- mercury fulminate
- silicon dioxide (as glass)

Early primers also contained potassium chlorate which on detonation produced potassium chloride. The potassium chloride was determined to be a serious source of corrosion in rifle barrels. Other primer constituents were nitrated organics such as picric acid, trinitrotoluene (TNT), gums, and nitrated guanidine compounds. Brass is an integral part of many primers and particles

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of brass are sometimes associated with primer residues. Brass is also commonly found as cartridge cases and brass particles are often ejected from modern autoloading weapons.

Methods of Deposition

Two principal modes of depositing gunshot residues on flags would seem likely.

First, the particles could attach themselves either directly from the force of the weapon's discharge (under 3 ft or so from small arms) or through gravity and wind currents from the atmosphere. Of course, projectiles going through the flag will also leave some residues. Anyone handling the flag with residues on their hands may also transfer that residue to the flag as well. Deposited salts can pick up water with time and attack the fibers or dyes. High humidity or cleaning may activate particles long after deposition.

Second, dissolution or mechanical transfer of gunshot chemical species by rain may affect the condition of the flag. Large amounts of particulates in the air over battlefields has been postulated as the cause of rain following battle. Rain would dissolve or force to earth many particles formed by gunshot and attack the flag with solutions of salts.

Chemical Reactions

Certain reaction products from gun powders can react with moisture and oxygen in the environment to produce further reactive species. For example, nitrogen oxides and moisture can produce nitric and nitrous acids. Thiosulfate ion can react in an acid environment to produce sulfur or other sulfur oxides. Moisture or water complicates the issue further.

Reaction products known to attack silks:

- nitrous and nitric acids
- sulfate ion
- hydroxide ion (alkali medium)
- formaldehyde
- heavy metal ions (lead, mercury, copper etc.)

Reaction products which can react with dyes:

- nitrous and nitric acids
- sulfur dioxide, sulfurous acid
- formaldehyde
- potassium salts, nitrate, thiocyanate, sulfide, nitrite etc.

Examination of Flags

Non-destructive evaluation of residues on textiles can be done in several ways. Infrared imaging will show many types of residues and x-ray photography can also show many of the denser residues. Visual examination at 5X to 50X can disclose most residues but will certainly be quite tedious on an object the size of a flag. There are also several wet chemical techniques which are probably not suitable for historic objects. The forensic literature contains a considerable number of papers on the subject of gunshot residues (see *Journal of Forensic Sciences*, *Forensic Science International*, etc).

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The Textile Conservation Centre The Diploma in Textile Conservation

ABSTRACTS: 1999 GRADUATES

Students in the final year of the three year postgraduate Diploma in Textile Conservation offered by the Textile Conservation Centre in affiliation with the Courtauld Institute of Art undertake two twelve month projects. One is an object-based project, which addresses a complex conservation problem requiring research and careful strategic problem solving before an appropriate implementation can be implemented within the required time. The other is an investigative research project, which may address any aspect of conservation theory or practice, interventive or preventive as well as exploring broader issues of collection care and conservation ethics.

The 1999 projects covered a wide range of issues and textiles. Two projects deal with the understanding of textiles themselves and our approaches to them as conservators. Documentation as a way of codifying information about artifacts and as a means of improving communication and comprehension between conservators, curators and other researchers is critical. Helen Bacchus' metal threads research project and Marilyn Leader's exploration of different approaches to weave analysis both emphasize effective communication in order to enrich and deepen shared knowledge and understanding between different groups of specialists involved in interpreting and preserving textiles.

Three projects explored various approaches to cleaning. Martina Krüger's work focused on the special cleaning requirements of wet archaeological textiles. Flora Nuttgens investigated the use of poultices with a particular emphasis on the problem of ringing. Howard Sutcliffe evaluated the potential of lasers for cleaning historic textiles.

Preventive conservation and collection care in the widest sense were the basis for both Sylvie François' and Elisabet Cerdà i Durà's projects. Elisabet Cerdà i Durà investigated the environmental conditions of three groups of tapestries in non-museum environments while Sylvie François explored the issues involved in the transformation of circus costume from 'working' pieces to becoming a defined collection in a theatrical company.

The seven textiles conserved for the Object Treatment projects span almost the entire millennium and include domestic, religious and political textiles. The earliest pieces are two Coptic fragments, one a tapestry-woven piece depicting scenes from the life of Joseph and the other, possibly part of a shroud, has a pile border. The most recent piece was a 1970's rubberised and PVC Airline bag presenting all the complex problems associated with the degradation of modern materials. The highly degraded English 17th century embroidered box required research into a wide range of materials. The musette, an early variety of type of French bagpipe with a decorative silk velvet top, was a fashionable accessory as well as a musical instrument. The rare embroidered Chinese thangka was originally used for private meditation and conservation needed to be sensitive to the change in context from private religious context to museum. The two starched cloth banners from the Suffragist movement required conservation for use in an archive rather than a museum. This variety of function, type and materials is a vivid demonstration of the complexity and range of the theoretical and practical problems faced by textile conservators.

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In order to develop our activities in both post-graduate conservation education and training and conservation services, including both tapestry and upholstery conservation, the Textile Conservation Centre merged with the University of Southampton in 1998. The Centre retains its own identity and will continue to offer both educational programmes and textile conservation services. Two new MA programmes will be offered: the two year MA in Textile Conservation and the one year MA Museum Studies: Culture Collections & Communication as well as MPhil/PhD opportunities.

The Centre is moving to a new purpose-designed building on the University's Winchester campus. Winchester is a cathedral city within easy reach of London so we are easily accessible by road, rail and air.

From 1 August 1999 our address will be:

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Winchester
Hants S023 8DL

Tel: 02380 597100
Fax: 02380 597101

The reports may be consulted in the Karen Finch Collection, the University of Southampton Library on the Winchester campus. Please contact Mary Brooks for further information on the MA and MPhil/PhD programmes and to make appointments to visit the library.

ABSTRACTS

ELISABET CERDÀ I DURÀ

Investigation Project:

The effect of environmental conditions on three tapestry collections in Catalonia, Spain

The effect of environmental conditions on three Catalan tapestry collections, containing 34 tapestries, in the *Monestir de Montserrat*, *Catedral de Girona* and *Castell de Peralada*, all of them in Catalonia, Spain, is investigated. The custodians of the tapestries do not have specialised conservation knowledge. Only two of the tapestries have environmental control, the rest are located in public places without climate control. The project includes written and graphic documentation, graphs of temperature, relative humidity and light levels recorded at the three collections and suggests a series of recommendations to reduce the likelihood of further damage, both environmental and physical.

Object Treatment Project:

Conservation strategy for an English 17th century raised work box, the 'Mercy Jewel Cabinet' (TCC 2181.1; Private Client)

The conservation strategy determined for the '*Mercy Jewel Cabinet*' belonging to a Church

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in Northampton is described. The cabinet is made of wood, lined with paper and is covered with what are now very degraded silk satin raised work panels. A detached door from the cabinet was used for a pilot study to determine the treatment for the cabinet. The panels were not removed for treatment, because of their brittleness. They were treated in-situ; patches of painted Japanese paper were inserted behind areas of loss and adhered with Klucel G (hydroxypropyl cellulose). Recommended preventive conservation measures include the display of the cabinet in a custom made Perspex (polymethyl methacrylate sheet) case.

HELEN BACCHUS

Investigation Project:

Developing guidelines for the documentation, characterization and analysis of metal threads

Guidelines developed for textile conservators to document, characterize and analyze metal threads found on historic artefacts are described. Metal threads can consist of metal(s), organic substrates (paper, parchment/vellum, gut or leather) and fibre(s). Their examination requires an inter-disciplinary approach. A literature review, field-testing and analysis of a range of metal threads helped the author to develop illustrated guidelines and a user-friendly Metal Threads Sample Reference Collection (MTSRC). The MTSRC includes samples of metal threads, cross-sections, organic substrates and permanent slides and is available for reference, comparison and analysis. Issues of classification and terminology are discussed as they relate to developing computerized documentation.

Object Treatment Project:

From private meditation to public access: the conservation of a rare Chinese embroidered thangka (TCC 2495; Victoria and Albert Museum)

The conservation of a rare 18th century Chinese thangka, one of only three embroidered thangkas belonging to the Victoria and Albert Museum. The thangka represents a significant stage in the history of Buddhist iconography. The conservation strategy aimed to balance the conflicting objectives of preservation and access; ensuring long-term preservation; respecting the thangka's traditional function and facilitating access for study in the museum context. The combined adhered (Klucel G, hydroxypropyl cellulose, with IMS through Gore-tex) and stitched support treatment on the damaged upper border is evaluated. The thangka was returned to partially rolled (traditional) storage for use during study.

SYLVIE FRANÇOIS

Investigation project:

Issues in conserving a stage costume collection within a non-museum environment: A Canadian case history

A Canadian theatrical company is used as a case study to discuss the suitability of textile conservation principles for a non-museum collection. The report examines the ethical and practical concerns involved in the collection management of corporate products. A literature search on costume design is used to explore the changing nature of stage costumes becoming artifacts. A selective survey of other Canadian theatrical institutions provides comparison of the role and organization of existing costume stocks. The needs and the structure of the company are examined in order to suggest a preservation strategy. Its application to

other theatrical companies is evaluated.

Object treatment project:

Dressed to impress: the treatment of an incomplete French musette (TCC 2494; Horniman Museum)

Contextual research helped to interpret radiographs of a reformed and fragile 18thC (?) musette (French bagpipe). The silk velvet top cover, which was found to be detachable, was removed from the instrument. The cotton first cover was found to be a rare feature amongst the existing musettes surveyed. The fragmentary top cover was stabilized and re-shaped using a stitched support and nylon net overlay. Preventive conservation was implemented for the cloth covered inner bag containing the stocks. The musette's role as study piece provided the opportunity to store and display the inner bag and its silver lace decorated velvet cover side by side.

MARTINA KRÜGER

Investigation project:

**Evaluating the use of organic solvents on wet archaeological textiles.
A preliminary investigation**

This investigation evaluated the use of organic solvents for cleaning and drying wet archaeological textiles. The problem of miscibility of water with semi-polar and non-polar solvents is discussed, as are the effects of solvents on degraded proteinaceous fibres. Experiments carried out on excavated artefacts from fresh water sites showed that cleaning with water might be more effective than with organic solvents. Drying appeared to be more effective with solvents than water in avoiding flattening and shrinking of the textiles. A combination of wet cleaning and solvent drying proved effective.

Object treatment project:

Scenes from the life of Joseph. The solvent cleaning and pressure mounting of a tapestry panel from an Egyptian burial (TCC 2535:1; Whitworth Art Gallery, Manchester)

The decorative tapestry panel dating to the late 7th/8thC AD and stitched to the remains of a woolen burial garment, was soiled with body fluids which disguised its design. Solvent cleaning was undertaken in two steps: immersion in IMS followed by spot cleaning with ammonium hydroxide. The object was mounted behind Perspex™ on a padded Hexlite™ board with wood inserts along the edges.

The date of the object was confirmed by dye analysis, which revealed the use of red insect dye. FT-IR microspectroscopy confirmed that the soiling was body decomposition products.

MARILYN LEADER

Investigation project:

Weaving is a language: the identification, analysis and documentation of woven textiles

This report details the investigation of the processes and problems encountered when ana-

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lyzing woven fabric structures, in order to produce a set of recommendations for a pilot guide to weave analysis appropriate for use by conservators, curators and other scholars. The context, function, methodology and problems of weave analysis are evaluated through responses to a questionnaire and literature survey. Comparative evaluations of the methods of identifying and graphically recording woven textiles are made by focusing on five different weave structures as representative models.

Object treatment project:

Marching on: treating two starched cloth posters, rare documents of the women's suffrage movement, for an archive (TCC 2258.01 & 2258.02; Fawcett Library)

The report explains the conservation strategy developed for two starched cotton posters made for a suffrage demonstration in 1911. These are now in the Fawcett Library archive, the national research library of women's history. Research revealed that the use of starched cotton as a base for signwriting is unusual. Characterization of the white paint used in the outlining of the letters was consistent with the 1911 dating. UV illumination revealed over-painting. The starch finish, wood battens and metal tacks influenced both humidification and a support treatment, using silk crepe-line patches spray-coated with a mixture of Lascaux 360HV/486HV adhesive.

FLORA NUTTGENS

Investigation project:

An evaluation of the potential of high-concentration Laponite poultices to prevent ringing in localized cleaning of historic textiles

This investigation explores the potential of poultices to prevent the ringing (tidemarking) caused by uncontrolled movement of liquid cleaning agents in localized cleaning treatments. A literature survey revealed that other textile conservators had found poulticing to be ineffective at preventing ringing. However, previous research and personal experience suggested that very high ratios of absorbent to liquid might provide sufficient control to prevent ringing. Tests using high-concentration Laponite poultices to remove ink stains from new linen showed that, with further testing, this method could be developed into an effective alternative to vacuum suction for controlled localized cleaning.

Object treatment project:

Deteriorating rubber and PVC: the characterization and conservation of a World Airways flight bag c. 1970 (TCC 2182; private client)

This project concerns the conservation of a World Airways flight bag, c. 1970, made of rubberized fabric with PVC trimmings and a metal zip. The techniques used to identify 'modern' materials are discussed. Failed experiments to soften and reshape the crushed and stiffened rubberized fabric with heat and organic solvents, and eventual mechanical reshaping of the bag are described. The cracked rubber backing was consolidated with adhesive-coated fabric patches, using a vacuum suction table to anchor the rubber while heat-sealing the adhesive. The storage system incorporating zeolites to inhibit degradation is discussed.

HOWARD SUTCLIFFE

Investigation project:

An initial investigation into the cleaning of historic textiles using laser radiation

The basic principles of laser radiation are presented before recent development in the laser cleaning of organic materials is discussed. The physical and chemical effects of exposure to infrared (1064nm), visible green (532nm) and ultraviolet (266nm) radiation on both new and naturally aged cotton, wool and silk textiles are investigated. The effectiveness of laser cleaning is tested using artificially soiled cotton and wool test fabrics and evaluated in comparison with three more traditional textile conservation cleaning methods. Time, cost and health and safety considerations are raised. Finally, key areas of further investigation are identified.

Object treatment project:

Recovering history: the characterization and conservation of a 'Coptic' tapestry cover with pile border (a study of the use of alpha-amylase enzymes) (TCC 2170.2; Fitzwilliam Museum, Cambridge)

Remedial conservation was undertaken on a 'Coptic' tapestry with a pile border. The cover was structurally weak, creased and heavily soiled. It had been stitched and in places adhered to a linen backing fabric using a starch adhesive. Removal of the backing fabric was necessary to facilitate the effective support of the cover. Tests with an a-amylase enzyme were carried out to determine treatment parameters. The backing fabric and starch residues were removed by immersion in a-amylase solution. The cover was supported onto an undyed plain weave linen fabric and mounted onto a padded board for display.

*Mary M. Brooks FIIC
Head of Studies & Research
Textile Conservation Centre*

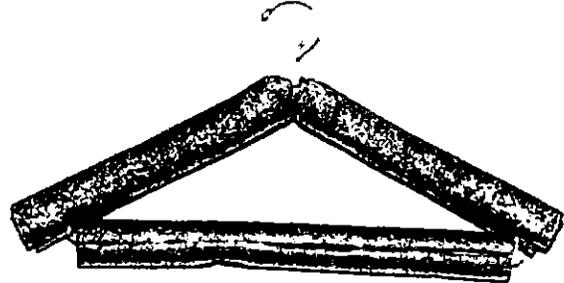
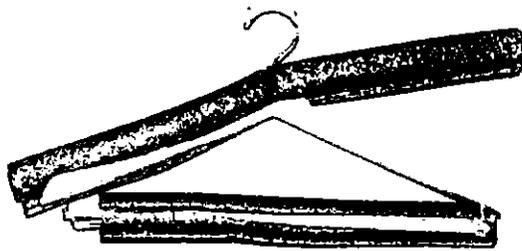
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'Insta' Hangers

The Canadian War Museum (CWM) recently initiated an ambitious project to integrate its backlog of accessioned material being stored in our warehouse into regular collection storage. This backlog comprises 250 pallets stacked one meter high with boxes of artifacts that have been accessioned but not catalogued or stored due to lack of resources. Four contractors have been hired for an 18-month period to handle the unpacking, documentation and storage of these artifacts.

It is estimated that 90% of the backlog material belongs in the Dress and Insignia collections, of which approximately 15,300 are clothing items. Unfortunately it's anyone's guess as to how many will require hanging storage because of changes made to our computer systems over the years. Custom made padded hangers were beyond the budget allocated to this project so we needed to develop a museologically acceptable, but affordable and easily made alternative. We've dubbed it the 'insta' hanger.

Closed cell polyethylene foam tubes (pipe insulation) is cut to the length of the hanger arms, a hole cut at the centre and the tube fitted over the hanger arms. We are using wishbone shaped wood hangers with and without a drop bar for trousers. Although we are currently using insulation for a ½" pipe, the next order will be for tubing for 1" pipe, it provides even greater coverage and padding.



*Helen Holt, Conservator
Dress & Insignia
Canadian War Museum
Ottawa, Ontario*

Workshop Review

Adhesives for Textile and Leather Conservation: Research and Application

In a word - excellent.

The four day workshop took place at the Canadian Conservation Institute, May 4 - 7, 1999 and due to high demand was repeated the following week.

Information on all aspects of the topic were covered including: research developments; preparation, application and removal of backings; case histories; some options for textile mount-making; suction table applications; CCI's investigation into the customizing of a vinyl acetate/ethylene copolymer emulsion; preferred choices for some applications. Each participant went away from the workshop with a very useful resource binder that incorporates samples prepared in the lab, information covered in the lectures, and tables containing the overall evaluation of adhesives for specific applications arrived at through experimentation in the lab sessions. The workshop program offered a good balance between hands-on time, lab demonstrations, and lectures. The workshop attracted numerous international registrants who contributed greatly to the lively discussion during lunch and coffee.

To provide a context, Ela Keyserlingk presented an overview of the adhesives, backing materials and application methods used for textiles and Carole Dignard presented a parallel one for skins and leather. An important point made by both presentations is that not only should the working properties and chemical stability of an adhesive be appropriate for the object being treated, but the application method chosen is equally important for optimal results. Ela cited the article, "Evaluating the Use of Adhesives in Textile Conservation: Part 1: An Overview and Survey of Current Use", published in *The Conservator*, 21 (1997), by L. Hillyer, Z. Tinker, and P. Singer as an excellent resource. Carole provided as a handout, a very comprehensive literature survey of adhesives and backings for skins and leathers.

Jane Down reported on the results to date of CCI research on selected PVAC and acrylic adhesives. What pleased me most about this session was that Jane taught us how to interpret her graphs. When selecting an adhesive for a specific treatment, characteristics can be easily compared for tensile strength, pH, flexibility, yellowing and volatile emissions. In graphs representing stress/strain measurements, tensile strength data refer to the strength of the adhesive film itself, not the bond strength; the elongation of break represents toughness and modulus tells us how flexible, stiff or brittle an adhesive is. If we wanted to select an adhesive that would do well under high stress conditions, the tensile strength graph would indicate that Lascaux 360 HV, for example, would not be a good choice; it has weak tensile strength, a characteristic of contact-sensitive adhesives.

Jane also presented an interesting and fun session on the effects of modifiers on a vinyl acetate/ethylene (VAE) copolymer emulsion adhesive. In the search to find a poly(vinyl acetate) emulsion adhesive that had characteristics suitable for conservation, it was found that the VAE copolymer group showed the best promise. Adhesives like Jade No. 403 and Mowilith DMC2 were found suitable to a degree but were still subject to changes in formulation and possible discontinuation. CCI, therefore, is investigating the feasibility of making available an acceptable additive-free emulsion with separate modifiers so that conservators could make up their own formulations depending on the characteristics required for

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a given application; for example, a thickener could be added to increase viscosity or a humectant to prevent skinning. We tested some prepared formulations and commented on their properties. Testing will continue for several years before an actual product is ready but a project to remain aware of.

CCI research updates were also given by Gregory Young on leather and Season Tse on textiles. Season reported that the experimental work is complete on the effect of deionized water on cellulosic textiles (the results showed no negative effects for cotton and linen), that Jan Vuori is experimenting with bleaching using an ultrasonic mist of sodium borohydride and that one future research project will study the long term effects of heat set adhesives on silk textiles.

Some portion of every day was spent in labs exploring possibilities. On day one we experimented with the preparation of textile backings. A useful technique when brushing out a stock solution onto Tetex or silk crepeline was demonstrated. Spraying the fabric lightly with water prior to brushing out the adhesive ensures that the warp and weft threads stay aligned and that the backing fabric stays in close contact with the release film. Other sessions in the textile lab included application techniques for textile backings and numerous combinations of materials for mounting systems for storage and display. A helpful tip for the final attachment of a backing, after the initial tacking has been completed, is to use a customized cover of Teflon coated fiberglass on the platen of the iron.

For the first three days the lab sessions for leather were spent applying approximately 105 samples of various adhesive and backing combinations to smoked skin, oiled skin and leather using solvent reactivation, heat reactivation or stock solutions. Time was also spent preparing samples using a squeegee and an aluminum sheet with dot-matrix to apply adhesive; we also prepared sausage skins for use.

The last day included time to experiment with the removal of backings and some lab demonstrations. When removing backings it is recommended that mechanical and heat techniques may be the least aggressive and are tried before moving into the use of solvents. To determine the most effective and least damaging technique, try solvent in vapour form before progressing to gels, poultice and brush applications; immersions should be considered last, if at all.

Lab demonstrations for textiles included making a silicone pad as an ironing surface for the final phase of bonding an adhesive backing; it eliminates sheen created by a too firm table surface. A suction table and suction device were used effectively for the removal of adhesives from backings that support voids in textiles. Paint brush bristles can be cut back to control the amount of solvent being introduced.

Other demonstrations were given by Vicki Davis, CCI Librarian, on the Bibliographic Database of the Conservation Information Network, and Greg Young on shrinkage temperature measurements of collagen.

The last session of the workshop was an evaluation of all adhesives for each application used during the workshop. As a group we reported our findings and a consensus was arrived at for the characteristics and possible uses of all the samples we had prepared in the labs. Some of the results for the backing of textiles are as follows: Lascaux 360 HV & 498 HV 1:1 is less tacky and flexible than 360 HV alone and needs more heat to reactivate but produces a stronger bond - a good overall backing adhesive; Clariant T-1460 (replacement

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for Mowilith DMC2) provides a good bond, is stiff, glossy, difficult to reverse and adheres well to dirty surfaces; Lascaux P550-40TB (replacement for Acryloid F-10) is shiny, stays tacky, gives a good nap bond and is suitable for flat textiles; Beva 371 (solution) produces a good bond, requires low but exact heat to reactivate and stays tacky. Jade 403 proved to be a good all-purpose adhesive for preparing mounting systems.

Overall, the workshop provided an invaluable opportunity to learn about the comparative chemical and working properties of adhesives and to experiment with various application methods under the direction of knowledgeable professionals. Speaking personally, I left the workshop feeling less hesitant about purchasing and using adhesives that I had not used previously due to lack of information and the time to experiment. My range of possibilities when determining treatment options has been expanded.

Those who are interested and missed out on attending the May workshops will have the opportunity to attend a repeat performance that is scheduled for September 11-15, 2000. For more information contact Christine Bradley, Client Services Officer, CCI, at (613) 998-3721 ext. 250 or by e-mail at christine_bradley@pch.gc.ca

Candace Sweet (Boyer)
Parks Canada
Halifax, Nova Scotia

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Conservation Combinations

North American Textile Conservation Conference
Textile Symposium 2000
Grove Park Inn, Asheville, North Carolina
March 29-31, 2000

The Second Biennial Symposium of the NATCC will be hosted by the Biltmore House Textile Conservation staff. The meeting will take place at the historic Grove Park Inn, an Arts and Crafts landmark located in the Blue Ridge Mountains of Asheville, North Carolina.

The symposium theme, "Conservation Combinations," will explore collaborations between textile conservators and other professionals. Collaborative projects involve textile conservators and scientists, curators, designers, artists, archeologists, other conservators, etc. Registration information is forthcoming. For more information contact the Textile Conservation Staff, Biltmore House, One North Pack Square, Asheville, NC 28801, USA; (828) 274-6270; Fax: (828) 277-3454; E-mail: pewer@biltmore.com.

Conference Presentations:

Keynote Address: Elizabeth Wayland Barber, "The Mummies of Chinese Turkistan"

- J. Barnett, "Dudok's Town Hall in Hilversum: the reconstruction of the interior textiles"
- D. Blum, S. Reiter, and V. Whelan, "The Ormerod Bedcover: research and treatment"
- N. Buenger, "Wet with Blood: the investigation of Mary Todd Lincoln's cloak"
- I. Calinescu and C. Varnell, "The Resurrection of an American Film Star: the beloved Cowardly Lion"
- B. Cases and A. M. Rojas, "Preventive Conservation: technical recording and making a reproduction of a late Chinchorro infant-mummy"
- J. Eisenberg and H. Irgang, "'Shade of Faith': the conservation of a painted Sukkah interior"
- S. Foskett, "Are Yeez 'appy: the framing and installation of banners for the Museum of Scotland"
- S. François, "Mémoire corporative: strategies in creating a theatrical costume collection while performing arts"
- J. Gardiner, J. Carlson, L. Eaton, and K. Duffy, "'That Fabric Seems Extremely Bright': non-destructive characterization of nineteenth century mineral dyes via XRF analysis"
- R. Hanson, "Melding Eighteenth Century Traditions with Twentieth Century Technologies: crèche crisis culminates in Christmas collaboration"
- K. Kiefer and J. Scheer, "Expanding Conservation Cleaning Options: collaboration with a professional drycleaner"
- S. Mathisen, "Collaborating Over Seas: the textile conservation project at Villa La Pietra"
- Dr. N. Odegaard, M. Jacobs, M. Pool, and T. Braun, "Threads and Treads: woven sandals from the Southwest"
- O. Negnevitsky and T. Schick "Conservation and Study of Four 6000 Year-Old Textiles From the Judean Desert"
- L. Román and A. Gutierrez, "Conservation Treatment of an Eighteenth Century Mexican Feather Costume"
- J. Vuori, D. Daly Hartin, S. Tse, A. Maheaux, and A. Ruggles "Local Stain Removal from Oceania, la Mer by Henri Matisse: the development of a reducing bleach technique using a textile suction disk, ultrasonic mister and airbrush"

Birth Defects Linked to Organic Solvents

C&EN, Mar 29, 1999, p. 6 & J. Am. Med. Soc., 281, 1106 (1991)

Women exposed at work to organic solvents during the first trimester of pregnancy are 13 times more likely to give birth to a baby with major defects, a new study reported in the *Journal of the American Medical S in March*. The exposed women were also more likely to have miscarriages and to give birth to premature babies and babies with low birth weight and fetal distress.

The solvents to which the women were exposed included aliphatic and aromatic hydrocarbons, phenols, trichloroethylene, xylene, vinyl chloride, and acetone, all of which cause birth defects in test animals at high-doses.

Occupation of Women Exposed to Organic Solvents

	# Studied
Factory workers*	37
Lab researcher/technician	21
Graphic designer	16
Paint industry employee	14
Industrial chemist	13
Commercial painter	8
Office worker	4
Car cleaning worker	3
Veterinary technician	3
Orthotic manufacturing worker	2
Mortuary technician	2
Carpenter	1
Social worker	1

* Industries include rubber, paint, cosmetics, automotive.

The study involved 125 pregnant women who were exposed to solvents at work and 125 unexposed women. Each exposed woman was interviewed early in her pregnancy and then matched to a control woman in terms of age, previous births, smoking, and alcohol use. Defects in babies born to these women were tabulated.

In infants born to the exposed women, 13 major and five minor malformations occurred. Babies born to the unexposed women had only one major and one minor defect. Major defects included deafness, clubfoot, neural tube defect, heart abnormalities, spina bifida, and micropenis. Twelve of the major 13 defects occurred in babies born among the 75 women who had acute symptoms associated with their solvent exposures such as eye and respiratory irritation, breathing difficulties and headaches.

The study's lead author, Sohail Khattak of The Hospital for Sick Children in Toronto, says that this study is just a first step toward determining if a problem exists and further research is needed. However, he thinks that "health care professionals...should inform their patients that some types of employment may influence reproductive outcomes," and that "based on our study, if you are not symptomatic, you are probably safe."

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As Predicted: Anthraquinone is a Carcinogen

BNA-OSHR, 29(1), June 2, 1999, pp. 11-12

Since 1991, *ACTS FACTS* has been reporting on the National Toxicology Program's (NTP) investigation of six naturally occurring dye-related chemicals called 'anthraquinones'. As each study has been completed, we have provided readers with the results. Up to now, five of the studies have been completed. In each case, the anthraquinone chemicals were found to be carcinogenic. *

Now the sixth and last study, that of the parent compound, anthraquinone itself, has been completed. As *ACTS FACTS* predicted, anthraquinone is also a carcinogen. It showed clear evidence of carcinogenic activity in female rats and in both sexes of mice in a two-year dietary study. Some evidence of carcinogenic activity also was seen in male rats.

Anthraquinone is used as an intermediate in manufacturing hundreds of dyes and pigments. It is also used as an additive in paper oils, as an accelerator in nickel electroplating, and as a bird repellent. The compound has been identified in outdoor air samples, in diesel engine exhaust, in samples of fly ash from municipal incinerators, and in surface water, tap water and in drinking water from 12 cities in the Great Lakes region.

Artists are not exposed to anthraquinone itself, but to the more complex anthraquinone pigments and dyes. For example, alizarin crimson (1,2-dihydroxyanthraquinone) is commonly used in children's products and labeled 'non-toxic'. Yet, alizarin crimson is almost identical to one of the NTP-studied, proven cancer-causing anthraquinones (1,8-dihydroxyanthraquinone).

Acts is not alone in believing that almost all the anthraquinones will one day be considered carcinogens. Some experts even think that the mechanism by which anthraquinones cause cancer is understood.** Artists would be wise to treat all anthraquinone dyes and pigments as carcinogens and take appropriate precautions.

* These were: 1-amino-2,4-dibromoanthraquinone (CAS No. 81-49-2); 2-aminoanthraquinone (CAS 117-79-3); 1-amino-2-methylanthraquinone (CAS 82-28-0); 1,4,5,8-tetraaminoanthraquinone (CAS 2475-45-8, Disperse Blue 1); and 1,8-dihydroxyanthraquinone (CAS 117-10-2).

** Anthraquinones are chemicals which convert or metabolize to form quinoid structures which in turn can generate free oxygen radicals.

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SUPPLEMENTS

<u>Annotated Bibliography on the Use Adhesives Used in Textile Conservation</u> <i>Jacinthe Moquin, Provincial Museum of Alberta</i>	Spring 1987
<u>Mannequins for the Royal Ontario Museum Gallery</u> <i>Alexandra Palmer, Textile Department, Royal Ontario Museum, 1987</i>	Spring 1988
<u>Warning! Dichlorovos Resin Strip Fumigation</u> <i>Sharon Hammick, Conservation Department, Royal British Museum, 1989</i>	Spring 1989
<u>Recent Trends in Costume and Textile Storage</u> <i>Jaquelin Beaudoin-Ross, McCord Museum of Canadian History, and Eva Burnham, Canadian Conservation Institute, 1990</i>	Spring 1990
<u>The Effects of Substrate Variation on Colorimetry Readings</u> <i>Leslie K. Redman, Canadian Museum of Civilization, 1990</i>	Spring 1991
<u>Characterization and Preservation of Weighted Silk</u> <i>Merrill Horswell et al, Department of Environment, Textile and Design, University of Wisconsin, 1992</i>	Spring 1992
<u>Conservation of an Egyptian Mummy Shroud</u> <i>Isabella Kravski and Diane McKay, Royal Ontario Museum, 1992</i>	Spring 1993
<u>Have Suitcase, Will Travel: Techniques for Packing Costume</u> <i>Irene F. Karsten, McCord Museum of Canadian History, 1994</i>	Spring 1994
<u>Intersecting Silhouette Mannequins</u> <i>Denis Larouche, Canadian Museum of Civilization, 1995</i>	Spring 1995
<u>Humidification of Glazed Cotton Fabrics</u> <i>Bonnie Halverson, 1996</i>	Spring 1996
<u>A Preliminary Investigation of the Tensile Properties of Yarns Used for Textile Conservation</u> <i>Shirley Ellis, 1997</i>	Spring 1997
<u>An Investigation of Poullice Materials for Textile Conscvation</u> <i>Shawna Lemiski, 1998</i>	Fall 1998
<u>Some Recent Successes in Displaying Costume</u> <i>Eva Burnham, 1999</i>	Spring 1999

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