ICOM
COMMITTEE FOR CONSERVATION
Working Group no 10
Conservation of Leathercraft and Related Objects
Interim Meeting
on the Treatment of and Research into Leather, in Particular of Ethnographic Objects
at the Central Research Laboratory for Objects of Art and Science
Amsterdam
5 - 8 April 1995

Postprints of the fourth Interim Meeting of the ICOM Committee for Conservation Working Group 10, Conservation of Leathercraft and Related Objects, 5-8 April 1995 in Amsterdam.

Editors: P.B. Hallebeek, J.A. Mosk
DTP: J.A. Mosk
Word processing: S.F. Fontijn

©1997 Netherlands Institute for Cultural Heritage (containing the former Central Research Laboratory for Objects of Art and Science, Centraal Laboratorium voor Onderzoek van Voorwerpen van Kunst en Wetenschap), Amsterdam

The illustrations were provided by the authors.
Digital scans of photographs were made through the kind co-operation of Bas van Velzen, Amsterdam.

Some Conservation Problems Encountered when Treating Shoes

Marion Kite
Textiles/Organics Conservation
Victoria and Albert Museum
South Kensington
UK-London SW7 2RL

Abstract

Footwear has, at one time or another, been made from almost every type of material, but processed skins or leather are by far the most common. The skins of almost all genera have been used: fish, mammals, reptiles and birds. These skins may have been treated in almost any imaginable way in order to make highly coloured, decorative or fashionable footwear. The skins (including furs) will most likely have been dyed. They may have been painted, gilded, embroidered, transfer printed, embossed or stamped, and coated with shellac, oil, varnish, wax or any type of ‘modern’ polymeric material to give a final protective coating.

In most shoe collections a wide range of these materials and decorative permutations is usually represented but whatever condition these materials are in, the already complex problems involved with their treatment and care have often been further complicated by poor storage and by some of the treatments that have been applied by conservators in the past.

This paper aims to address some of the problems associated with the decorative elements found on footwear and to take note of some of the previous treatments that may have been undertaken by conservators in museums over the last 20 years. It also outlines how simple relaxing, reshaping and storage preparations can greatly improve the condition of a collection of shoes without recourse to complex invasive treatments.

It is intended that this paper be an introduction to a more in depth study to be undertaken during the course of 1995.

Introduction

In the context of costume history shoes are extremely important objects, and in recent times the current fashion of shoes has had high profile press coverage. There can be few people who are not aware of the unusual high platform shoes that the fashion model Naomi Campbell was wearing when she fell over on the Paris catwalk in the fall of 1994.

From the study of historic shoes much may be learned about fashion and taste of the day and by close scrutiny much may also be learned about the wearer.

In European culture the study of shoes reveals a direct link with other elements of fashion of the day. The design motifs and colour pallet represented in fashionable dress may be directly linked to those chosen for footwear, similarly the choice of fabrics for fashionable dress are also found in footwear of the same date.

Eighteenth century silk brocades and wool damasks are commonly found in eighteenth century shoes. During the 1920s the beaded chiffons so favoured for evening wear were also used for evening shoes.

The wearing of shoes is something that crosses all cultural, social and economic boundaries and the materials which may be incorporated in them may be representative of almost all material disciplines covered by the conservation profession.

Conservation

Throughout history footwear has been made from animal skins, most processed into leather, but this is very much a generalization as there are many other materials incorporated into footwear which are just as important.

These materials may be found either as part of their structure or as decorative elements and may include leather, fur, feathers and many other ‘animal’ products, plant fibres, textiles, paper, timber, glass, metals (both base and noble), rubber and a huge range of modern polymeric materials (plastics). The decorative elements may also incorporate embroidery, painted surfaces, transfer printed decoration, and all manner of applied embellishments.

Shoes may be finished with varnishes, lacquers, waxes and many other substances.

When considering the conservation of footwear the presence of all these materials and finishes
must be taken into account when working out a
treatment strategy.
Previous treatments must be noted in order to
ensure the compatibility of any subsequent
treatments. Records of previous treatments to
leather may not always be available so a
knowledge of what treatments may have pos-
sibly been used at a given time may be helpful.
Occasionally evidence of past treatment is
present and visible. The surface of the object
may be sticky or have a deposit of salts on it
which may be sampled and analysed using
Fourier Transform Infrared Spectroscopy to try
to determine the composition and if they are
the result of a past treatment or if they have
come directly out of the leather and could be
associated with the original tanning or
manufacturing process. Scientific analysis may
not provide a conclusive result but coupled with
a general knowledge of what could have been
used at a given time a possible treatment history
can sometimes be worked out.

At the end of this text is included a survey of
treatments which are known to have been used
on leather in the past and are most likely to
have been used on boots and shoes.

Storage

The properties of all incorporated materials
must be considered when preparing shoes for
storage. Because of the huge range of materials
used the selection of the best storage conditions
will be difficult and always rely on a compromise.

Basic principles relating to the storage of organic
materials have set the preferred standard at a
stable environment with temperature of not
more than 17°C plus or minus 2 degrees, rela-
tive humidity of 55% and storage in the dark
but this is only a starting point when consider-
ing the ideal storage conditions required for a
mixed collection of shoes incorporating a wide
range of materials.

Certainly, sufficient storage space is very
important. Shoes should not be stored touching
one another nor boots leaning against one
another. It has been shown that where linseed
oil finishes have been used in the manufacturing
process and a boot has been stored in direct
contact with another or with a hard storage
material then marking and bruising of the finish
has occurred resulting in lasting disfigurement
and damage.
Storage materials such as acid free tissue should
be used only after much forethought and not as
a matter of course to wrap and isolate a shoe.
It has been seen that where complex finishes
and coatings have been used, the tissue often
sticks to the surface as the coatings degrade.
Removal is not always possible without causing
further damage.
However in general, it is advisable to store
footwear with appropriate padding inside if
possible in order to give support to the shape
and limit the damage caused by the shoe collaps-
ing in on itself and the original shape being lost.

Stability of the environment is essential but
where ‘plastics’ (20th century polymeric mate-
rials, particularly PVC) are incorporated a
slightly cooler temperature is advisable in order
to try to retard the breakdown of unstable
polymers. It is impossible to be specific to an
exact temperature range here as there is a large
range of polymers, all with slightly different
requirements, and as yet not enough work has
been carried out on this. Careful storage of
footwear incorporating ‘plastics’ is important as
the attendant consequences of polymer break-
down are the release of hydrochloric acid and
the plasticizer migrating out to the surface of
the polymer material leaving a wet sticky
deposit. A good circulation of air is important
in the storage area where ‘plastics’ are kept in
order to prevent a build up of the hydrochloric
acid breakdown product. If it does build up
then degradation will be accelerated and there
will be high risk of damage being caused to the
other materials present in the shoes, particularly
the leather, textile and metal parts.

Rubber is a common component of footwear
but it is an unstable material and subject to
degradation by oxidation. The result is either
chain scission which causes the rubber to
become soft and sticky or cross linking which
causes it to become hard and brittle.
Much work has been done using ‘Ageless’
oxygen scavenger in a sealed environment for
the storage of rubber objects but many shoes
have rubber only as a component part of the
whole and often it is found together with other
polymeric materials such as PVC. In this
instance enclosed storage may not be a good
idea as a microclimate would be created.
allowing a build up of hydrochloric acid in the storage capsule as the PVC degrades. Where other polymers are incorporated such as a polyurethane a closed storage system using an oxygen scavenger may be suitable depending on the needs of all other materials being taken into account.

These examples serve to show the importance of identifying what materials are incorporated in each item of footwear before the appropriate environment and method of storage is chosen.

Other Problems

Insect pests can be a problem in a collection of footwear as in any other collection of organic materials. Moths, carpet beetles and wood boring insects may be found. It is common practice to use freezing to -30 °C as a method of control for some pests but where modern polymeric materials are incorporated this is not advisable and would most likely cause crazing and damage to the ‘plastic’ present. Where wood-borers are present the use of ‘Cuprinol’ solution, a common treatment on timber, is also not possible due to the risk of contaminating and staining fabric coverings or adjoining materials. Recently, thermo-lignum heat treatment has been carried out for the control of wood—borers but this is also not possible where ‘plastics’ are present as it could cause accelerated degradation of the ‘plastic’ concerned. Treatment in a CO₂ or nitrogen rich environment is however a possibility. Mould can be a problem on most organic materials when the humidity and temperature rise above 65-70%RH and 19°C. Stability and environmental control is therefore very important for a collection of footwear. It is only by controlling the temperature and RH that an outbreak of mould can be prevented or controlled when it has occurred. Current EC regulations on the Control Of Substances Hazardous to Health have made previous chemical treatments for mould illegal and unavailable for use.

Repair

The repair of shoes is usually a complex issue but it should always be kept in mind that previous repairs are part of the history of the object and usually should not be removed. Reshaping is often a necessary treatment as poor storage may have resulted in deformation of the footwear or crush damage. To do this it is frequently necessary to humidify the shoe to relax the leather or fabric components and allow them to be manipulated back into their original form. A humidity chamber is essential but if one is not available, a simple structure may be built to serve the purpose using polyethylene sheet, some adhesive tape and a simple means of introducing moisture, such as an ultra sonic humidifier.

Once relaxed the shoe may be reshaped then padded out with acid free tissue to hold the shape while it returns to ambient humidity and sets in the correct shape. After reshaping, the tissue supports may be retained or purpose made supports fashioned from inert materials should be provided ensuring full support for the object whilst it is in store.

Time and effort spent on simple reshaping, providing supports and good storage facilities with appropriate environmental control will go a long way to reducing the need for complex interventional treatments in the future. In some instances where there are highly reactive and rapidly degrading materials, adhering to the principals of good storage could prevent, or at least retard the possibility of total loss of the object.

Known Previous Treatments

Aluminium Alkoxide, 1 % in mineral spirits: used as a retanning agent, having a consolidative effect. The aluminium ions cross-link with the collagen in addition to having a buffering effect.

Bavon Leather lubricants based on alkylsuccinic acid:

- Bavon ASAK ABP: leather lubricant applied from a solvent solution. Provides good flexibility at low levels of use. Based on synthetic paraffin long chain polymers with non-ionic water in oil emulsifying agents.

Soluble in white spirit, petroleum spirit or 1,1,1-trichloroethane, used in 2-25% solutions (10% is normal).

Painted on leather with 15 minute intervals between coats (10 coats normally sufficient to
allow manipulation). Very brittle leather may be immersed and soaked.

- Bavon ASAK 520S: highly polar leather lubricant based on an alkylsuccinic acid modified to give complete water solubility. Used on intestines, bladders and other fine membranes. Very effective on drumskins and can be used on objects particularly when reshaping; water content being used to advantage. 5-20% solutions. Often useful to start at 5% working up to 20%. Can produce a spew over time, which can be removed with white spirit. Supplied by Frank Joel.

Bedacryl 122X, polymethacrylate ester: a consolidant for wood and some types of leather. Supplied in a mixture of xylene and n-butanol, or xylene and cellosolve acetate, or a petroleum solvent. Cellosolve = 2-ethoxy-ethanol.


DDT (dichloro-diphenyl-trichloroethane): now banned but older collections may have been treated with it as an insecticide. Used on skins, leather and wool.

p—Dichlorobenzene (PDB, 1,4-dichlorobenzene, one of 3 isomers): mothballs

Draftclean: ground rubber

Ethylene glycol: solvent, substitute for glycerol in conjunction with olein soap for softening ethnographic, semi-tanned leather.

French chalk: used to clean feathers fur and chamois leather.

Fullers earth: used as a powder often mixed with magnesium carbonate. Sprinkle over feather, leave overnight and then brush off. Also used mixed to a stiff dryish paste and brushed onto surface. Leave to dry, then brush vacuum off. Only suitable for strong good condition furs.

Invasol S: used as a leather lubricant. Soluble in water (up to 20%); apply in several coats with swabs. Softens leather well but it has been recorded that light coloured leathers darken. Ciba Geigy.

Isopropanol or isopropyl alcohol (2-propanol): solvent used to soften and swell leather; to lead in water to soften hard and brittle parchment. Properties between ethanol and acetone.

Lanoline, anhydrous: used as a leather lubricant

Magnesium carbonate: as absorptive cleaner, particularly for feathers, fur, chamois leather

Opodeldoc: soap liniment of the following composition:

Camphor 40 g
Oleic acid 40 g
Alcohol (90%) 700 ml
Potassium hydroxide sol. 140 ml
Rosemary oil 15 ml
Purified water to 1000 ml.

PEG 400, polyethylene glycol 400. (25-35% in tap water): Impregnation period between 1-5 weeks. Used for treatment of waterlogged archaeological leather.

Pilantine (British Museum Leather Dressing, standard and special C): thick brownish liquid: lanolin, cedarwood oil, beeswax, 1,1,1-trichloroethane. Special G omits the beeswax. Used as a dressing for hard, brittle leather.

Pliantex: flexible polyacrylic resin based on ethyl acrylate. Supplied as a 30% solution in ethyl acetate. Used for the consolidation of fragile leather, particularly where ‘red rot’ is present. Used up to 10% dilution in ethyl acetate or amy acetate (ethyl acetate is used as a solvent for nitrocellulose lacquers and varnishes). The polymer is stable in light and flexible. It is not swelled by water and non-tacky. The material will not harden because no C=C double bonds remain in the polymer molecule. Because of this, subsequent polymerization of the dried film cannot occur. Ageing does not produce cross-linking with its lack of solubility. Supplied as a colourless 30% solution in ethyl acetate, it is diluted 1:4 for use. Diluents are: esters, ketones and aromatic hydrocarbons. Produces a very soft film after the evaporation of the solvent (Waterer, J.W., Studies in Conservation 17 (1972) 126-30).
Renaissance Wax: microcrystalline wax used for cleaning and sealing leather and ivory. High shine can be achieved useful for patent leather. Saddle soap (Proparts): commercial leather cleaner. Alkaline pH: 9-10. Based on Neatsfoot oil, cod or sperm oil, emulsified with soap in water to produce an emulsion fat liquor. Considered obsolete, extremely alkaline 9-10 when 4-6 is most favourable for leather. Spew formation can occur and in time stiffening of the skin. See LCN Vol. 9, 1993

Silicone leather wax: used as a leather cleaner and lubricant

Tannic acid, gallo tannin, gallotannic acid: sometimes used to treat archaeological leather

Thymol: fungicide for leather, furs, paper, Parchment

1, 1, 1-trichloroethane: solvent, component of most leather dressings

Vulpex (potassium methyl-cyclohexyl-oleate): soap; for leather, featherwork etc. where use of water is impractical. pH 10.5-11.5; soluble in white spirit, trichloroethane or water

White spirit (Stoddard solvent): mixture mainly of alkanes of boiling range 150-200°C. Miscible with acetone. Used as a solvent, for dry cleaning and leather treatment