ICOM
COMMITTEE FOR CONSERVATION

Working Group n° 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.

What is Wrong with Freeze-drying?

Olaf Goubitz
Rijksdienst voor het Oudheidkundig Bodemonderzoek
Sectie Conservering Organische Artefacten
Kerkstraat 1
NL-3811 CV Amersfoort

What is wrong with freeze drying?

A title with two faces, depending upon which words you emphasize, or I could also call it 'Who's afraid of freeze drying?'

Well, I for one, am no longer afraid of the freeze drying process. In the beginning the whole complicated procedure was very dark and mysterious; the apparatus, the vacuum, and all the knobs and dials. How freeze drying works is still an arcane and complicated process to me, and strange enough, when I ask people who do freeze drying, they cannot explain to me what actually happens. Those who claim to understand the process understand it so well that they are unable to explain it clearly and simply to someone like me, who does not have a degree in applied physics.

Actually, I have no formal training in physics or chemistry, only some basic knowledge, which is perhaps why my laboratory is more like a kitchen. I have learned to use my natural senses instead of scientific meters and gadgets. I test the leather with my fingertips, use my nose to smell if it is sour or mouldy, feel the dampness of the drying leather with my cheek, and rumbling over the vats like an old wizard. ‘Hmm, the leather looks bad today, let’s give it a swim in the acid, and this ugly old sole needs an ultrasonic beating, that will teach that lumpy leather a lesson’.

Think what you will of my methods, but I wonder why the leather I conserve has no troubles afterwards; it doesn’t dry out, it doesn’t develop a rash or surface peeling, nor does it lump up or mold away. Even pieces that have been in dark boxes for over 25 years still appear happy and healthy. Maybe because I do not freeze dry leather. Could it be that simple?

What then do I use the freeze-dryer for? Wood! Just wood. It took me a year to figure out the whole mess, but now the results are satisfactory. Experience, with all its ups and downs, gives the best training, that also goes for the treatment of leather.

Even before I had a freeze-dryer, I had the feeling that freeze drying was not a good idea for the conservation of archaeological leather. There are other methods, simpler, cheaper, and less dangerous. Methods that I still use today. Sure, I put leather in the freeze-dryer, as a test of the method. I also read the reports in Studies in Conservation, Arbeitsblätter and other journals. From the incoherent confusion reported in the journals, one fact stood out, the leather still needed a lubricant. PEG 400 was recommended as a pre- and post-treatment, and most people seem to think that PEG 400 will solve all the problems of freeze-drying.

I have never used PEG 400, as it is too hydroscopic. Leather pre- or post-treated with PEG 400 tends to keep sweating excessively, even without working out, or when too diluted with water, it has no body and the leather dries out. The truth is that PEG acts the same as the glycols used in anti-freeze for cars. Even PEG 600 does not fully freeze at minus 30°C (which is minus 22°Fahrenheit, or 243 Kelvin, and 24°Reaumur). So PEG 400 as a pretreatment is self defeating, and as a post treatment, it makes the leather really wet again!

I regard the freeze-drying of archaeological leather as a money, time and energy wasting process. I am really not sorry to say that, especially when there has always been easier, safer and cheaper alternatives.

The main alternative I use is a gentle cleaning, some slight air drying, followed by a bath in PEG 600. Usually the leather is soaked in water, and I test with my fingers first to feel both the consistency of the soil and the quality of the leather. I can also feel the shape and size(s) of the objects(s). With that information, I can go on to do the investigative cleaning, using an extremely feeble source of running water, artists paintbrushes, and for the really heavy mud: a minuscule paint spatula. If the soil is heavy clay, or has metal deposits, a treatment with an
ultrasonic cleaner can be used. After a thorough yet gentle rinsing, the leather is placed on newspapers to dry until about 80 percent of the water has been absorbed by the papers. I can hear the cries: 'But newspaper is acidic!' Yes, but the leather does not sit on the newspapers longer than a few hours, which is not enough time to do any damage, so save your expensive acid free blotting paper for the things that need it.

Knowing when the leather has the right amount of dryness is something that can be learned by experience, though it does mean that you will have to trust your own senses rather than some scientific gadget. It is at this time the leather is closest to its original form, so this is the time to measure, draw, and record all important information.

The leather is then given a bath in PEG 600, diluted with 40 percent water. About 36 hours is enough, though if it sits longer no harm is done. The leather is allowed to dry on newspapers again. According to its destination - direct storage, near future reference, exhibition, etc., the leather can be stored in perforated polyethylene bags, and be put into boxes. When taken out of the PEG 600 bath the leather is very dark, sometimes even black. As the PEG evaporates over the years, the leather becomes lighter in colour. Leather pieces that I have kept for over 25 years as reference pieces for typological and technological data have become light brown with time. I think that we have to accept the colour as it is because to change the colour, the leather would have to undergo, some bleaching treatment, which is probably not healthy for the leather, and also we cannot really know what colour the leather was originally and any attempt to force another colour on the leather would be misleading.

Because of this long experience with the treatment I know that some kinds of leathers may need re-treatment. This consists of a dip into PEG 600 for medieval leathers, a swim of about 5 minutes for a 16th century leather, and a real drowning for 17th century and newer leathers. But most of my leathers, including the medieval haven't needed re-treatment and are still flexible and supple after so many years of storage.

As with all methods, there is some shrinkage after the treatment, varying from 5 to 15 percent, depending upon the type and thickness of the leather.

This is one of the reasons why all measurements and registration should be done before treatment. With this low tech method of conserving wet archaeological leather in a span of three days one can conserve 10 to 1000 pieces of leather, depending upon available working space, whereas the freeze-drying method takes 10 or more days.

There is one other method I use to conserve leather, and that is with oils. If a piece is to be restored, sometimes glues have to be used and these will not stick to PEG treated leathers, the colour is lighter (which for some reason people find more 'natural'), and the object can be polished lightly with oils, giving the object a bit livelier shine. Also in the case of Roman shoes which still have all their nails, the oils are less aggressive for the metal.

The recipe for the oil is:
- Castor oil 35 Vol. parts
- Glycerol 15 Vol. parts
- Tertiary butylalcohol 50 Vol. parts.

No impossible to pronounce secret ingredients, no miracle snake oil potions, nor magic invocations are added. If the mixture is kept simple there are only three components to be blamed for treason if anything goes wrong. In the treatment the leather is dehydrated before with methylated spirit.

I fully understand that by revealing my simple methods in this paper, that my approach is not the newest breakthrough of scientific advancement, and may be open to attack by those who need dials and meters. But the leathers that I have conserved are not having the problems now being seen in freeze-dried leathers. I know that it may be possible that the leather I am working with may differ in quality, soil type, and burial conditions, from leathers elsewhere, or it may be that the climate in the Netherlands is perfect for my methods.

You may want to ask me right now, what do I think gives me the right to speak so unscientifically about leather conservation. Well, ask my happily conserved leathers!

Congratulations and abusing letters to my address.