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Conserving Textiles

STUDIES IN HONOUR OF ÁGNES TIMÁR-BALÁZSY

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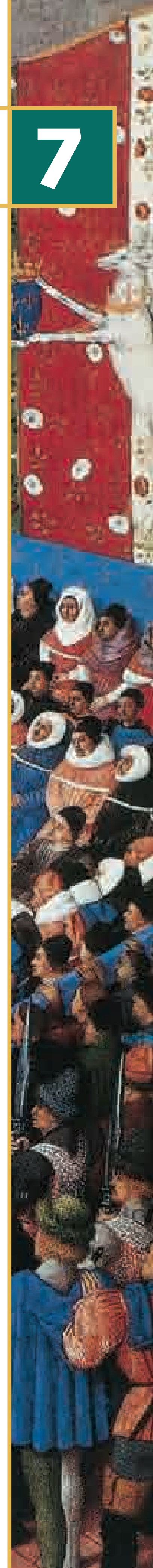

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In memoriam: Ágnes Timár-Balázsy (1948–2001)

Ágnes Timár-Balázsy was an inspirational teacher of conservation science and she will be remembered as a joyful and passionate person, with vision, intelligence and the ability and willingness to work very hard. She loved both teaching and travel and developed a network of friends and colleagues all over the world.

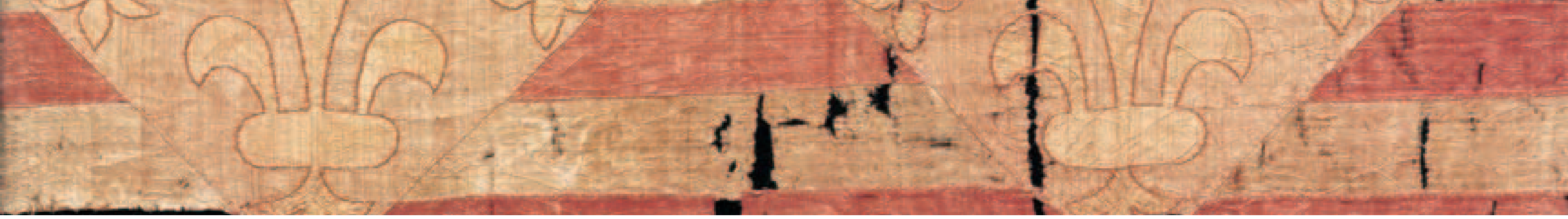
Ágnes began her career in 1966 as a metal, ceramics and glass conservator at the Hungarian Central Museum Technology Group, then at the Institute of Conservation and Methodology of Museums, the National Centre of Museums, and finally at the Conservation Department of the Hungarian National Museum. She took a degree in chemical engineering at the Budapest Technical University in 1975, a further degree in 1985 and was awarded a PhD degree in 1997. Her doctoral dissertation focused on the dye analyses of museum textiles.

From 1974 onwards she contributed to the training of Hungarian conservators and remained committed to improving the standards and status of Hungarian conservation and conservation training. In 1991 she was instrumental in establishing a programme in conservation training as a successful collaboration between the Hungarian University of Fine Arts and the Hungarian National Museum. Ágnes loved Hungary and was proud of its rich cultural heritage and strong museum sector. She was a gifted linguist and disseminated the results of Hungarian conservators' work and conservation training at an international level. She fostered international links, for example by co-organizing the International Restorer Seminars in Veszprém, Hungary.

Ágnes became well known around the world as a teacher of chemistry and of the scientific background of textile conservation for professionals. She taught regularly on international conservation courses at ICCROM in Rome as well as at the Textile Conservation Centre in Britain, the Abegg-Stiftung in Switzerland and in Hungary. Ágnes also taught in Austria, Chile, Finland, Ghana, Israel, Nigeria and Zambia. Hundreds of conservators benefited from her knowledge and enthusiasm. One outcome of her teaching was the publication in 1998 of Chemical Principles of Textile Conservation, co-authored with Dinah Eastop. She was proud of its many reprints and was always delighted to see well-thumbed copies in conservation workshops. As well as teaching, Ágnes carried out important research into the analysis of historic dyes and the cleaning of historic textiles. She was particularly proud to contribute to the investigation of the dyes of the Hungarian coronation mantle.

Ágnes succeeded Judith Hofenk de Graaff and Mechtild Flury-Lemberg as coordinator of the ICOM Conservation Committee Textile Working Group, which she led between 1990 and 1996. She became a member of the ICCROM Council from 1994 to 2001, and Vice-Chairperson of the ICOM Conservation Committee from 1999.

In 2001, Ágnes postumously received the ICCROM Award in recognition of her outstanding contribution to the field of cultural heritage preservation.



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Between 1998 and 2000, finds in extraordinary profusion and of a unique quality were excavated by archaeologists of the Budapest Historical Museum on an 8,000 sq m stretch lying west of Szent György square in the Buda Castle.[1] The archaeologist Dorottya Nyékhelyi, in charge of the excavation at well no. 8 of the Teleki Palace, still supplied by fresh water rivulets, uncovered hundreds of ceramic dishes, wooden objects (spoons, casks, dishes, troughs and carvings), as well as leather footwear and wooden caskets covered in leather. Textiles of various sizes also came to light during the excavation. The conservation of these finds is bound to continue over many years. A rather concentrated layer of black peat, metres deep (composed of seeds and wood debris apart from the already mentioned historically significant objects), had preserved the objects. What follows is a description of the conservation of the silk cloth with the Hungarian and Anjou Coats of Arms (referred to below as the Anjou Cloth), fragments with oak-leaf-and-flower patterns, and spearhead-shaped, acorn-topped fragments.

[JUDIT B. PERJÉS, KATALIN E. NAGY AND MÁRTA TÓTH]

Conservation of silk finds dating to the Anjou period (1301-1387)

Excavation

An initial cleaning of objects recovered from the well, which was brimming with sludge, was undertaken simultaneously with the ongoing excavation. This consisted of extracting the objects from the enveloping mud. Immediate transportation of finds to the restorers' workshop was facilitated by its proximity to the site. The restorers carried out a preliminary cleaning of the objects grouped according to their material (wood, metal, ceramics, glass, leather or textile). In the case of wooden and leather objects, conservation commenced immediately. An exceptional piece among the silk finds was the Anjou Cloth, which arrived at the laboratory on Friday, 4th October 1999, encased in a solid block of mud and packed in plastic foil. The mud-block packs containing the two other silk fragments were brought out of the well a few days later. The finds had lain at nearly the same depth.[2] (Figs. 1-3)

The good condition of the silk material is explained by the fact that the fragments had been in the oxygen-free environment of the mud, and in a state of equilibrium through the centuries with only slight variations in temperature. The peat was pH 9. In theory, alkaline conditions are unfavourable to both leather and silk materials, but experience has shown that lack of contact with oxygen and a fixed temperature are the most important conditions for the preservation of archaeological finds.

Following excavation, restorers of the Budapest Historical Museum kept the textile items damp and cool, and wrapped in polyethylene sheeting. The prolongation of the state of equilibrium was of fundamental importance in this instance. A sudden change in the textiles' environmental conditions (e.g. temperature, humidity or light exposure) after excavation had to be avoided. Irreparable damage could have been caused to the partially disintegrated textile structures if they had suddenly dried out.

FIGURE 1 Well under excavation, detail

FIGURE 2 The Anjou Cloth as recovered, caked in a single block of mud

FIGURE 3 The mud containing the oak-leaf-and-flower patterned fragments

Preliminary cleaning

The solid block of mud containing the Anjou Cloth could not have been unpacked without immersion in water. After sixteen hours under water, the silk had loosened enough to allow it to be spread out without tearing.[3] Unaware of the size or form of the piece of silk, it was first allowed to soak in a smaller plastic dish and was only later put into a large photo-developing tray. Ultimately, the find with an unprecedented capacity for expansion was moved to a specially constructed wash bath with polyethylene net spread in it, where the material could unfold completely with gentle manipulation. The underlying net not only insured safety in handling the material, but also helped with the removal of small bits of dirt, such as seeds, other vegetal remnants and pebbles. A similar procedure was implemented for the preliminary cleaning of the silk fragments with oak-leaf-and-flower patterns and the spearhead-shaped, acorn-topped fragments.

Deionized water, without added surface-active agents, was used for wet cleaning. A disinfectant (in a concentration of up to 0.1%[4]) was added to the water because *coli* bacteria, known to cause inflammations in the human body, were identified in the sludge from the well during health inspections.

Preliminary cleaning results

In spite of deformations in the Anjou Cloth, the base fabric had become less brittle, and the characteristics of each piece became apparent after repeated cleaning and soaking in the deionized water. The main types of cloth could also be distinguished. The ragged, crumpled edges had smoothed out, the glow returned to coloured surfaces, and dimensions could be ascertained with relative accuracy. Only some light-grey patches (barely a few square millimetres in area) remained caught in the threads of the material, these came from the stone substances in the wall of the well. They could not be removed altogether, even later, in the process of conservation. The finds were then kept under suitable conditions, covered and laid out for a few months,[5] until work could be continued. Following the first-aid cleaning, the archaeologist László Dinnyés, the draughtsman of the Budapest Historical Museum, made drawings of the finds for archaeological research.

An expert committee decided what was to happen with these textile finds of exceptional importance.[6] The group of finds was moved from the Budapest Historical Museum to the Textile Conservation Laboratory of the Museum of Applied Arts, where all the equipment necessary for conservation of the textiles was at hand. Restorers appointed by the committee prepared a preliminary work plan, which was then accepted by

FIGURE 4 The silk cloth fragment after preliminary cleaning

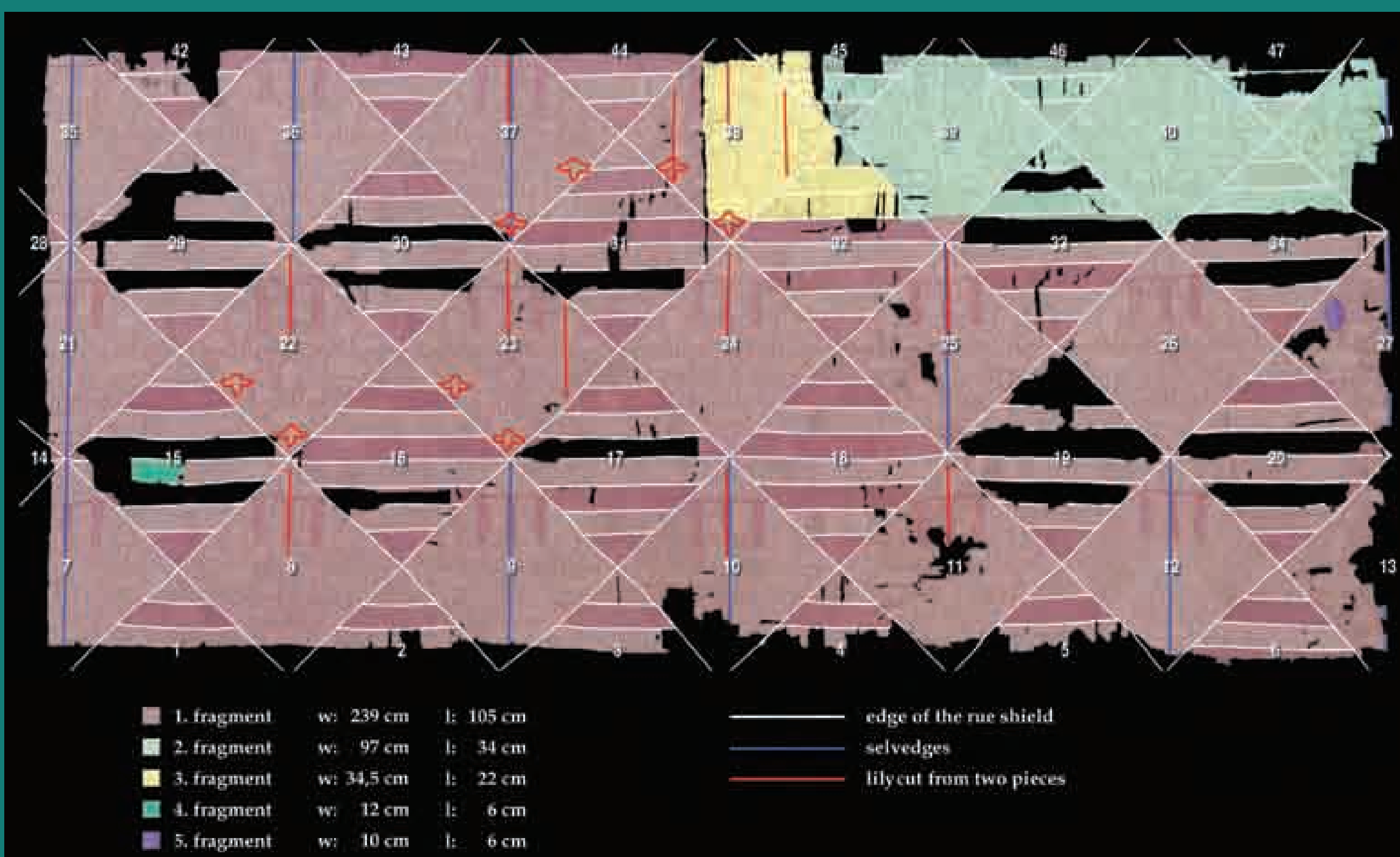


FIGURE 5 Illustration for the condition report, demarcation of fields 1 to 47

a jury of experts.[7] In devising a plan for the artefacts' preservation, the guiding principle was choosing methods involving only the most necessary intervention. No formal or aesthetic completion (in-filling) was undertaken, because the purpose was to stress the fragmentary nature of the finds.[8]

Description of finds

Anjou Cloth

The Anjou Cloth was composed of five individual fragments. Adjoining fragments could be arranged into groups composed of twelve Hungarian coats-of-arms (whole rue coats-of-arms), twelve halved rue coats-of-arms and two segments of rue coats-of-arms, fifteen Anjou coats-of-arms (whole rue coats-of-arms), as well as three half and three incomplete coats-of-arms. The original colours of seven of the Hungarian coats-of-arms were red and white. On the once-blue Anjou coats-of-arms four *fleurs de lis* of yellow silk were sewn, and a lambel[9] of red silk was placed on the lily at the top.

Dimensions:

1. L: 2390 mm, W: 1050 mm
2. L: 970 mm, W: 340 mm
3. L: 345 mm, W: 320 mm
4. L: 120 mm, W: 60 mm
5. L: 100 mm, W: 60 mm

(Figs. 4-5)

When investigation of the fragments showed that it was possible to reassemble them, an illustration of their condition was prepared. The forty-seven fields were outlined on the drawing, as well as the five separate fragments, the edges of each cloth, the sewn edges and the stitches joining the coats-of-arms. The hems were examined for clues to indicate the original height and width of the Anjou Cloth. Visible on three sides of the Anjou Cloth were the edges of fields 1, 2, 3, 7, 21, 35, 37, 40, 42, 44, 45, 46, where the silk material had been folded back. However, hems on the top and bottom provided equivocal evidence in determining the original height of the cloth; that the original edge of the cloth was at the hem on the top is mere conjecture.

No lambel could be found on the lilies in fields 13, 27 and 41 (found to the right of the cloth), nor were there any stitch marks to prove that they had ever been there. This gave rise to the premise that this had been the cloth's right side, perhaps with a border serving as a line of closure. No explanation was found for the fabric folded back in fields 21 and 35. The pattern of repeated coats-of-arms did not offer any reliable point of reference for the reconstruction of what the original size had been. (Figs. 6-7) Stitches that could be deciphered on the front of the cloth, along with the silk-thread remnants that were to be found on its reverse, allowed the assumption that it had originally been made with a quilting technique. No remaining *lining and padding material* was found to substantiate this premise when the cloth was dismantled; this suggests that it found its way into the well without these components. (Fig. 8)

FIGURE 6 Edge of field no. 35, viewed from the front

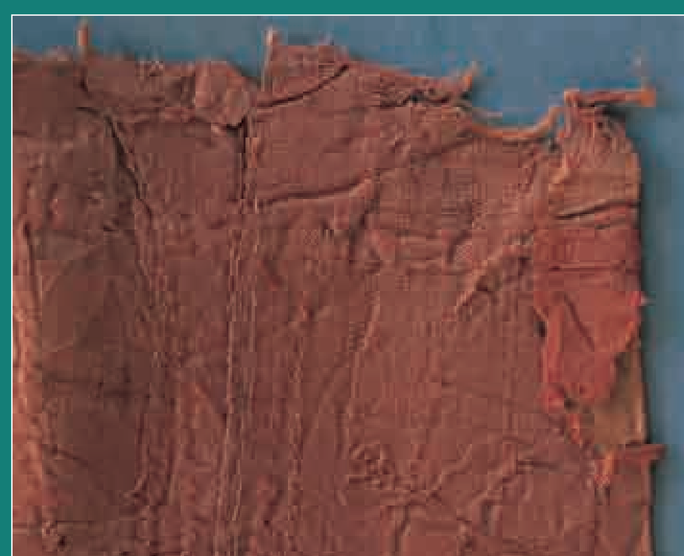
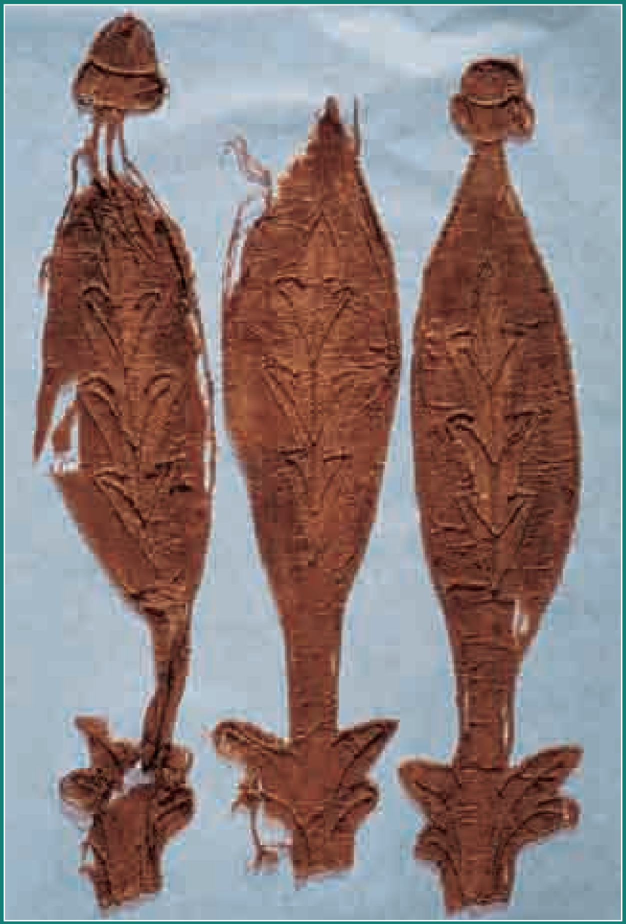


FIGURE 7 Edge of field no. 35, viewed from the reverse



Textile fragments with oak-leaf-and-flower patterns

Four pieces of the fragments were alike, whereas two were mirror images, depicting something reminiscent of branches with oak leaves.

The main motif is a vertical stem with little leaves bending out right and left. Two-thirds up the stem, a vigorous tendril continues, carried on in a falling branch with leaves, to end in a flower with five petals. The flower turns towards the vertical stem, forming a beautifully curving unit at the centre of the motif. The outlining threads of the silk fragments emphasize the vitality of the plant motif and delineate the leaf veins. Size: ca. 260 x 260 mm. (Fig. 9)

Spearhead-shaped, acorn-topped fragments

The three textile fragments shaped like leaves, but also reminiscent of spearheads, have short stems branching in two directions at their base, and an acorn shape at their points, with an insert shaped like an oak leaf in the centre of the spearhead form. Threads outline both the motif and the insert. The leaf veins are also emphasized by outlining threads. Size: Length: 430 mm; maximum width: 90 mm; insert length: 180 mm (Fig. 10)

Investigation of materials and technology

Production technology

The silk finds described above are historical artefacts of outstanding significance, testifying to the artistic achievements in textiles at the Hungarian Anjou Court. There are many references to objects decorated

FIGURE 8 Traces of quilt stitching visible on the reverse of field no. 12

FIGURE 9 Detached fragment with oak-leaf-and-flower patterns

FIGURE 10 The detached spearhead-shaped, acorn-topped fragments.

with heraldic coats-of-arms in Hungarian sources, but until now there has been no information about how they were made. Splendid palaces and cathedrals, built from the thirteenth century onwards, and their furnishing gave a huge impetus to the arts and crafts, with embroidery among them. Celebrations, hunts and travels afforded ample occasion for elaborate dressing and the ornamentation of palatial halls with decorative wall hangings.[10] (Fig. 11)

Royal commissions in the beginning of the century escalated apace. This may have been why an artist working either in the immediate surroundings of the royal house or in a guild found the rapid reproduction of works designed by him a matter of paramount importance when it came to execution. This made simplification of the production process necessary, which in turn led to the widespread use of methods and tools that took the brunt off labour. There were instruments of various sorts that made it possible for the artist to place a given pattern (or certain elements from it) directly upon the base of the final composition, speeding up the process of manufacture and allowing for repeated duplications.[11]

The appliqué technique (called *opus consutum*) was a simple and quick method of achieving a decorative effect. Only a few objects made in this manner are extant, but sources prove that its use was widespread. The speed of production is well illustrated by the following example: the armourer au Roy et brodeur, Nicholas Waquier, was tasked on the 8th of September 1352 with the preparation of a velvet horse-covering and room-hanging decorated with fleurs de lis for All Saints' Day. In the short time available, 8,544 embroidered lilies would have to be manufactured and stitched onto the various textiles. The lilies were of course in production constantly, and the embroiderers were helped in their effort by large quantities of wine and candles.[12] The accounts left by the heads of workshops show the type, cost and quality of materials ordered, and wages per head. Labour was very cheap; information on labourers in debt can also be found. The names of the workers are mentioned very often, with details as to the number, expertise, pay scale and ratio of women to men employees.

Philippa, Queen consort,[13] ordered three embroidered blankets for church ceremonies in 1330. An artist and a designer commanded a group of labourers numbering 112 persons:

70 men were employed at wages of four and a half dinars/day

42 women were employed at wages of three and a half dinars/day

the artist was paid six and a half dinars/day

the designer was paid eight and a half dinars/day

It is not clear how work was distributed among the sexes, but it is likely that they were separated into three groups, and each prepared one blanket. The Queen's tailor, William de London, organized the purchase of everything required, making all necessary arrangements for the work. He oversaw the acquisition of the frames, strings, thick threads and needles, also ordering the fluffing up and beating of cotton/wool to be used as filling. He purchased wax as well, to seal the raw edges of silk. The bills and the fact that the wax, used before the motifs were cut out and set in their place, can be found on the edges of the embroidered silk motifs are a clear indication of this practice.[14]

The manner of preparing an under-drawing and the techniques of copying model drawings in the fourteenth century cannot have differed much from the methods explained in the handbook of the fifteenth-century painter of Florence, Cennino Cennini. The drawing was either made directly upon the material, which had been stretched on frames, or the design created earlier in advance was copied onto the final base. He also mentions the use of tailors' chalk[15] for drawing upon black or blue base materials and a wooden template for copying motifs.[16]

Manufacture of the Anjou Cloth

Pattern

The designer/producer of the Anjou Cloth might well have taken a similar approach. One of the possibilities for preparing the pattern of the coats-of-arms would have been cutting it out of parchment, which has the various motifs of the embroidery intarsia drawn onto it in ink, lead or tin pencil.[17] Then the parchment template would be placed on the cloth to draw the contours on the material. After having drawn the exact number of motifs appropriate to the design of the artwork, these were cut out of the material. Another possible means for replication may have been the use of tailors' chalk. In either case the frayed silk edges would have had to be reinforced with wax, so that the edge of the material did not deform or fray in the process of cutting and sewing. Signs of wax having been used were found on the reverse side of the Anjou Cloth, and also on the edges of the material.

In the case of the Anjou coats-of-arms, the necessary amount of rhomboid base materials, lilies and four-part patterns for the lambels were cut out first. Now, 21 pieces of rhomboid ground material (of a blue colour originally) can be found on the fragment of the cloth. In nine of the fields (nos. 7, 9, 10, 12, 21, 25, 35, 36, 37), the base fabric for the coats-of-arms was made by combining two pieces. The edge of the base material is clearly visible where the pieces were

FIGURE 11 Painting showing wall-hangings at the court of Philip of France (1285-1314)

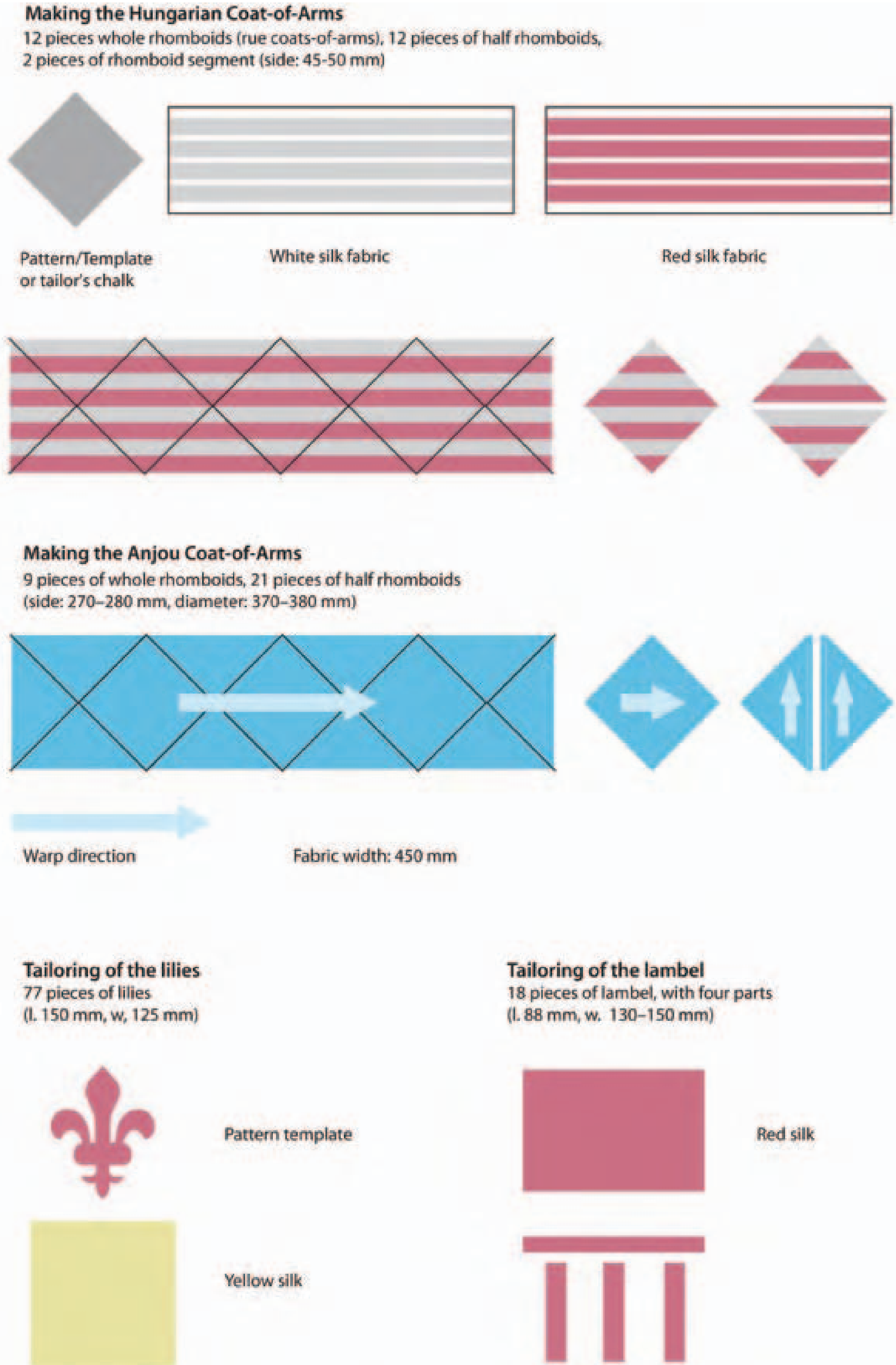


FIGURE 12 The pattern of the Anjou Cloth

stitched together. The rhomboids were cut from silk cloth 40 mm wide.

The application of the pattern and the cutting of the material for the lilies of the Anjou coat-of-arms must also have been carried out by the means outlined above.

In nine fields (nos. 8, 10, 11, 22, 23, 24, 25, 37 and 38), the lilies were made from two pieces of cloth, and in 8 instances (in fields 22, 23, 37 and 38) the lower stem was also made from two pieces. These facts indicate a rather thrifty attitude toward materials on the makers' part. Four red and four white strips were cut from the silk cloth used for the Hungarian coats-of-arms.

Appliqué embroidery

The implements used for the manufacture of the embroideries, such as the simple, adjustable wooden frame, the needles of different sizes or even thimbles, have remained effectively unchanged with time. Frames both propped up and horizontal were equally in use, with their size adjustable for the particular needs of each piece. A thick thread or cord was used to stretch the cloth on the frame.

Embroidery for the Anjou Cloth would have been prepared in the same fashion. The rhomboid blue base material stretched on the frame, and the lilies pinned down upon it with a few stitches, applied just to prevent it from shifting while the contours were stitched on. A red silk thread outlining the lily is fixed to the ground fabric with a thinner thread. The red silk material of the horizontal bar of the lambel has been stitched without any outline, just folding back the edge of the material, while the vertical stems were fixed with outlining threads. (Fig. 13)

The Hungarian coats-of-arms could only have been made while held in the hand, not on a frame. The strips of fabric cut from the red silk were fixed with their reverse sides to the front side of the white silk material piece by piece. The rhomboid coats-of-arms would have been cut after the seven strips had been stitched together. (Fig. 14)

FIGURE 13 Anjou coat-of-arms, detail

Assembly

The coats-of-arms prepared individually were stitched together. The Anjou coats-of-arms made up of appliqué embroideries were placed upon the Hungarian coats-of-arms and their edges were stitched together with running stitches. If seen from the reverse side, in most cases the Hungarian coat-of-arms is first, with the Anjou coat-of-arms folded back. The manner of assembly diverges in the case of fields 26, 38 and 39, with the Hungarian coat-of-arms superimposed, from which it may be deduced, that the embroidery was the work of numerous artisans. The material used as lining can only be guessed at from marks left by the stitches. Numerous bits of extant silk thread used for the quilt stitches were found on the reverse of the embroidery. The pattern left by the quilt stitching was visible when the silk was viewed on a light box. (Fig. 16)

The quilt stitching on the Hungarian coats-of-arms was worked in a diamond grid pattern with a 15 mm spacing between the lines. The concentric pattern of quilting on the Anjou coats-of-arms is spaced at 10 mm, with the lilies and lambels left free so that they emerge in relief from the embroidery. (Fig. 17) The filling material for the Anjou Cloth must have been cotton/wool, which would have been

FIGURE 14 Hungarian coat-of-arms detail

FIGURE 15 Construction of the coats-of-arms, from the reverse

FIGURE 16 The pattern of holes made by quilt stitches, as seen on a light box

FIGURE 17 Marks showing the pattern of quilting stitches. (Copy made by the handicraft artist Renáta Rajcs)

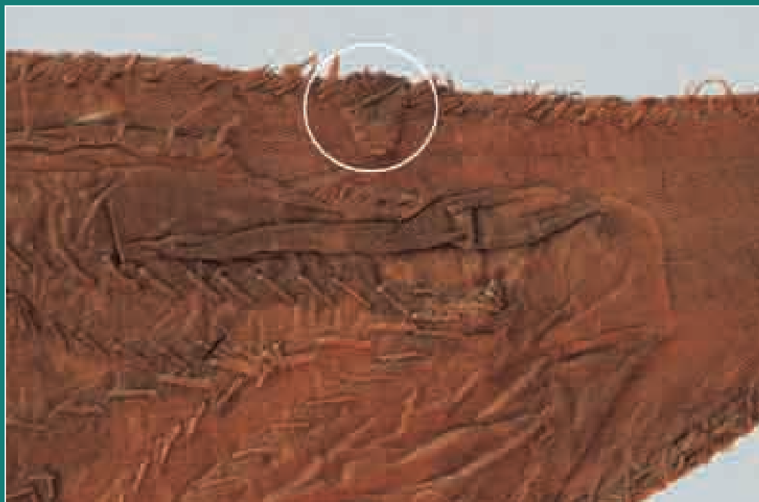


FIGURE 18 A piece of ground fabric discovered on the reverse side of the spearhead-shaped silk fragment

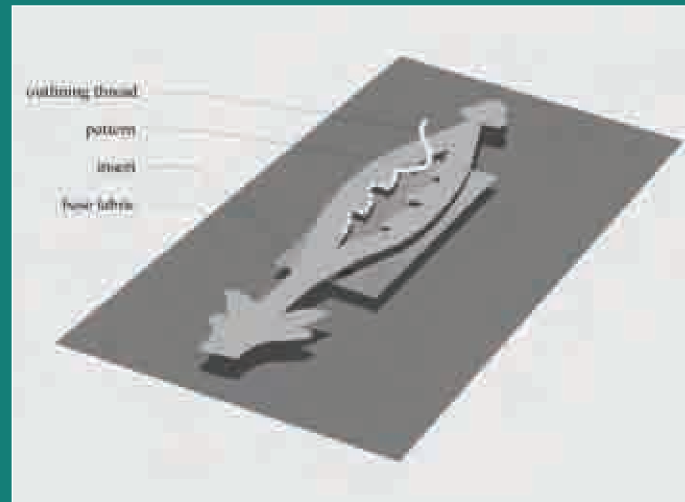


FIGURE 19 A technical drawing showing the technique used to make the spearhead silk fragments

secured with the quilting stitching. The appliqué embroideries would then probably have been lined with some fabric.

Manufacture of the spearhead-shaped, acorn-topped fragments

These were most probably drawn up first according to a pattern, as observed in marks left by the procedure. The oak leaf shape was cut out of the centre of the spear-head shape: an inlay was placed under the hole. The forms were stitched onto the ground material with the outlining thread, a small segment of this material having been found on the reverse side of the embroidery. The outlining thread also lends emphasis to the stylized leaf veins. The association of the motifs in relation to one another has not been clarified, which means that their placement on the ground fabric is not conclusive.

Manufacture of the textile fragments with oak-leaf-and-flower patterns

Oak leaves and flowers, cut from a square of silk material, had motifs traced onto them in advance, probably with the aid of a template. The under-drawings are clearly visible on the fragments. The motifs were in all likelihood edged with some kind of wax, while the leaf veins were traced with a line reminiscent of a thin, grey graphite pencil mark.[18] Stitches placed at 2-3 mm intervals secured the outlining thread and fastened the cut pieces to the ground fabric, of which no remains could be found. The drawn leaf veins were emphasized with stitches worked in the outlining thread. The relationship between the various motifs is not clear in this case either, leaving doubts as to their arrangement when applied to the ground fabric.(Fig. 20)

Dye identification[19]

Anjou cloth

The ground fabric of the Anjou coat-of-arms, which had originally been blue, changed to a light pinkish brown, but the yellow colour of the lilies and the red of the lambel had only faded. Of the red and

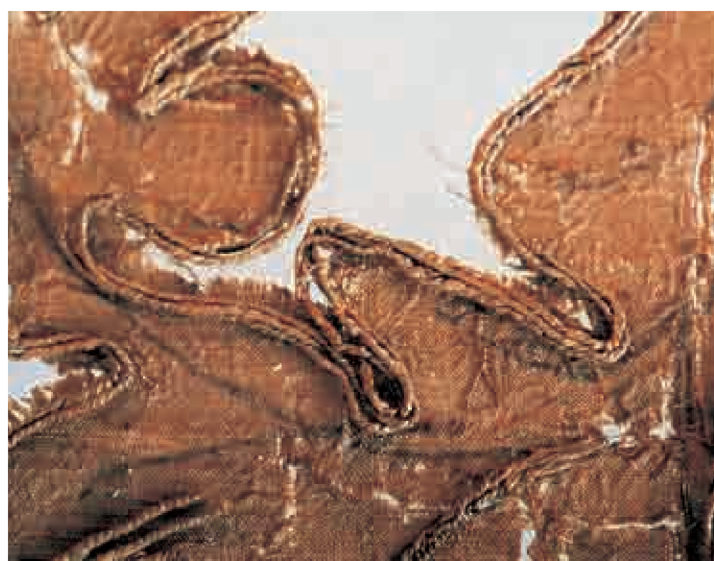


FIGURE 20 Edging on the fragments with oak-leaf-and-flower patterns

white stripes of the Hungarian coat-of-arms, the red had faded, while the white stripes had changed to a brownish yellow. Chromatographic examinations showed that the red colour was achieved with a mixture of colours extracted from kermes (*Kermes vermilo*), and madder (*Rubia Tinctorum*) with the addition of tannin. An extraction of the indigo dye for the blue ground fabric of the Anjou coats-of-arms could not be determined. Experts are of the opinion that the slightly alkaline environs had dissolved the colour base.[20] Mention must be made of kermes dye remains found on the sample taken from the once-white strip of the Hungarian coat-of-arms. The phenomenon can be explained by the slow dissolution of the colour in a wet and somewhat alkaline state, which would have allowed it to permeate the undyed cloth.

Fragments with oak-leaf-and-flower patterns

The colours of the fragments were of a light brown shade typical of archaeological finds. Dye analysis did not reveal any colouring agents used.

Spearhead-shaped, acorn-topped fragments

The colour of these fragments was also of a light brown shade. Tests showed the presence of alizarin in the ground fabric, which hints at the use of madder. Signs of luteolin were established in the material used

Material investigation

Technological and material investigation of the Anjou textiles

FABRIC

Silk Cloth	Warp	Weft	Weave	Warp density	Weft density	Warp twining	Weft twining
Blue ground fabric of the Anjou coat-of-arms	silk	silk	taffeta	36-40	36-40	Z	unspun
Yellow fabric of the fleurs de lis	silk	silk	taffeta	38-40	38-40	Z	unspun
The coat-of-arms of the Árpád house beige fabric	silk	silk	taffeta	35-40	35-46	Z	unspun
The coat-of-arms of the Árpád house red fabric	silk	silk	taffeta	36-40	36-40	Z	unspun
Lambel red fabric	silk	silk	taffeta	35-40	35-46	Z	unspun
Fragment with oak-leaf-and-flower patterns	silk	silk	taffeta	38-40	38-40	Z	unspun
Spearhead-shaped, acorn-topped fragment	silk	silk	taffeta	38-40	38-40	Z	unspun
Oak leaf insert for the spearhead-shaped, acorn-topped fragment	silk	silk	taffeta	35-40	50	Z	unspun

PRODUCTION TECHNOLOGY

Sample	Outlining thread for the overlay embroidery	Thread used to stitch the outlining thread	Sewing thread	Application	Quilt stitching	Suspending string
Silk Cloth	silk. unspun. red	silk, split strip, wound, S, red	silk, split trip wound, S ?	Horizontal and pinned fastening stitches	The face of the applied material is covered with fastening stitches	flax or hemp strip wound S
Fragment with oak-leaf-and-flower patterns	as above	as above	as above	as above		
Spearhead-shaped, acorn-topped fragment	as above	as above	as above	as above		

for the oak leaf insert, indicating the use of weld. Tests on a sample of the spearhead-shaped fragment proved unsuccessful in establishing any dye.

Conservation of the finds

Anjou Cloth

Wet cleaning

No surface-active agents were used to clean the Anjou Cloth, since no contamination justifying their use had occurred. Following its recovery, the cloth was immersed in water and disinfected for a period of 24 hours to remove mud and various vegetal remains. If the applied silk fabric had undergone another lengthy cleaning process, it may well have suffered further deterioration. For this reason the material was only moistened so that the wet fabric could be arranged according to its weave structure and original shape, as far as was possible in the case of such a crumpled and torn fabric. Deionized water was tamped on at this stage of the work, so that the artefact stayed as little as possible in a wet environment. The moistening took place on a polyfoam board[21] covered in foil, and an area of 20 x 20 mm was handled each time. All loose ends on the warp and weft, as well as the weave of the material itself, were set right and held in place with glass plates or entomological pins. Cold air was used to dry the cloth to avoid further fibre swelling. (Figs. 21a, 21b, 22)

Support

When making a choice for the support fabric and its colour, all materials and colours that were alien to the rules of heraldry were avoided. For support, the

FIGURE 21a Anjou Cloth as it is moistened and pinned in place

FIGURE 21/b Anjou Cloth, detail showing realigned silk weighted with glass plates and weights

FIGURE 22 Anjou Cloth, detail, as it dries to shape

FIGURE 23 Anjou Cloth, during conservation stitching cloth was mounted onto a polycarbonate[22] board of a size equal to the dimensions of the cloth. Silk crepeline[23] dyed black was applied over this, and after a stretching of the material a ribbon was stitched around its edge. The cut edge of the silk crepeline was fastened on the back of the polycarbonate sheet, so that material of the thin fabric was not exposed to damage, but would also be stretched evenly.

The size of the Anjou Cloth was marked out on the now crepeline-covered board with white thread. The transfer of the artefact from its position on the polyfoam to the board covered in crepeline was carried out in the following manner: a thick canvas was placed on the front side of the artefact, clamping it down tightly with the insertion of needles along the side; the cloth was then turned so its reverse side was uppermost; the needles holding the canvas were then removed. The polycarbonate board was placed on top, and the canvas was fastened on again, and turned over. By these means the large, tattered artefact could be moved to its destination without risk of damage or wrinkling.

Prior to conservation stitching, a grid was prepared from yellow silk thread for the horizontal and vertical lines of the diagonals of the coat-of-arms. This helped in aligning the fragments during conservation stitching.

First, the cut edges of the cloth were fastened to the crepeline with running stitches. In this instance a widely used technique of conservation stitching was discarded because the extremely fragile silk material would have torn along the minute stitches. Loose warp and weft yarn, as well as the torn edges were sewn to the crepeline with a running or where necessary the so-called 'laid and couched' stitch, using a yellowish brown, or reddish brown thread. (Fig. 23) After completion of the sewing work, the cloth was lifted off the polycarbonate sheet, the white ribbon removed from its edge and a trimming ribbon of black satin was sewn on after folding back the crepeline. Since it was impossible to place the transparent silk material upon the bare polycarbonate sheet, both sides were covered with a black cotton material that was sewn into place. The cloth was then replaced upon the covered sheet, pinned down along the black satin ribbon on the reverse, and after checking whether the tension was right, it could be sewn on to the black cotton material.[24] (Fig. 24)

FIGURE 24 Anjou Cloth, after conservation

Fragments with oak-leaf-and-flower patterns, and spearhead-shaped, acorn-topped fragments

Cleaning

The process of cleaning began with soaking in soft water, swabbing and brushing with small brushes. Cleaning was then completed on a back-lit glass table. The fact that the contour lines had kept together many of the pieces of the silk motifs that had fallen apart, was a valuable aid in recovering and rejoining the threads, following the weave in connected segments. (Fig. 25) After careful cleaning, realignment of the grain and readjustment of the contour threads in all pieces, they were dried on the glass sheet. The contiguity of pieces was established in the process, as they were easily placed where they belonged on the glass table while still wet. The pieces stuck slightly to the glass surface, so they did not deform while drying. (Fig. 26)

After joining fragments 1 and 2 of those with oak-leaf-and-flower patterns it became clear that very little was missing, giving it a priority for cleaning. After they had dried, an approximation of their original shape could be established; this was drawn on Melinex foil and helped in recognizing pieces of other fragments. Four of the fragments from the oak-leaf-and-flower patterns have the same pattern, and two show a mirror image where the flower bends to the right. By turning over the drawing made on the transparent Melinex, the pieces of the fragments with their flowers bending to the right could also be set aright.

The cleaning of the spearhead-shape, acorn-topped fragments was also carried out on the glass pane. Since the outline threads had been effective in keeping the pieces together, the realignment of the grain of the fabric was greatly helped by the back-lighting.

Conservation stitching

Before proceeding with the case of the fragments with oak-leaf-and-flower patterns, six sheets of poly-carbonate (each 400 x 400 mm), fitted with a card mount measuring 300 x 300 mm, were prepared. Then the panels were covered in silk crepeline, fastened at the back of the plastic sheet in a way that gave it an even tension over its surface so that it provided a satisfactory base for stitching. The silk fragments, which had been cleaned and dried to shape, and were still on the glass panes, could now be placed on the mounts. The transferral could only be carried out with utmost care, since the process of detaching them from the glass could have dislodged the carefully aligned small pieces and outlining threads. Accordingly, the transfer could only be carried out in steps. (Fig. 27)

First the adhesion between silk fragments and the glass was eliminated using a thin spatula. A glass pane of similar shape was then laid over the surface of the object, and both panes of glass, held tight against one another, were turned upside down. The pane previously below, was now above the object, and could be carefully lifted off. The silk fragment lay face down upon the second glass pane, so the cotton-covered polycarbonate sheet prepared earlier

FIGURE 25 Fragment with oak-leaf-and-flower patterns, cleaning on the glass table

FIGURE 26 Fragment with oak-leaf-and-flower patterns, realignment of the grain of the weave, shown on a glass table

FIGURE 27 Fragment with oak-leaf-and-flower patterns, during conservation stitching

FIGURE 28 Spearhead-shaped, acorn-topped fragments, after conservation

could be placed on to the reverse side. The glass and the prepared sheet were now turned over, so the glass was on top; the removal of the glass left the silk fragment placed on the crepeline ready for stitching.

All parts of the fragments were now secured in position onto the crepeline using entomological pins and small glass plates, necessary to ensure that no pieces would be moved by a chance flick of the hand or thread. Each fragment was sewn onto the stretched crepeline surface with silk thread that had been dyed brown. The fragments were secured by stitching the leaf veins first, so that their centres would be kept in place. The contour threads were stitched next; the tears and edges of holes were then secured, as necessary, with tiny stitches that held the embroidery by their span.

Finally, following their conservation, the silk fragments (each held by its supporting crepeline) were placed on a polycarbonate sheet covered in black jersey cotton, and their edges were sewn onto the back of this panel. The fragments with oak-leaf-and-flower patterns were sewn onto six separate panels, due to lack of certainty regarding their positions relative to one another.

The procedure for conservation stitching of the spearhead-shaped, acorn-topped fragments was the same as the one described for the flower patterned ones. In this instance the three fragments were stitched onto a single 600 x 800 mm sheet that had been prepared in advance, following discussions with museologists and the archaeologist. (Fig. 28) This of course does not signify any certainty that the original arrangement of the pieces has been found. Rather, having been built on scholarship, the form achieved meets the need to exhibit and present the objects in an aesthetically pleasing manner.

Summary and evaluation

Affinities between the silk fragments were discovered during investigations of their materials and manufacture at the Museum of Applied Arts. The ground material of the fragments is composed of unevenly woven silk taffeta, the warp and weft density is identical, and un-spun silk thread is used for the weft in both cases, while the applied embroidery used widely on medieval textiles can also be observed here. The slight difference in the depth at which they were found is no proof of their landing in the well at the same time, but the premise cannot be dismissed. It may even be argued that the Anjou Cloth and the silk fragments stood in close relation to one another. Since the exact dimensions of the original cloth cannot be ascertained, it is not out of the question that on its border it was decorated with plant ornamentation. Further research may provide answers to questions and surmises that arise.

A predilection for combining decorative motifs from heraldry and the use of stylized vegetal ornamentation is a trait typical of Hungarian Anjou objects.[25] These were discovered mainly upon medieval goldsmith's works, stone sculpture, miniatures and seals, with details repeated irrespective of the qualities of the object. These facts suggest that the objects emerged from the hands of the craftsmen working

FIGURE 29 Fragments with oak-leaf-and-flower patterns, after conservation

FIGURE 30 Seal of Charles Robert III, made by Petrus Simonis Gallicus in 1331

for the court under the same conditions.[26] Until now information about textiles at the Anjou court could be gleaned in the first place from the literature, the miniatures, the descriptions contained in medieval inventories and from seals.[27] Since there was no extant textile of the time, the Anjou Cloth is the first textile artefact to provide evidence for the use of heraldry as a widespread fashion.

Establishing whether the designer and producer of the Anjou Cloth was a master craftsmen of the city or a hired artisan, or establishing the environment in which this work was undertaken, is impossible due to lack of information. Cloths similar to the Anjou Cloth are, however, portrayed in the background of a number of seals from the Anjou period. The double seal of Queen Elisabeth (1338)[28] and the royal seal of Lewis II the Great (1368)[29] show a very similar cloth, but the double seal of Charles Robert III, which is a major miniature sculpture not only on a Hungarian but also on a European scale,[30] shows the one closest to it in likeness. (Fig. 30) The seal was made by Petrus Simonis Gallicus in 1331 to replace the lost second seal of 1330. This is the only verified work of the Master from Siena. Charles Robert used the seal until the end of his life; he died on the 18th of November 1342.[31]

The similarity between the seal and the silk finds cannot be a coincidence. The goldsmith portrays a line of coats-of-arms on the drapery at the back of the throne that is identical to the Anjou Cloth except that the lambels are missing; even the number of coats-of-arms is the same. A characteristic plant motif, bending on opposite sides on the side of the cloth, is also portrayed; this shows extraordinary similitude to the other fragments recovered in the excavation.

Various workshops and artists of the time must have worked in the immediate surroundings of the king, and in close association with one another. There are examples of the same artist designing both metalwork and textiles, and even overseeing production.[32]

There is no way to prove that Petrus Simonis Gallicus designed the Anjou Cloth, or that he used the cloth already in possession of the king for a background, without any data to this effect. For similar reasons, the place where the cloth may have been made cannot be established. In any case, the original view provided by a quilted cloth of appliqué embroidery is remarkably similar to a goldsmith's work with an embossed design and a punched background by virtue of the materials and techniques used in their creation.

Endnotes

1 Bencze Z., 'Layers of the past', *Hungarian Museums 8*, no. 2002/2: 34-5.

2 Records of the site where the Anjou Cloth was found: K/4825, 1999.10.04. szp. 147 m, K/4923, 1999.10.08, szp. 147.7 m. Records of the site where the oak-leaf-and-flower patterned fragments and the spearhead-shaped, acorn-topped fragments were found: K/4882 and K/5016, 1999.10.07.12, szp. 146 m.

3 Participants in the preliminary cleaning were: Judit B. Perjés and Márta K. Bendefy, Judit Benda, Eszter Kovács and András Végh.

4 An Alcyl-dimethyl-benzil-ammonium-chloride disinfectant (Dodigen 226) that had been used to good effect since 1996. See Perjés J.B., 'Women's Shoes from the Crypt of the Dominican Church in Vác', *Conservation Around the Millennium*, Budapest, 2001: 100-1.

5 In environmental conditions of 18°C, 50-52 RH%.

6 Members of the Committee included: Dr. Sándor Bodó. Director; Dr, Katalin Dózsa, Vice Director; Dorotty Nyékhelyi, archeologist; Zoltán Bencze, Head of the medieval department; Dr. András Végh and Dr. Károly Magyar archaeologists; and Judit B. Perjés Head of the restoration department from the Budapest Historical Museum; Dr. Ernő Marosi, Professor and vice-chairman of the Hungarian Academy of Sciences; Dr. Walter Endrei, historian of textiles; Ágnes Timár-Balázsy, Professor and textile chemist from the Hungarian National Museum; Dr. Zsuzsa Lovag Director; Katalin E. Nagy, textiles restorer from the Museum of Arts and Crafts; Dr. Csanád Bálint, Director of the Institute of Archaeology of the Hungarian National Academy of Sciences; Dr. Imre Holl and Katalin Gyürky-Holl, archaeologists.

7 Dr. Katalin Dózsa, Dorottya Nyékhelyi, Bencze Zoltán, Zsidy Paula (Budapest History Museum) Emőke László, Dr. Emese Pásztor, Márta Tóth, Anikó Pataki, Katalin E. Nagy (Museum of Applied Arts), Dr. Ágnes Timár-Balázsy (Hun. National Mus.), Dr. Walter Endrei (Hun. Acad. Sciences) were present at the meeting on the 20th of September 2000.

8 Work began on 1st Nov. 2000, and was completed on the 28th of June 2001.

9 A Lambel (Turnierkragen, tonagallér) is a free floating swaddle-cloth whose lower side is mounted. It is usually placed at the head coat-of-arms. Its shape is reminiscent of a rake without a handle. (Oszkár Bárczy, *The handbook of Heraldry* [in Hungarian], Budapest, 1897: 93.)

10 Emőke László, *The Art of Embroidery* [in Hungarian: Hímzőművéstet]. *Book of Antiquities* [in Hung.: Régiségek Könyve]. Ed Pál Voit. 312. Budapest, 1983.

11 Scheller, W. Robert, *Model-Book Drawings and the Practice of Artistic Transmission in the Middle Ages*. (ca. 900- ca. 1450) Translated by Michael Hoyle, Amsterdam University Press, (1995): 70.

12 Staniland, Kay: *Embroiderers*. Toronto, (1991): 30.

13 Philippa of Hainaut (b. ca.1314, d. Aug. 15, 1369) Queen Consort of Edward III, King of England.

14 See note 12: 28.

15 The Craftsman's Handbook '*Il Libro dell'Arte*', Cennino d'Andrea Cennini, Translated by Daniel V. Thomson, Jr. Dover Publications. JNC. New York (1960): 104-5. 'Take tailors' chalk, and make little pieces of it neatly, just as you do with charcoal; and put them into a goosefeather quill, of whatever size is required. Put a little stick into this quill, and draw lightly. Then fix with tempered white lead.'

16 Op. cit. p.116. 'Take a stretcher made as if it were a cloth-covered window, four feet long, two feet wide, with linen or heavy cloth nailed on the slats. When you want to paint your linen, roll up a quantity of four or fourteen yards all together, and lay the heading of this cloth over the stretcher. And take a block of either nut or pear, as long as it is good strong wood, and have it about the size of a tile or a brick; and have this block drawn upon hollowed out a good line deep; ... When you are going to work: Have a glove on your left hand; and first grind some vine-sprig black, ground very fine with water, then thoroughly dried either by sun or fire, then ground again, dry; and mix it with as much liquid varnish as may be required; and take up some of this black with a little trowel, and spread it out the palm of your hand, that is, on the glove ... And underneath the stretcher take a porringer in your right hand, and with the back, rub hard over the space occupied by the incised block.' Going on to describe the use of other colours apt for use with textiles.

17 Feldhaus, F.M.: *Die Technik der Vorzeit der Geschicshtlichen Zeit und der Naturvölker.* München: 106, 1034.

18 Dr. Márta Járó and Miklósné Gál, of the ELTE TTK Minerals Department, carried out the examination of the material used for tracing. Procedure: SEM microanalysis of the surface of the sample. Results: The sample contained silicon, sulphur and calcium. Conclusions: none of the minerals, silver, tin or lead, which had been raised as possibilities earlier, were found on the sample.

19 Analysis undertaken by Dr. Ágnes Timár-Balázsy, the colour tests were carried out at the Laboratory for Examination of Materials and Technologies at the Institut Royal du Patrimoine Artistique of Brussels enabling HPLC analysis. We would like to thank Dr. Jan Wouters, Head of Laboratories, and Ina Vanden Berghe, Textiles engineer, for carrying out the examinations.

20 The wet mud had shown an alkalinity of pH 9 when recorded.

21 Made of polystyrene.

22 2600 x 1300 mm Type: LTC 10/2 RS/10 of opal colour, and environmentally friendly material.

23 The transparent silk material was chosen so that the reverse side of the cloth was open to investigation in later stages.

24 The textile restorer of the Museum of Applied Arts, Anikó Pataki, also took part in the work of sewing restoration.

25 Marosi, E., 'Art in the fourteenth century at the Hungarian court, and in Central Europe'. *Art in the Age of Louis I,* 1342-1382. Budapest, 1982. (Ed.: Ernő Marosi, Melinda Tóth, Livia Varga.): 59.

26 Kovács, É., 'Anjou representation: Goldsmith's work', op. cit.: 94.

27 Dercsényi, D., *The Age of Louis the Great,* Budapest: 157-8.

28 Marosi, E.: op. cit.: 144.

29 Marosi, E.: op. cit.: 146.

30 Marosi, E.: op. cit.: 135.

31 Marosi, E.: op. cit.: 143

32 Christie. A. G. I., *English Medieval Embroidery*. Oxford, 1938: 18.

2

The crypt of the former Dominican Church, now known as the White Church, on the main square of Vác, served as a burial place for upper-class citizens and the clergy between 1731 and 1808. Walled up and later forgotten, the passage leading down to the crypt was only discovered during renovations at the church in the autumn of 1994. (Fig. 1) Due to the urgency of the rebuilding work, it was impossible to avoid emptying the crypt, which was tightly packed with coffins, and discontinuing the burial place. The Tragor Ignác Museum of Vác organized a team of museologists, conservators and anthropologists to bring the rescue excavation to a conclusion as soon as possible.[1] With the wealth of finds discovered in the crypt, it is to date the largest Hungarian burial crypt dating recent times to have undergone a comprehensive, scientific excavation, considering both the number of coffins found and the period of time over which the burials had occurred. Similar sets of contemporaneous finds have been deposited in museum collections from the crypts of the Rosalia chapel of Eger in 1952 and the Saint Elisabeth church of Gyöngyös excavated in 1993.[2]

JUDIT B. PERJÉS, EMIL RÁDULY AND MÁRIA ÚJVÁRI

Excavation of the crypt of the Dominican Church in Vác:

PRESERVING COFFINS, DRESS AND OTHER FUNERARY PARAPHERNALIA, 1731-1808

A unique opportunity presented itself to document every discernible detail of a practically undisturbed crypt, and to deposit the complete group of finds, which were to be removed from the burial place, in museums for further treatment. Coffins, sets of clothes and burial paraphernalia went to the collection of the Tragor Ignác Museum, while the remains of the circa 300 buried corpses were deposited in the Anthropological Collection of the Hungarian Natural History Museum. Close anthropological and pathological study of the mummified bodies provides information about the health, lifestyle and the acquired or inherited diseases present in eighteenth-century Hungarian society.[3]

Monks of the Dominican order settled in the city in 1699, and immediately set about constructing their monastery and a small church with a crypt in the main square. Taking the cue from the monks' clothing, the popular term for the church became the 'church of the white ones'. Three years later, the monastery of Vác became a convent, and work on the extension of the church began; a new tower was raised, with a large crypt below with an entrance from outside. The church was widened between 1746 and 1755, which entailed the partial alteration of earlier existing crypts as well. The old cellar under the new side-chapel of the church was also used as a burial crypt from that point onwards.[4] (Figs. 2 and 3) Despite Royal decrees which regulated or rather forbade the use of communal crypts without dividing walls for general health considerations, the crypt in the Dominican church of Vác continued in use until

FIGURE 1 A detail of the crypt before excavation

FIGURE 2 The Dominican Church of Vác

1808. A few burials were also admitted in later years, until the early 1840s. Burial in the crypts of the holy orders became common practice during the seventeenth and eighteenth centuries in Central European cities.[5] Apart from monks and priests, this form of burial was an option for their family members, donors to the establishment and well-to-do citizens. It was an expression of the heightened religious propensity characteristic of the baroque period.

Excavation

In the crypt of the Dominican church, coffins were placed tightly against one another, piled four or five rows high, with the feet usually pointing towards the wall. The bottom row was placed directly upon the brick paving. (Fig. 4) As more burials took place, an effort was made to place the larger, heavier coffins lower down, so that close relatives who had died at great intervals of time sometimes came to lie next to one another. There was such a great demand for burials in the crypt over the years that by 1808, the final year of its continuous use, even the corridors were jam-packed with coffins. The entrances to the crypts were permanently walled up at the end of the nineteenth century. This ensured that the burial place remained undisturbed and did not suffer any subsequent damage of note.

In the crypt under the tower, 152 coffins were excavated; 110 came from under the side-chapel, along with the remains of another 40 deceased in the bone repository. Some 166 persons were successfully identified by name with the aid of Hungarian,

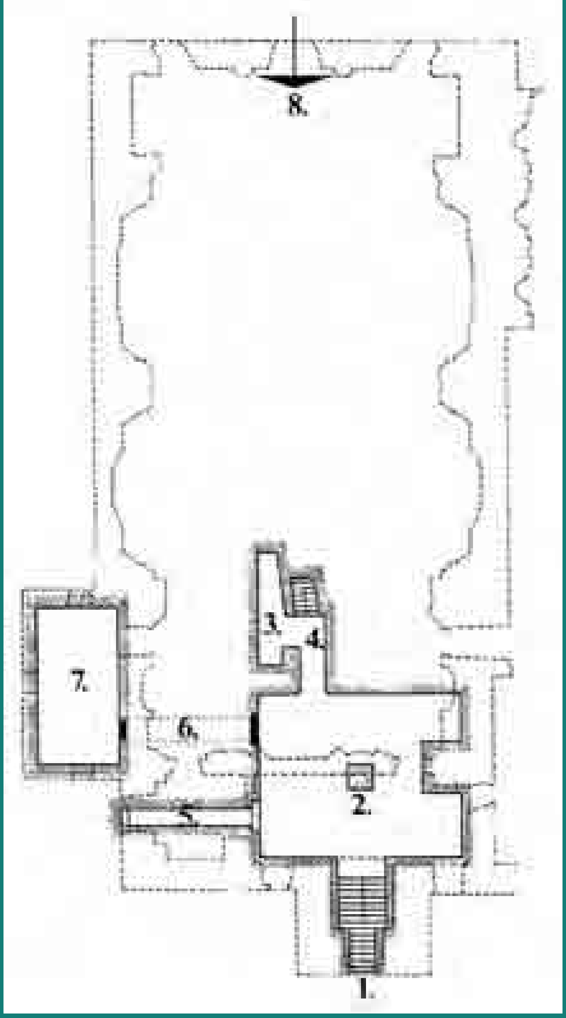


FIGURE 3 Plan of the church crypt

FIGURE 4 Detail of the crypt before excavation

FIGURE 5 Painted coffin before opening

FIGURE 6 Excavation of the coffin of a young woman, 1795

Latin or German inscriptions and records from the death register. Coffins without inscriptions were mostly those of monks, priests or children. The ideal microclimatic conditions of the crypt ensured that most of the corpses were either completely naturally mummified or part-mummified. The paraphernalia, clothes and funeral requisites were also preserved in large numbers and in good condition, often even having kept their original colour. (Figs. 5-10) In the cellar of the side-chapel, however, which was exposed to weather conditions and permeating dust, and in the ill-ventilated depths of the corridors or lower rows, the processes of decay took their toll upon the contents of the coffins.[6]

Apart from the urgent construction work, an important consideration in the choice of time for the excavation was that it had to be completed during the winter season. This time-frame ensured the least difference between temperature and moisture levels within the crypt and in the outside environment into which the objects would be lifted. Irreversible damage might have been caused to the organic finds had there been a sudden environmental change. This left only a few weeks for the work. Members of the team had to prepare for unfamiliar work, and the necessary materials and tools had to be procured within this time-frame. Special attention had to be paid to the acquisition of personal protective equipment and its proper use. Microbiological tests carried out repeatedly during the excavation did not reveal the presence of any organisms that might threaten the workers' health. (Figs. 7-8)

To help record observations in the greatest possible detail, a data sheet for documentation

FIGURE 7 Preliminary cleaning of finds during the excavation of the crypt

purposes was prepared in advance, and completed parallel to the ongoing excavation. The data sheet was modified on the basis of experience gathered in the first few days of the excavation. From there on, data was gathered according to a comprehensive set of reference points for each coffin. Colour photographs complemented written documentation. Work was carried out with the involvement of the least possible personnel and only the absolute minimum amount of light needed in order to protect the original condition of the crypt's microclimate.[7] In the final stage of work, a detailed film was also made to document the methods implemented.

The work of conservators and museologists inter-linked closely during this excavation. The initial cleaning and dusting of coffins preceded the photo session, since the thick layer of dust completely obliterated all ornamentation and inscriptions. Removal of the huge amounts of dust was done with a vacuum-cleaner and a soft brush, while a water-based solution of ethanol, ranging from 30% to 50% w/v depending on the condition of the coffin, was sprayed over it as an initial disinfectant. The excavation of the coffins took place layer by layer, and was accompanied by detailed photographic and written documentation. The packing of items of dress and burial paraphernalia followed after preliminary cleaning. Every object had to be freed from clinging dirt by means of a brush, low-power vacuum cleaning or tweezers. A variety of cloth remains were spread out on large wooden trays especially prepared for their temporary storage. (Fig. 11) Remains from each individual coffin were generally placed in a single tray or box during packing. Wherever possible,

FIGURE 8 Preliminary cleaning of the finds during the excavation of the crypt

FIGURE 9 Corpse of an older man, dressed in silver- laced dolman with open collar-ruffle

FIGURE 10 Excavation of the coffin of a middle-aged woman

FIGURE 11 Intermediary storage of material finds after excavation

these were also sorted by material to facilitate conservation treatment. A gauze-like, acid-proof foil was used for packing. This was suitable for filling gaps in and between objects, as well as for stuffing fragile objects (such as silk clothing, shoes with leather or cloth uppers and bonnets) so they would not be crushed. Any objects that seemed moist were either packed with an antiseptic material, or their packing material was impregnated with disinfectant.[8] An immediate, on-site reinforcement of paper objects, especially devotional pictures, was necessary to avoid the continued disintegration of these small pieces until their proper restoration could be managed.[9] Objects thus prepared and packed for transportation stayed in the crypt for another few days, and were then taken to a storage space with similar temperature and humidity, for an initial safekeeping period of several months.

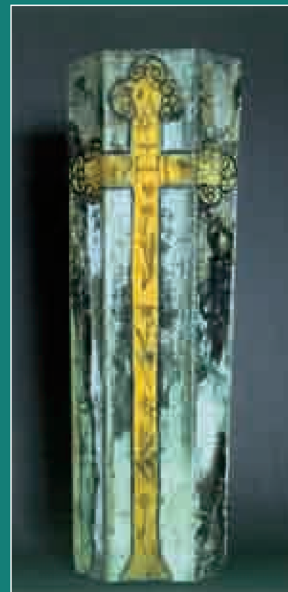
The finds

As a result of the excavation, around 1,500 pieces were added to the collection of the Vác Museum. Among them, one might especially mention 169 different, highly ornamented coffins, 150 rosaries and 60 crucifixes, also of great variety. The main part of the collection is made up of pieces of apparel or their fragments, along with a mass of burial paraphernalia made from textiles.

Sixteenth- and seventeenth-century Hungarian historical sources often mention coffins coated in canvas or silk and studded with decorative nails. Coffins dating to the 1790s, such as these, can also be found in the crypt of Vác, but only in limited numbers. (Fig. 12) The cloth-covered coffins were mostly of a dark colour for adults, and green or white for children. Masters of the local carpenters' guild made them. They, or their relatives, also carried out painting and ornamental work, with attention to customer needs and the dictates of tradition. A gradual modification in the ground colour and the character of the ornamentation can be observed over the hundred years of the crypt's usage. Meanwhile citizens arrived in Vác from different regions of the country; of different national backgrounds, these newcomers also contributed to the variety in colour and ornamental motifs used on coffins buried at the same point of time. Styles imported by settlers of German, Austrian and Czech descent had a determinant role.

Until the 1760s, a green colouring, to be followed later by blue, marked children's coffins. (Figs. 13, 15) The coffins of adult married men or women cannot be distinguished on the basis of colour or ornamentation. The earliest ones were painted with wood dye, and their ornamentation was also simple, with black foliage and stylized tulips or floral designs. A coloured ground becomes popular only from the 1750s. First grey and later yellow becomes the usual colour, to be followed by brown at the end of the century. The decorative motifs are also of an increasing variety, and of greater naturalism, with the simultaneous use of a diverse array of colours characteristic of the latest coffin made. (Figs. 13-4) A crucifix is found on every coffin, with the possible accompaniment of other symbols indicating a particular branch of Christianity. Hand and feet stigmata appear at first; complete portrayals of Christ become frequent from the middle of the century, some of them worked by skilled artistic hands. Inscriptions (Memento Mori, Venit Hora) and emblems (hour-glass, broken candle, skull, spade and hoe, owl) on the coffins refer to death and the inescapable fact of impermanence, and reflect the religious worldview of the baroque period. Yet this is accompanied by a rich diversity of colour; a variety of floral patterns, ornamental foliage and wreaths, as well as the harmony of composition, which testify to the spirit and good faith of the relatives of the deceased. (Figs. 16 and 28)

Inscriptions found on the coffins also afford a chance to observe the situation at that time with regard to ethnic background and language use. The dominance of Latin as the literary language of the time asserts itself in the language of choice for the inscriptions as well; inscriptions in Hungarian were particularly scarce, really coming into play only from



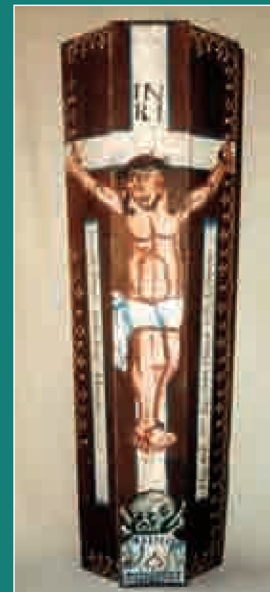


FIGURE 12 The crypt with painted and covered coffins in their original position

FIGURE 13 Painted coffin of a child, 1751

FIGURE 14 Painted coffin, 1808

FIGURE 15 Painted coffin of a child, 1790s

FIGURE 16 Exhibition of the works of the restoration course (summer 1995)

the first decade of the eighteenth century. Many citizens of the city were of German background, a fact reflected in the number of coffins inscribed in German, as well as the rolls of names of people buried in the crypt. Mass migration in the eighteenth century was directed into the regions that had been depopulated by the Turkish wars so that cultural factors and traditions also led to a mingling of customs.

The great number of finds made the involvement of workers from other museums imperative, and a wide-scale co-operation of experts evolved. An example of this was the organization of ‘summer camps for conservator volunteers’ in 1995. Two more followed over the years. The temporary exhibition, organized as early as 1995 by the Museum of Vác to draw the public’s attention to the significance of the finds, was a direct result of this work. (Fig. 16)

Burial paraphernalia found in the coffins provide evidence for a profound religious feeling in eighteenth-century society. A rosary with a crucifix was placed in the hand of every single deceased person. (Fig. 17) That devotional societies operated in this section of the town at the time is indicated by the scapular devotional pictures (symbols of affiliation to a religious order, often consisting of two small rectangles of woollen cloth, joined by tapes passing over the shoulders) and waist-cords. Sources first mention the Society of the Rosary in 1720. The promulgation of the use of the rosary is traditionally attributed to the Dominican order. Tokens, relics, and wooden or mother-of-pearl inlaid crucifixes from Jerusalem, medallions brought from pilgrimages to the Holy Land, from shrines of the Virgin Mary and other places of pilgrimage are typical of the period. Most crosses, crucifixes and other objects of piety would have been in use for a long time before burial. Yet some of them, like the wax crucifix, should be considered a funerary requisite. (Figs 18-19) The variety and fine execution of the objects are proof of the high standards of workmanship reached in European mass production workshops.

Beyond the burial and funerary customs of the eighteenth century, the excavation also made it possible to see the dress of the middle classes. Most of those buried were put to their final rest in their own richest attire. Women and children were always laid to rest with a bonnet, men usually with bare heads, sometimes with a knitted nightcap, and rarely with a hat. (Fig. 9) Young girls, women and children were decked out in ribbons, flowers, both natural and artificial, in a girl's Hungarian head-dress and wreaths in even greater abundance. (Fig. 20) Even youths wear small wreaths, usually woven of a rosemary branch, placed on the head. Women are dressed in a variety of clothes: shirts and aprons made of fine woven cambric; skirts are of woven or colourfully printed material; and, kerchiefs, blouses and ribbons made of silk. Men are dressed in close-fitting tunics and broadcloth trousers with ornamental

FIGURE 17 Rosary with cross, 1772

FIGURE 18 Wax crucifix, 1774

FIGURE 19 Wax crucifix, 1841

FIGURE 20 Conserved head-dress of a girl, 1784 strings and buttons, or a long gown fastened at the front with hooks and eyes or buttons.

Wool stockings were pulled on to the corpses in most cases, but in rare instances we find leather foot-cloths, boots and even shoes in the case of priests. Leather foot-cloths were typically Hungarian footwear, with short legs reaching above the ankles, stitched from three or more pieces of soft leather, laced on the inner side and without heels. Such footwear was widely worn in the sixteenth and seventeenth centuries. An iron-heeled shoe, called a slipper because of its low sides and heel, also went with it.[10] (Fig. 21) According to the records, the leather foot-cloth was no longer everyday wear in the eighteenth century. It was primarily a piece of funeral costume.[11] The colourful and ornamented women's and children's shoes always followed the Western European fashion of the day, with uppers made of leather or cloth. The fronts of the shoes were decorated with copper spangles and pleated silk ruffles. The slippers were similar to ladies' shoes in both shape and style.[12] (Figs. 22-4)

Many were buried in a funeral tunic, a cloth that symbolized full apparel, and as a consequence became a burial accessory. The tunic's size and pattern were in fact prescribed by the Hungarian tailors' guild of Vác in 1961.[13] In any case, grave clothes differed from everyday dress to a significant degree, as they represented festive wear. Due to difficulties with clothing corpses, the attire of the deceased would often be left incomplete. This explains the fact that shoes were often missing, or certain pieces of cloth were just laid over the body.

Thick layers of wood shavings were strewn under the burial sheet, and shavings filled the funeral pillow as well. A wide border of bobbin lace sometimes decorated the edge of the funeral sheet near the head of the deceased. Before the coffin was shut, the corpse was often covered with a funeral shroud of silk, cotton, wool or linen. The edge of the

CLOCKWISE FROM UPPER LEFT

FIGURE 21 Restored leather leggings, 1764

FIGURE 22 Pair of lady's shoes prior to conservation, 1808

FIGURE 23 Shoes of a child after conservation, 1801

FIGURE 24 Shoes of a child after conservation, 1805

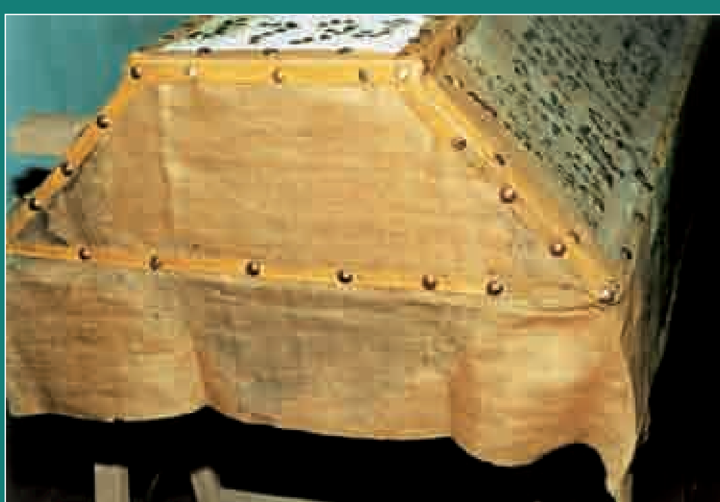


FIGURE 25 Restoration of painted coffins in the exhibition hall of the museum

FIGURE 26 Conservation of a painted coffin

FIGURE 27 Detail of a coffin from 1791, after conservation

shroud that remained outside the closed coffin was decorated, e.g. with rosettes.

The extant pieces of clothing in good condition make up forty sets of what may be considered full costumes. These are of special significance because until now sources for the study of the history of dress in the eighteenth century have depended on pictures and archival data. There are very few surviving items of dress, and these are mostly of aristocratic court fashion. Portrayals also only deal with over-clothes. It is easy to suspect that these are idealized, at least in part. Major parts of the substantial archival material available on the subject are difficult to interpret without knowledge of the objects themselves. The finds from the crypt, in good condition and accompanied by the investigations carried out during the excavation, ensure a wealth and detail of information that may be likened to recent ethnographic collections of data. These not only deal with particular items of dress, but also with entire sets of clothes: from headgear to footwear, outer clothes to underwear.

The varied material of the finds provided an opportunity for students to join the work during their conservation training. Participation of students from the Object Conservation Department of the Hungarian Academy of Fine Arts in the rescue work was made possible either through group exercises on site, or in the form of individual examination pieces. (Fig. 25)

Cleaning and conservation

The coffins

The layer of paint on most painted coffins had crumbled and become powdery. Removal of a thick layer of dust and other dirt had to be done mechanically, before proceeding to fix the paint. A polyvinyl-butyral or polyvinyl-butyroacetate solution (5%) in ethanol worked best as fixative coating. (Figs. 26 and 28)

The cloth- covered coffins demanded a special conservation method. It was not possible to carry out their cleaning, conservation and restoration by types of material because the coffins would have suffered further damage through the disassembly that would have been required, and even destruction of the cloth, which was already in a ragged and decayed state. There was a need to devise a way of going about handling the object that would circumvent the removal of the nails and textiles from the coffin's pine boards, which were themselves in fine condition.[14]

A separate work plan was prepared for conservation of the 75 cloth-covered coffins with overhanging drapery. This specified the coffins that were definitely in need of conservation, the most characteristic pieces

FIGURE 28 Painted coffin with inscription, 1766

FIGURE 29 Reconstruction of the crypt in the exhibition

in the class of object dealt with here. A schedule for their cleaning, conservation and storage was prepared. An investigation into the condition of each object was made, as the material and condition of the object were considered to be the most decisive factors in determining the conservation treatment. Cleaning followed by hand, using brushes and the suction of a vacuum cleaner applied with maximum care and through a fine net covering. Then the overhanging drapery was laid out and the dust was removed by similar means. The cleaning of the textile cover was carried out with an upholstery vacuum cleaner and a cleaning solution made with softened water. Mechanical cleaning of the copper-topped nails came next. The surrounding cloth was protected so it would neither be damaged nor smeared with the corrosion products being removed. To help legibility of inscriptions, the missing nails were replaced with nails prepared according to the original manufacturing technology.[15] Where possible, the conservation and restoration of the textile itself took place with conservation stitching. In each case of repair to overhanging drapery, the treatment was successful, for these could be laid out flat. Crepeline dyed to a suitable colour was used as a support material, and linen canvas of an identical weave was used for infilling. Silk thread was used to attach the support, with a laid stitch.

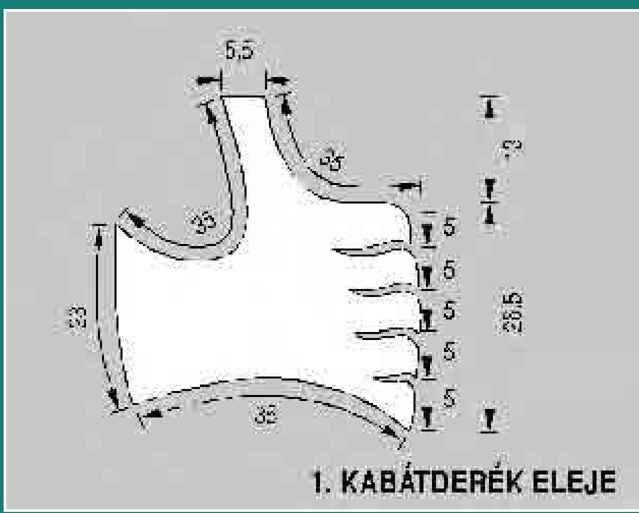
Filling losses in the material nailed to the boards proved to be a greater challenge. In the case of silk materials, the fills were usually successfully applied by conservation stitching. The linen canvas had by its decay become too weak for stitching. In such instances the areas missing between the nails had to be in-filled by cutting out the new material (dyed the right colour), with extra material left around the edge. A pH neutral water-based dispersive adhesive was spread on the edges of the insert, which was then stuck on the wood under the original material with the warp of the cloth running the same direction. The loose threads of the original material could then be attached with a minimum application of adhesive.[16] (Fig. 27)

The textiles

The textiles retained their original colours in all but a few cases. Textiles prepared from vegetable fibres were in rather good condition compared to those made of fibres of animal origin.

The germicidal cleaning of clothes and other textile articles began a few weeks after excavation, with fears that the mould spores on them, and microbes breeding within the organic remains, would activate on contact with a changed environment, and trigger the process of decay.[17] While the pieces of cloth that had become hardened due to body-fluids were being moistened through a mesh, most of the remains of putrefaction and larvae passed out with the polluted water. The cloths were dried on polystyrene sheets covered in polypropylene sheeting.

Some parts of the garments, however, could not be exposed to wet cleaning. Their material was so complex and fine, and their condition so precarious,



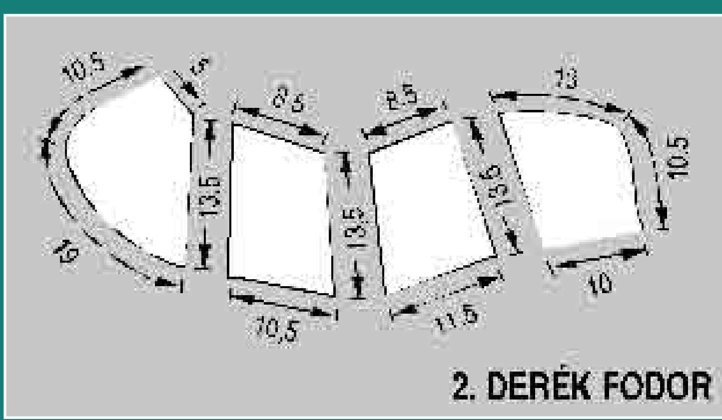


FIGURE 30 The silk bodice of Barbara Kiss from 1780, after conservation

FIGURE 31 Pattern for the 1780 bodice

FIGURE 32 Pattern for the side panels of the 1780 bodice

FIGURE 33 Pattern for the back panel of the 1780 bodice

that this had to be avoided. Examples included children's and women's bonnets, where the cleaning was carried out mechanically, using brushes. These bonnets were lined (padded) with acid-free gauze permeated with germicides, and they maintained the condition in which they were found for many years. The bonnets were usually made with quilted cotton (piqué), silk or cambric, decorated with lace edges and silk ribbons or tulle frills.

The restoration of the textiles took place with concern for the interest shown in them, and the requirements set by their exhibition in both Hungary and elsewhere. Apart from a few dress accessories and some textile funeral requisites, a woman's complete costume was restored. In addition, the reconstruction of a woman's costume, and the grave-clothes of a man and a child, was also completed. The large quantity of finds meant that all-inclusive conservation and restoration was not possible. The finds were made available for research and some of the costumes were surveyed by professional conservators. Thus the patterns for the clothes could be processed through a computer programme.[18] As a result the exact description, size and pattern of some costumes was made available. Using these aids, authentic reproductions can be produced for exhibition purposes. (Figs. 30-3)

Leather objects

The number of leather articles of clothing is not significant in comparison to those of textile. Their conservation and restoration went ahead at a comparatively quicker pace for this very reason.[19] (Fig. 34) Cleaning and disinfecting of alum-tawed leather, sensitive to water, was carried out with an emulsion of perchloroethane and sulphated neatsfoot oil in the ratio of 3:1. Water, to which a non-ionic detergent

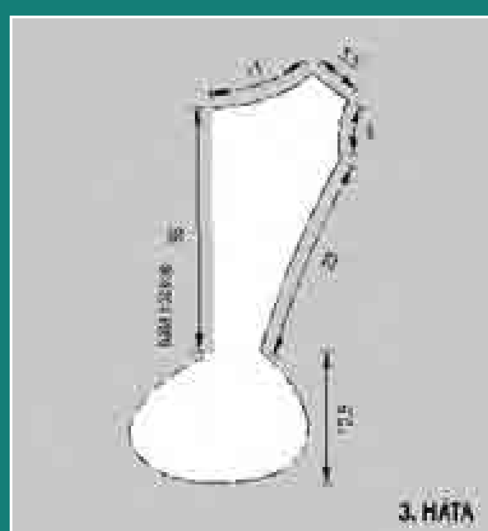


FIGURE 34 Men's boots, 1806, after conservation

FIGURE 35 Pair of leggings with knee-guards, after conservation

had been added, was used to clean the vegetable tanned leather.[20] Depending on the condition of the objects a water-based solution of polyhydric alcohols (glycerol, sorbitol, PEG 600), and various mixtures of sulphated neatsfoot oil -lanolin, cetyl-alcohol and t-Butanol were used. After drying to shape, the stitches that had weakened or broken were re-stitched, and missing parts replaced with identical leather glued on.[21] Crepeline supporting material and modified cellulose glue was used with sewing conservation when textile-topped shoes were being 'completed'. Metal ornamentation, buckles, and copper spangles were best cleaned mechanically. Attention had to be paid to leaving signs of wear untouched. Shoe-trees were prepared for the storage of all treated shoes, so their stability would be ensured over time.[22]

The restoration work on a pair of gaiters with knee-guards, whose mode of manufacture was previously unknown to the team, required a special solution. This is its first occurrence in sources on Hungarian costume history of the eighteenth century.[23] The gaiters were found in the bone repository in poor condition: in pieces, torn and with areas of loss. After conservation in a solution of glycerol and water, the gaiters were dried slowly at room temperature, between sheets of blotting paper. Before beginning restoration, analogies had to be found for the reconstruction, so it would take place with full awareness of its original form and manufacturing methods. The conservator first glued into place the parts that had come apart in sheets, using thin glue. The weakened or torn parts were secured by gluing in vegetable tanned calfskin. Finally the segments were sewn together along the holes left by the original stitches. (Fig. 35)

A permanent exhibition under the title 'Memento Mori' opened in the summer of 1998. It was set in three halls of a fourteenth-century cellar on the main square of Vác and in the vicinity of the Dominican church, which had been the excavation site. The exhibition provides an overall view of the decoration of the coffins and the funeral accessories. The most typical costumes and burial customs are also presented. (Figs. 29 and 36)

FIGURE 36 Memento Mori Exhibition. Finds from the crypt of the White Friars Church of Vác

Endnotes

1 The leaders of the museology work team were Emil Ráduly (Ethnographic Museum, Budapest) and Márta Zomborka (Tragor Ignác Museum, Vác) and in conservation, Judit B. Perjés (Budapest Historical Museum) and Mária Újvári (Tragor Ignác Museum, Vác), with Dr. Susa Éva as expert advisor in anthropology. A detailed description of the circumstances of the excavation is available in: Zomborka, Márta: Az előzmények és a feltárás [The Precedents and the Excavation]. *Magyar Múzeumok* 1996/1: 3-7, and Ráduly, Emil: A váci fehérek temploma kriptafeltárása [The Excavation of the Crypt of the Premonstratensian church of Vác]. *Műtárgyvédelem* 1997/26: 21-27. Work continued through November 1994 to early February 1995; another section of the crypt (discovered later) was excavated in May 1995.

2 Ember, V. Mária, Az egri Rozália-kápolna textiljei [Textiles from the Ralia chapel of Eger]. *Folia Archaeologica* 9 (1957); 219-236. Ember, V. Mária, Az Egri Rozália-kápolna cipői. *Folia Archaeologica* 13 (1961): 251-268. B. Gál, Edit, Szilcz, Ágnes and Deák, Endre, Életmód és temetkezési szokások Gyöngyösön a 18. század végénés 19. század elején [Life style and burial rights in Gyöngyös in late 18th and early 19th c.]. *Mátrai Tanulmányok* 1995: 29-49.

3 Susa, Éva, Pap, Ildikó and Józsa, László: Váci múmiák antropológiai vizsgálata [An anthropological investigation of the mummies of Vác]. *Magyar Múzeumok* (II évf.) 1996/1, pp. 14-16. Pap, I., Susa, É., Józsa, L.: Mummies from the 18th-19th Century Dominican Church of Vác, Hungary. *Acta Biologica Szegediensis*, 42 (1997): 107-12. Szikosy, I., Bernert, Zs., Pap, I.: Anthropological investigation of the 18th-19th Century ossuary of the Dominican Church at Vác, Hungary. Acta Biol., 42 (1997): 145-50.

4 Karcsú, Antal Arzén: *Vácz város története*, 8. köt. [History of the city of Vác, vol. 8]. (1887): 139.

5 Johnova, Helena: Barokk koporsók díszítményei a cseh területen [Ornamental work on Hungarian coffins in the Czech Republic]. *Magyar Múzeumok* (II. évf.) 1996/2: 64. Mais, Adolf: Die Gruftbestattungen zu St. Michael in Wien, *Kultur und Volk*, V., Wien (1954): 245-72.

6 The tests and culture of samples were carried out at the National Centre of Traumatology.

7 According to the technical examinations conducted by the Department of Meteorology at the Eötvös Lóránd Academy of Sciences, the temperature in the crypt was 8-11°C, air pressure was 109 hPa, and RH ranged between 85-90%.

8 Substances used for disinfection and killing of spores: Sterogenol (ethanol and water solution of 0.02-0.05% with cetylpiridinum-bromide) and Preventol CMK (p-Chloro-m-Cresol 0.05-0.1% in Ethanol).

9 Mounting onto rice-paper with an adhesive solution of water and 5% ethanol with Klucel M (hydroxy-propyl cellulose).

10 *Magyar Művelődéstörténet III*. (ed.: Sándor Domanovszky): 365-372, ill. 24. Radvánszky, Béla: *Magyar családélet és háztartás a XVI-XVII. században* [The Hungarian Home in the 16th and 17th c.]. Budapest (1986): 117, ill.

11 Schramm, Ferenc: Vác népének szellemi kultúrája 1686 és 1848 között [The cultural spirit of the people of Vác between 1686 and 1848]. *Levéltári Szemlem* (1963/3): 581-627, 649.

12 Perjés, B. J.: Women's Shoes from the Crypt of the Dominican Church in Vác. Conservation Around the Millennium. Hungarian National Museum (2001): 95-105.

13 Duray, Kálmán: A váci céhek [The Guilds of Vác]. Vác (1912): 140.

14 Kovács, Petronella: *A váci Fehérek* templomában feltárt festett és textillel bevont koprsók restaurálása. [Conservation of the painted and cloth-covered coffins found at the Church of the White Friars in Vác] *Műtárgyvédelem* 26 (1997): 29-37.

15 Coating: an equal mixture of Paraloid B72 3% of acetone-toluene.

16 The implementation of this method took place in the practical class of the Object Restoration Department of the Hungarian Academy of Fine Arts under the supervision of Professor Györk Mátéfy.

17 Disinfectant: a soft water solution with 1% Dodigen 226 (alkyl dimethyl benzyl ammonium chloride).

18 The survey was carried out by Katalin E. Nagy (Museum of Applied Arts) and Enikő Sipos (Hungarian National Museum).

19 The students of the Object Restoration Department of the Hungarian Academy of Fine Arts (leather specialization) conserved 8 pairs of footwear under the supervision of Judit B. Perjés and Márta Kissné Bendefy, while one was conserved for the exhibition *Europalia Hungaria* of 1999 in Brussels: Perjés, J.B. Women's Shoes from the Crypt of the Dominican Church in Vác. *Conservation Around the Millennium*. Hungarian National Museum (2001): 95-105.

20 The disinfectant was Preventol CMK ((p-Chloro-m-Cresol) dissolved in i-Propanol, or Dodigen 226 (alkyl dimethyl benzyl ammonium chloride) dissolved in water.

21 Adhesive application was carried out using a mixture of starch and Planatol Superior BB (polyvinylacetate dispersion) in the case of leather, and Klucel M (hydroxypropyl-cellulose) adhesive in the case of textiles.

22 Various shapes can be made out of polyethylene plastic sheets 5-20 mm thick.

23 Kissné Bendefy, Márta: Restoration of a pair of 18th Century Leather Gaiters. *Conservation Around the Millennium*. Budapest (2001): 85-94.

3

The conservation of two medieval parchment codices is described. Both codices belong to the Oriental Collections of the Hungarian Academy of Sciences and come from the Kaufmann Bequest. The invaluable library of Dávid Kaufmann (1852-1899), a professor at the Jewish College of Theology in Buda, was donated to the MTA (Hungarian Academy of Sciences) Library by his mother upon his death. The gift contains, among other rarities, 1,066 books printed in Hebrew, 9 items of incunabula and 591 manuscripts.

[ILDIKÓ BEÖTHYNÉ KOZOCSA]

The conservation of two medieval parchment codices

The Kaufmann Haggadah

One of the most valuable manuscripts is the Kaufmann Haggadah (ref. A 422).[1] Haggadah means 'teaching', and the manuscript contains hermeneutics by ancient rabbis. It was one of the ceremonial readings of the Jewish Passover. It was first found in a separate volume in the eighth century. Jewish artists took pleasure in making illustrations for the book, several of which can be found in public and private libraries all over the world. Up to now three facsimiles have been published: the Haggadah of Sarajevo, which came into the possession of the National Museum of Sarajevo in 1894 from a Spanish Jewish family. The second, the so-called Haggadah of Darmstadt, is in the Darmstadt Library, and the third is the Kaufmann Haggadah. There are several theories about its origins; it is supposed to be of either Spanish or of Southern Italian origin. Professor Sándor Scheiber is of the opinion that the manuscript is Spanish but he acknowledges some Italian or French influences. In his view the volumes date from the third quarter of the fourteenth century.[2]

The illustrations of this Haggadah fall into three categories: scenes from the Bible, historical scenes, and depictions of the Seder rituals. The biblical scenes, quite unusually, were arranged in an incorrect order. Some are at the beginning and some at the end of the manuscript and they follow from left to right. Professor Scheiber argues that the sheets were assembled in an incorrect order during rebinding. This fact would explain why the full-page biblical miniatures were put at the end. Professor Scheiber assumes that the artist must have been strongly influenced by Christianity. The large number of bare-headed figures, the shroud carried by women, and people kneeling at prayer support this assumption. Kaufmann noticed the influence of Northern Italian artists in the illustrations, e.g. Italian Gothic features in the architecture, while the rich ornamentation of the background reveals French influence.

Production technology

The manuscript was made of unusually thick parchment including a few thinner leaves. The results of the ink and dye analysis carried out before conservation show that the ink was lamp-black In a gum-arabic medium.[3] The same diluted ink was used to sketch the scenes, to draw the geometrical patterns, and to edge the gold letters.

After drawing an unusually thick - about 2 mm - gluey coating was applied which was given its ivory colour by using microscopic quantities of azurite, ochre red and lamp-black. The sheets of gold-leaf were glued to it with egg-white, and were then polished and trimmed. The following step was to tint the background, apply the colours; finally the gold letters were edged in black and decorated with white lead dots. Bole was used under the gilding. The pigments used are: lead white, minium, malachite, verdigris (copper green), red ochre, lamp-black. The colours claret, pink and violet blue were all achieved with organic dyes. The medium was a mixture of gum-arabic and egg-white. The claret folium and the green malachite have come through to the verso of the parchment.

Condition report

When it arrived at the restorer's workshop at the National Széchényi Library, the manuscript had been badly damaged.[4] According to Miksa Weiss' earlier description its leaves had been mangled and trimmed.[5] The trimming must have taken place before 1898 during the rebinding of the book in order to repair the imperfections on the margins. The codex was probably bound in the simple parchment cover on that occasion. As a consequence of rough trimming the marginal ornaments were mangled and some figures were cut in half. The size of missing parts can only be guessed at: the loss probably amounts to about 1.5-2 mm.

The bottom corners were badly damaged, probably due to intensive use. There the edges of the parchment have became brownish and quite brittle. There were greasy stains caused by fingerprints and

FIGURE 1 One of the damaged leaves of the A 422 codex

FIGURE 2 The damaged miniature and parchment of codex A 422

FIGURE 3 The damaged miniature of codex A 422 after conservation

evidence of damp patches was found. The verso of the full-page size illustrations was left empty by the miniaturist. Some of these pages were stained by the glue that had run down the spine during rebinding. The sheets were stitched onto six narrow parchment strips by the binder who was repairing the book; then they were reeved through the parchment cover in the usual way to fasten the body to the paper-lined cover.

The torn leaves were probably repaired with self-adhesive tape in the past few years or decades. The adhesive in such tapes gradually becomes yellow and dissolves a text written in ink. Fortunately in this case it did not cause irreparable damage as it did not cover any texts or miniatures but the parchment underneath became a darker yellow. The parchment became stiff, slightly wavy and rather dry. Leaf no.16 was deformed and crumpled. Its parchment must have been defective but still there was a text written on it although there are no miniatures or ornaments on it. Tiny holes were caused by insects.

The ink of the text was hardly faded or damaged but the dyes of the miniatures and most of the marginal ornaments were rather faded, cracked or had come off. Some of the gilt letters had come off due to the too-thick under-coat, and some of the gilding was missing in these places. A number of these gaps were filled and coated in golden-brown (bronze?) dye.

Conservation

During restoration it turned out that the chipped, faded colours, mostly red and blue, had been repainted. The shades and the solubility of these dyes are rather different from the original pigments: methanol would not dissolve either the ink or the original dye but to a small extent it gradually, in the course of time, dissolved the retouched blue dye, and in some cases the claret as well. After the solubility tests, the body of the book was removed from its soft parchment cover. The leaves were re-numbered in order to arrange them in the correct order; then the manuscript was dismantled into its constituent sheets. The dust-covered, stained surfaces of the parchment were gently cleaned with powdered india rubber avoiding the coloured areas; the greasy stains were removed with an electric eraser. This was followed by complete removal of the self-adhesive tapes by applying acetone wipes. Cracked gilding was coated in several layers with an egg-white emulsion developed by the restorers themselves, using paintbrushes under a magnifying glass. The components of this emulsion are similar to that of the ground used in gilding.[6] It penetrates into the cracks and fixes loose particles.

The loose layers of pigments had to be fixed, the wavy leaves had to be straightened in order to eliminate the differences in the surface tension caused by the waviness which may have led to the cracking and peeling of the pigments. At the same time we wanted to soften and loosen the hard, stiff and dry parchment leaves via procedures that were both delicate and of short duration. The most important aspect was to achieve maximum effectiveness without doing any harm. A plan was drawn up to realize all three objectives in one single process. As the ink and dyes of the manuscript are extremely sensitive to water, they had to be protected from any moisture. The procedure was to leave the manuscript in the air-conditioned climate of the workshop for a few weeks; then the leaves were immersed in a solution of alcohol and Klucel[7] for 10-15 minutes under permanent observation. Each leaf was mounted on protective paper sheets before immersion, and then dried under slight pressure between Bondina sheets.[8] While changing the Bondina and the felt sheets, pressure was gradually increased by means of weights, making the leaves flatten out and dry in a gradual process. The loose layers of pigments were fixed by the invisible, gentle dispersion of Klucel. The once stiff and hard leaves became more flexible, elastic and softer to touch.

The torn parts of the letters were pasted and covered with goldbeater's membrane.[9] The larger, missing parts of the corners were replaced by writing parchment. The minor gaps and punctures caused by insects were filled in with a semi-moist parchment pulp[10]. The conservation process was completed with replacement of the mangled parts and complete drying of the manuscript for several weeks. The codices were gathered on parchment strips with a flyleaf and then bound in a semi-hard parchment cover. The covers were tied together with cords to prevent the 'motion' of the material; finally the manuscript was put into a protective cardboard case.

A Hebrew Prayer-Book

The Hebrew manuscript (ref. A 384) was also part of the Kaufmann Bequest.[11] According to the Weiss catalogue it was written in ca.1320 in South Germany. It was a prayer-book (*mahzor* in Hebrew) especially made for the German rituals of the major Jewish holidays. Originally it consisted of three volumes: the first is in the Oriental Collections, the second is in the British Library, and the third is in the Bodleian in Oxford.

Condition report

The text-block's most recent cover is of simple light brown leather and is in relatively good condition. The repairer had saw-cut the sheets at three points of the spine and had stitched them onto a hemp cord. The ink of the manuscript is lampblack in a good state, but the mineral and vegetal colours of the miniatures and illustrations had been smudged or come through in certain spots. Gilding is cracked, imperfect, or peeled off. The manuscript had probably been exposed to moisture at the spine before rebinding so it became mouldy.[12] The first twenty-five leaves had been badly damaged and mangled at the head; there were dark purple stains around the middle of the leaves where there are gaps and holes in the text as well. Thick paper and parchment strips from fragmented manuscripts had been glued to cover the gaps, probably as part of the rebinding. The script was partly obscured by these patches. The 'bites' of drugstore beetle larvae can be seen on the leaves.[13] The centre of the decayed sheets had been fastened with over-thick strips of paper which made the parchment crumpled.

FIGURE 4
A damaged leaf with the paper strips glued to the parchment of codex A 384

FIGURE 5
Manuscript A 384
after conservation

After stitching, the binder coated the spine with a thick layer of bone glue.

Conservation

Before conservation the text-block was removed from the cover. The thick coat of glue was softened and removed from the spine with a methyl-cellulose solution; then the manuscript was dismantled into sections. The paper and parchment strips used to cover imperfections were removed. Disinfectant[14] was sprayed onto each leaf separately. The disinfectant provides preventive care against later contamination. Only the waviest and most deformed sheets (sixteen in all) were immersed in a solution of methanol and Klucel (as mentioned earlier in the description of the first codex). After surface-cleaning (including meticulous cleaning with powdered rubber) the cracks in the real gold ornaments were fixed with egg-white emulsion. The mangled leaves were completed with new sheets made with strips of parchment and goldbeater's membrane, since many leaves had only been held together by a thick layer of glue or strips of paper at the spine.

The missing parts of the mangled, weakened parchment (damaged by micro-organisms) were infilled using the restorers' own method of 'parchment casting', which had been successfully applied in conservation for many years.[15] The parchment pulp (that is, parchment and swollen cellulose fibre made from Japanese paper with the addition of organic glue and disinfectant) is mixed in a solution of water and ethanol. The parchment is cast on a vacuum table made from perforated acrylic sheet (Perspex/Plexiglass). A polyamide sieve is put on the table under a finer silk sieve and after preparatory procedures the manuscript is laid over the sieves. It is moistened with a spray of ethanol and the air-exhaust process is started in order to smooth out the leaf on the perforated sheet. The pulp is poured onto the damaged areas from a lipped bottle so it spreads out on the surface. In the vacuum most of the moisture disappears. As the table can be lit by transmitted light the defective spots are clearly visible. The pulp must not be spread onto the script. The completed leaves are lifted from the vacuum table together with the silk sieve; they are pressed under felt sheets, and after a few weeks of drying, sheets are made from the leaves. They were stitched onto hemp cords, and the text-block was made in the usual way; the text-block was rebound in its repaired leather cover. The paper and parchment strips with the manuscript fragments (which had been used to cover imperfections) were cleaned, restored and carried to the original repository of the codex together with the documentation of the conservation process.

The climatic conditions of the repository were analysed at the request of the Oriental Collections. It was suggested that the manuscripts should be kept in a room where the relative humidity is between 55-60% and the temperature is between 18-20°C; any fluctuation in these conditions should be avoided. Under these conditions the leaves of the codex stored in a protective box will not become wavy or deformed, and the miniatures can be preserved in good condition. Conservation was implemented by Krisztina Ballagó Fischer, Ildikó Beöthy Kozocsa, Mária Czigler and Ágnes Kálmán Horvát, co-workers at the Conservation Laboratory of the National Széchényi Library.[16]

Endnotes

1 One of the invaluable Hebrew manuscripts is an illuminated parchment codex (ref. A 422); the other is another Hebrew manuscript (ref. A 384).

2 *The Kaufmann Haggadah. Facsimile edition MS 422 of the Kaufmann Collection in the Oriental Library Hungarian Academy of Sciences*. Introduction by Alexander Scheiber, Budapest, 1957: 55. Appendix 1: 29

3 The analysis was carried out by Z. Szabó; the data were taken from his report.

4 The size of the codex leaves is 185 x 220 mm; it is written on parchment and contains 60 leaves (120 pages).

5 Miksa Weiss: Néhai dr. Kaufmann Dávid tanár könyvtárának héber kéziratai és könyvei [The Hebrew Manuscripts and Books from the Library of the Late Professor Dr Dávid Kaufmann] Budapest 1906. This condition report was mentioned in *Die Haggadah von Sarajevo* by D. H. Müller and J. von Schlosser (1898) pp. 187-99.

6 The beaten white of an egg (approx. 30 g.) is drained, 15 g of French vinegar (5%) is added, some crystals of Nipagin (methyl 4 hydroxybenzoate) are dissolved in ethanol, equal to 20% of the whole quantity, and we add a few drops of Solovet R surfactant (Dyoctyl Sodium Sulphosuccinate). It is mixed and diluted to make a double quantity in distilled water. This emulsion is painted twice under a magnifying glass.

7 The solution is 2% w/v of Klucel M (hydroxy-propyl-cellulose) in methanol.

8 Bondina is a polyester, non-woven fabric made in England.

9 Goldbeater's membrane is a completely transparent membrane made from a cow's appendix; the glue is a mixture of rice starch and a small quantity of polyvinyl-acetate.

10 Beöthy Kozocsa, I., Sipos Richter, T. and Szlabey, Gy. (1987) 'Report on Parchment Codex Restoration by Parchment and Cellulose Fibre Pulp'. *ICOM Committee for Conservation 8th Triennial Meeting. Preprints*, Sydney, Australia. 6-11 September, Vol. II: 641-8.

11 The number of the illuminated parchment leaves of the manuscript is 251; the size of the leaf is 330 x 220 mm. It was probably bound in its current cover by D. Kaufmann.

12 Mould was not identified during the analysis.

13 The drugstore beetle (*Stegobium paniceum*) feeds on glue.

14 The solution of Preventol CMK (p-Chloro-m-Cresol) in ethanol.

15 Beöthy Kozocsa, I., Sipos Richter, T. and Szlabey, Gy op. cit. Beöthy Kozocsa, I. (1988) 'Some Problems and Achievements in Codex Restoration in the National Széchényi Library' in I. Éri and G. Sárközy (eds.) *Sixth International Restorer Seminar Veszprém, Conservation-Restoration of Leather and Wood - Training of Restorers*. Budapest: 233-340. Wouters, J. (2000), 'The Repair of Parchment: Filling', Reviews in Conservation 1: 77-86. Beöthyné Kozocsa I., Siposné Richter T. and Szlabey Gy (1990), 'Parchment Codex Restoration Using Parchment and Cellulose Fibre Pulp', *Restaurator* 11: 95-109.

16 I would like to convey thanks to I. Ormos at the Oriental Collections of the Hungarian Academy of Sciences for providing me with useful information about the manuscripts. This information contributed to the successful planning and implementation of the conservation process.

4

The conservation of cultural heritage has undergone many changes in the last thirty years. The focus has widened from treating individual objects in the conservation laboratory to encompass caring for collections of objects in the whole museum, e.g. via integrated policies and practices of preventive conservation. The 2002 triennial meeting of the Conservation Committee of the International Council of Museums (ICOM) manifested a further shift of emphasis, moving from collections to the community. As part of the Rio Meeting there was a Museum Forum called 'Community Involvement in Conservation', in which museum colleagues showed how they have seized opportunities for community involvement in conservation.[1]

[DINAH EASTOP]

Conservation decision-making:

FROM OBJECT TO COLLECTION TO COMMUNITY AND BACK AGAIN

The Museum Forum, which was organized by ICOM rather than by ICOM-CC, introduced a fascinating range of community initiatives, mostly in Latin America. The following account [2] summarizes some of these presentations, links them to recent analysis of decision-making in conservation, and considers implications for the future practice of conservation.[3]

Strengthening awareness of natural and cultural heritage as a future resource

At the start of the Forum, the President of ICOM LAC (Latin America and the Caribbean), Luis Repetto Málaga, argued that heritage must serve communities, and that this commitment should be stated explicitly in state cultural policies. The Secretary General of ICOM, Manus Brinkman, stressed that awareness of cultural heritage cannot be taken for granted; for some people an archaeological site was a heap of stones. For conservation to take place, the sites/artefacts/practices must be considered worth preserving. For this reason he supported initiatives which encouraged active local involvement in conservation.

Intangible heritage: a community response

The case studies started with Liliana Graciela Barela, an historian, who reported what she described as a 'cultural resistance phenomenon'.[4] She introduced an oral history project in Buenos Aires, Argentina. We were shown a video of the team's recording of people's feelings and actions sparked by the closure and destruction of a corner café (El Café Angelitos).

The café, founded in the Balvanera district in ca.1900, became legendary. Its name 'little angels' was an ironic reference coined by the police because of the many local fighters who used the café. By the 1940s the café was associated with the tango, said to have been invented there. The café closed in 1992, and later the roof caved in. In order to demonstrate their feelings of loss, local residents and people who used to walk by the café began weekly tango dances on the street outside the closed café. Locals said they were dancing in homage to the café. Barel described the café as having symbolic value, rather than being considered of architectural or artistic value: spirit of place was important. Rather than accepting modern cafés which demonstrated a homogenization of globalized style, locals said they wanted to 'rebuild a meeting place of our own'. Bareal argued that the actions of the local community showed a love of the intangible (in this case meeting, dancing, playing music, and looking). She added that oral history is the best tool with which to evaluate intangible heritage.[5] One of the later speakers emphasized that tangible and intangible heritage were inseparable categories, interpenetrating each other.

Re-development: civic and state initiatives

Carola Alejandra Brito Castro described a huge 'civic development' project to 'recover local heritage' at La Casa de Maquinas de Temuco, Chile. Temuco is famous as a railway town and as the birthplace of the poet Pablo Neruda, whose father was a railwayman. The obsolete station, with repair workshop, was listed as a heritage site in 1985 and 2000; it includes a huge revolving stage (which can be operated by a single person) of 1937-41, a coal-elevating building, 15 steam locomotives, carriages and a crane. The railway buildings are to be preserved and put to new uses; for example, the vast circular revolving stage will be roofed over (like the British Museum's Great Court) to form a museum, and a landscaped playground will encircle the museum. It is proposed that the coal-elevating building will house the Neruda Museum.

An amalgamation of community and state was evident in the next presentation. Maria Claudia Ferrer Rojas described the establishment of 'Guardians of Cultural Heritage' in Colombia. The aim of the Ministry of Culture is to encourage community participation in conservation, by acknowledging different perspectives and the fact that everyone can be an accomplice to negligence. The scheme's motto is 'Discover, Value and Preserve'. Projects include: scrutiny of building repairs; the development of a book and toy to encourage children's interest in historic sites; classes in the technology of adobe and stone roads. The Guardians are local volunteers, including children, who undertake some training, have a distinctive uniform, sign a written agreement with the Ministry of Culture, and who are sworn in as Guardians at a special ceremony. The project is linked with citizenship initiatives designed to encourage political stability and support for the current government. Recovering democracy is linked with preserving heritage. There are currently 67 'guardian groups', with two in the conflict areas in S.E. Colombia, one linked to the archaeological park of San Agustin, a World Heritage site.

Sigfrido Jiménez Regidor described community involvement with the Museo de la Cultura Popular, Costa Rica, The museum is responsible for the maintenance of hacienda (farmhouses) built using a wattle-and-daub technique. He contacted local people who were skilled in these techniques and a network of local specialists was created; this led to workshops with schools, universities and other local groups. Benefits included community involvement in the museum's work; support for local tourism with new hotels being built in traditional techniques; and support for local workmen. The national building code of 1901, which prohibits 'wattle-and-daub'-type building, is under review.

Building memories

One of the most moving presentations was by Milton Doño, one of two persons who run the archive programme of the Museo del la Palabra y la Imagen (Museum of Word and Image), in El Salvador. The archive programme was set up, without any government funding, but with Dutch support, after the end of armed conflict in El Salvador in 1992. In 1997 an archive campaign was launched to defy 'chaos and oblivion, and the loss of memory'. The aim of the archive is to 'build memories' by documenting and collecting pictures and letters, e.g. by collecting records of a massacre of 10,000 people, and by preserving the records of writers from El Salvador. He and his single colleague tour the country with artefacts and audio-visual material, both to share the collections and to encourage people to share their memories. A recent touring exhibition was called. 'Fingerprints of Memory'. He acknowledged that sharing memories is painful; he believed such 'memory work' was essential to securing a safe future for El Salvador <http://www.museo.com.sv/IntroMu.html>.

Conserving the material and the symbolic

Maria Eugenia Marin described community (in this case mostly adult male) involvement in the conservation of a carved wood figure of Christ from a grotto shrine in Iztapalapa, Mexico,. Here it was considered essential to agree on interventions necessary to conserve the material, function and symbolic properties of the sculpture. Great care was taken to handle the figure with due respect; to encourage bi-monthly visits of community representatives to the conservation studio to witness and advise on the treatment undertaken; and, to provide preventive conservation advice that could be implemented on the figure's return to the shrine. She stressed the importance of strengthening awareness of both natural and cultural heritage as a future resource.

Rommel Angeles Falcón, an archaeologist, introduced an 'Adopt a Textile' programme instigated by ICOM Peru, and led by him and Denise Pozzi-Escot. The scheme, with only two paid staff, involved getting local schoolchildren, local businesses and tourists to sponsor the conservation of excavated textiles. The project was designed to foster local interest and appreciation of the site. Visits to the site were encouraged with the aim of making visitors value both the site and the excavated material, so as to help protect against illicit trade and looting. Local interest has been maintained, e.g. school children painted the walls of their school with designs drawn from the textiles; and, one class, from a poor neighbouring town with 3,000 inhabitants, spent six months raising funds to pay for the costs of conserving just one textile. Fifty textiles have been conserved, and they have been exhibited in Lima and Washington, DC, USA. Hundreds more textiles are awaiting treatment. The success of the project led the Municipality of Asia to construct the Municipal Museum of Huaca Malena in order to exhibit the 'adopted' textiles. The following website was developed thanks to a local telecommunications company: <http://huacamalena.perucultural.org.pe>

Networking

In 1989 a meeting was held in Costa Rica on Sustainable Heritage. It was recognized that creating and sustaining a participatory structure was essential. There are 4,380 museums in Latin America, and a collaborative site has been established: <Red-ILAM. www.ilan.org>. This on-line site won an award in 2000 for 'Patrimony on line'. ILAM is the Institute of Latin American Museums. It aims to: identify successful initiatives; foster access to technology; create a directory of stakeholders; and, supply on-line information. Inclusion and democratization were described as the keys to success.

In addition to the Museum Forum, other evidence for the growing interest of ICOM-CC in community involvement in conservation includes: (a) the setting up of a Task Force on Public Awareness and Involvement in Conservation (two-way dialogue between conservators and the public) within ICOM-CC; (b) the acceptance for a resolution on communication by ICOM-CC in Rio; (c) the selection of 'Community Involvement in Conservation Decisions' as one of the four key objectives of the Ethnography Working Group of ICOM-CC.

Discussion

A growing awareness and commitment to 'Community Involvement in Conservation', particularly decision-making, was evident at the Rio meeting of ICOM-CC. What was refreshing about the Museum Forum was the explicit recognition by the speakers from Latin America of the overtly political nature of their work. The work of preservation and documentation was explicitly linked with initiatives to foster democracy and citizenship. The speakers were proud to state that as heritage professionals they were actively engaged in local, regional and national politics.

As a corollary to the political dimension, issues of cultural value were acknowledged as influential in conservation decision-making. 'Community involvement' makes it necessary to address openly what is to be preserved: is it the material, the functional and/or the symbolic properties of objects/sites? Some of these issues are addressed in a fascinating set of essays edited by Marta de la Torre (2002). Clavir's analysis of conservation practices in N. America and their relation to First Nation Community use of museum artefacts has focused attention on what is valued and by whom (Clavir 1994, 2002; the latter reviewed by Odegaard 2002). The papers presented in Rio add another dimension to the challenges of 'Preserving what is valued' (the title of Miriam Clavir's 2002 book). The preservation of memories, artefacts, and ways of being, as described in the Rio Museum Forum, can be understood as ways of working for the future while resolving past conflicts in Latin America. The personal investment of meaning is seen as part of a community response to local histories. Cultural artefacts/sites are shown to be a part of life which is politically contested.

This overtly political dimension may present a challenge to much European conservator/curator education. State bodies in Europe determine the future of cultural artefacts, with limited community involvement, supporting the notion of heritage conservation as an uncontested political field.

It is one thing to tell the community what we (the conservators/curators) are doing, and to invite comment. It is quite another to facilitate and accommodate more active practices of community involvement. It is perhaps a significant omission that not one of the case studies in the 'Community Involvement in Conservation' forum mentioned any need to resolve inevitable differences arising between different local communities, professional groups and state agencies. If community involvement in conservation becomes an accepted policy, how in practice will heritage professionals respond to conflicting demands within and between local communities, funders and professional bodies?

Dedication

For me, the Museum Forum was one of the highlights of the Rio meeting. The saddest aspect was the absence of Dr. Ágnes Timár-Balázsy, a dear friend and colleague, who had become an essential and much-loved part of ICOM's Conservation Committee. She would have loved Rio; we missed her wise and joyous presence very much.

References

Berducou, M. 2002. Why involve the public in heritage conservation-restoration? Is it important? 'Nous du service des signes'. In: D. Grattan, ed. *Conservation at the End of the 20th Century. Plenary Sessions from the 12th Triennial Meeting of ICOM-CC, Lyon, France, 1999*. Paris: ICOM: 15-18. [Paper also published in French in the same publication.]

Clavir, M. 1994. Preserving conceptual integrity: ethics and theory in preventive conservation. In: A. Roy and P. Smith (eds.) *Preventive Conservation. Practice, Theory and Research*. London: IIC: 53-7.

Clavir, M. 2002. *Preserving what is valued. Museums, conservation and First Nations*. Vancouver: UBC Press (University of British Columbia).

Grattan, D. ed. 2002. *Conservation at the End of the 20th Century. Plenary Sessions from the 12th Triennial Meeting of ICOM-CC, Lyon, France, 1999*. Paris: ICOM. [Papers published in both English and French]

Odegaard, N. 2002. Book Review. Miriam Clavir. Preserving what is valued. Museums, conservation and First Nations. Vancouver, Canada: UBC Press (University of British Columbia). Museum of Anthropology Research Publication, 2002, 320pp. ISBN 0-7748-0860-8. *Journal of AIC,* Fall/Winter 2002, Vol. 41, No. 3: 300-2.

Torre, M. de la. ed.) 2002. *Assessing the Values of Cultural Heritage*, Research Report. Los Angeles. Ca.: Getty Conservation Institute.

Endnotes

1 Berducou recently asked: 'Why involve the public in heritage conservation-restoration? Is it important?' (Berducou 2002:15). This question was raised at the plenary session of the 1999 meeting of the ICOM-Conservation Committee in Lyon (Grattan 2002). The debate was continued at the Rio meeting of ICOM-CC via the Museum Forum.

2 This account is based on a report I prepared for ICOMUK News, and published as: Eastop, D. 2002, Conservation as a democratizing practice: learning from Latin America. *ICOMUK News*, 63: 22-4.

3 Papers presented at this excellent forum have not been published, but I hope they will be. Of all the papers I heard in Rio, these are the ones that I would most like to see published, ideally with English and French translations. The recent publication of the papers presented at the plenary session of the ICOM-CC meeting in Lyon sets an excellent precedent for publication (Grattan 2002).

4 Most of the presentations were given in Spanish. What I listened to, and quote above, were the simultaneous translations into English.

5 Preserving intangible heritage is the subject of the 2004 General Assembly of ICOM in Seoul, Korea.

5

In memory of Ágnes, my dear friend and colleague for many years.

It is not an ordinary piece of linen that has been handed down to us in the cloth preserved in Turin. It is distinguished by features that have caused it to become an important and, at the same time, much debated document of Christianity. There is no parallel for the image of a human body, seen from the front and from the back, on one side of the cloth. This body displays all the characteristics of a crucified man who suffered the same destiny as described in the Bible for the crucifixion of Christ. For centuries this fact made the cloth the most important relic of Christianity, and also the most controversial one.

MECHTHILD FLURY-LEMBERG

The image of a crucified man on the Turin Shroud:

MEASURES TAKEN FOR CONSERVATION OF THE LEGIBILITY OF THE BODY IMAGE

The linen fabric, a 1/3 twill weave in herringbone structure, which appears yellow today, was originally the colour of natural linen. Traces of blood have been authenticated on the Shroud, but no paint pigments could be found. The blood had seeped through to the reverse of the cloth, whereas the representation of a 'photographic negative' (extraordinary in itself) only affects the top fibres on the face of the Shroud. (Fig. 1) Obviously, an uncommonly strong oxidation has occurred in these places, resulting in a visibly darker brown. The image of a male body is clearly distinguishable, but without sharp outlines in these darker brown areas on the lighter-coloured, yellowed linen background. How this detailed representation of a human being happened to come onto this cloth still is a mystery. It is clear, however, that we are not dealing with a drawing or a painting here.[1]

As might be expected in the case of the Shroud of Turin, the tradition is especially difficult. I shall only mention the main dates.

Certain knowledge of the existence of the linen goes back to the fourteenth century. The preceding period is still full of question marks. In 944, the linen probably went from Edessa to Constantinople, where it is said to have been present in 1204.

It is not clear how it eventually came into the possession of the knight Geoffroy de Charney, at Lirey in France. There are sources directly connected with the object since 1389. In 1453, Margarethe de Charney La Roche brought the linen into the possession of the Savoy dynasty. In 1502, the Savoys brought the Shroud to the Ducal Chapel of Chambéry, where it was seriously damaged by a fire in 1552. The holes caused by the fire were restored on the spot by Poor Clare nuns with patches of linen cloth. Since that time, the Shroud has been characterized by the patches covering the holes caused by the fire. (Fig. 2)

In 1578, the Shroud came to Turin, the capital of the Savoys. Since 1694 it was kept in the chapel

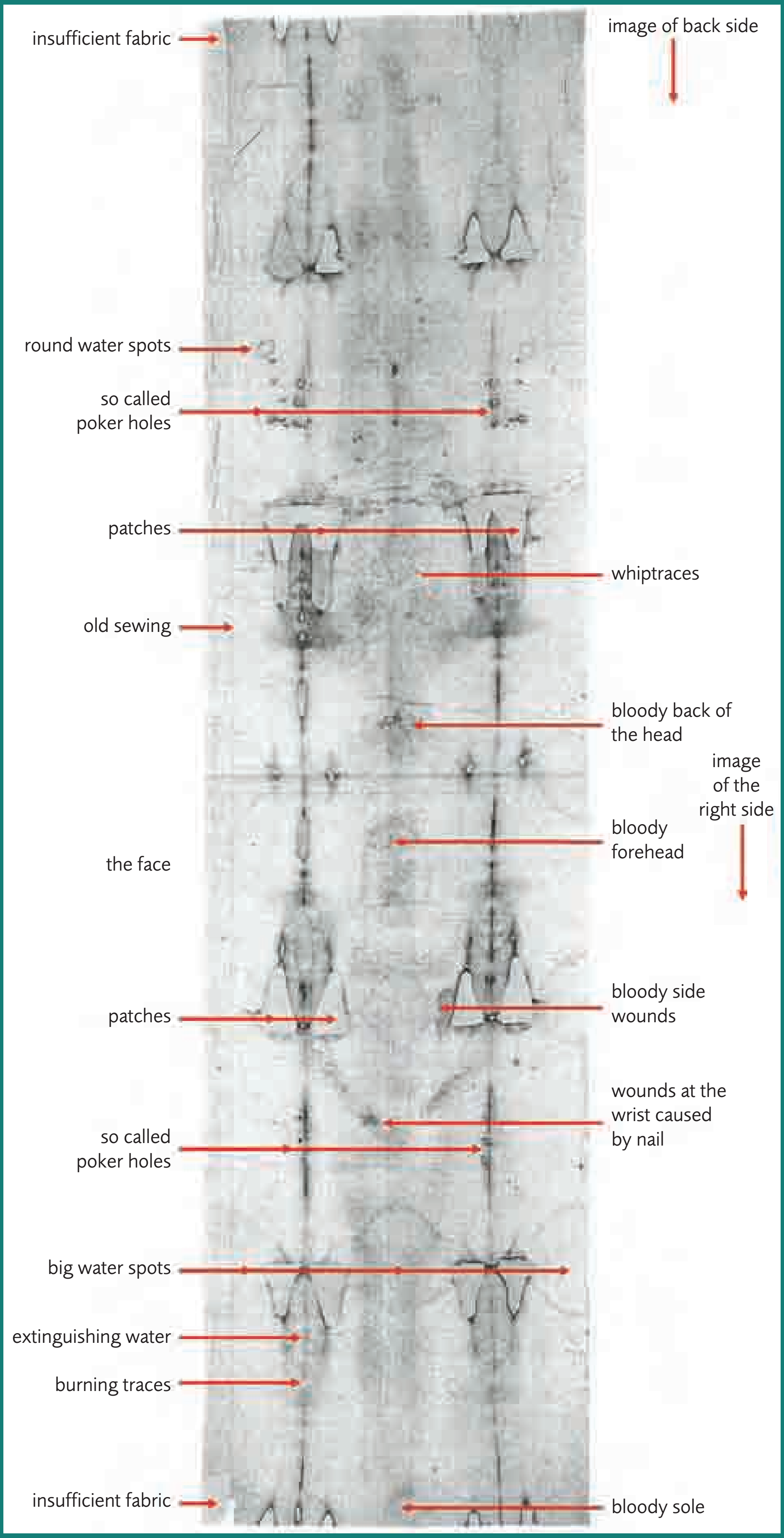


FIGURE 1 Photographic negative of the back side of the Shroud

FIGURE 2 Holes caused by the burning of 1532 covered by spots

built by G. Guarini until a fire in 1997 destroyed the beautiful chapel. Fortunately the Shroud was saved without any damage.

In 1889 the first photograph of the Shroud was made by Secondo Pia.

The photo negative showed a natural image which had not been visible before because the linen itself shows a negative picture of the image. From that moment on, modern scientific research began – the so-called 'Sindonologia'. A huge variety of different scientific disciplines have since been employed to research the Shroud.

In 1988, the results of Carbon 14 analysis dated the Shroud to the medieval period, between 1260 and 1390. This result is extremely doubtful for a number of reasons, i.e. because we have a remarkable source for the existence of the linen as early as 1192/95, based on the Pray Codex (Széchenyi Library, Budapest). (Fig. 3)

This manuscript contains two miniatures, one depicting the anointing of the body of Christ and the other the women visiting the empty tomb; careful analysis revealed a curious representation of Christ's Shroud. In the upper part of the picture, the cloth on which Christ's body is laid is white, with no pattern, as one would normally expect. However, in the scene of the women at the empty tomb, the funeral cloth depicted has two clearly visible features: first, a series of four holes arranged in an 'L' shape, whose position and shape correspond to those of the so-called 'L-holes' in the Turin Shroud; and, second, the entire Shroud is depicted with a stylised herringbone pattern.

All this is unusual and extremely significant, because it shows that the painter was familiar with Christ's Shroud and that he recognized the indubitably exceptional nature of the weave of the cloth, a sign of its value. This kind of weave was special in antiquity because it denoted extraordinary quality. While he was drawing the weave and the holes, the painter of the Pray Codex managed to leave as a 'signature' on the cloth the signs of a sheet that he already knew as Christ's funeral cloth. As a result, this source is much more significant than any comparison with an ancient artefact could be, and for the textile historian it is equally powerful.[2]

The linen fabric of the Shroud, though marked by past damage, has survived until today without special measures taken for its preservation. The fibres of the linen are in very good condition and there would be no cause for concern if it were not for the image of a crucified man. The Shroud of Turin is a unique relic, the meaning of which rests solely in this image, independent of the proof of its authenticity. All efforts regarding the conservation of the Shroud must, therefore, aim at preserving this image.

The phenomenon of the image on the linen fabric is due to an as-yet unrecognized process which affected only the topmost layer of the fibres. The yellowing of the linen, however, was caused by the naturally occurring process of oxidation. This process can be observed in daily life on yellowed tablecloths which have been kept unused in a linen closet for some time. The image, also the product of some kind of oxidation, is only a few degrees darker than the background and therefore needs to be preserved if the testimony of the Shroud is to be passed on to future generations. Conservation would therefore consist of stabilizing the lighter colour of the linen foundation weave in order to avoid possible 'absorption' of the relatively delicate lines of the image into the darkening colour of the background, which would render the image unrecognizable. It is therefore a matter of some urgency to find effective measures to counteract the oxidation process.

The Shroud in its 'new wrapping' after the Chambéry fire, though always treated with great care, had been exposed to agents that can accelerate the process of oxidation. The possibility that residues of burnt material in the areas of the holes caused by the fire could be trapped between the linen backing cloth and the patches applied by the nuns was soon recognized as a danger. As these substances can considerably accelerate oxidation, and as the consequences of future water damage would be devastating for the Shroud (because the combination of water and burnt residue would produce a black dye) the fundamental question arose early on of removing the patches, so that the areas around the holes could be cleaned.

In 1993 the scientist Alan Adler[3] suggested that removal of the patches would be the most effective way to reduce oxidation. Although I agreed with Adler in principle from the beginning, I was unable at that time to accept this fundamental solution. Arguments around the inviolability of the historical conservation work done by the Poor Clares of Chambéry, as well as concerns that the optical appearance could be changed, had first to be overridden by the proven danger.

So all these deliberations led to the decision to keep the Shroud for the time being in an oxygen-free showcase (filled with the inert gas argon). The problems due to the staining of the Shroud in the Chambéry fire preoccupied the committee again and again in the following years.

In November 2000 we did not foresee that one day the linen ('Holland') cloth lining would be removed. Only the thorough investigation carried out on the lining on that occasion revealed the whole dramatic meaning of the staining.[4] I had never had the opportunity to view the lining in its entirety before.

Entombment of Christ

The Angel and the Saint Women visiting the tomb of resurrected Christ

FIGURE 3 Miniatures from the Codex Pray (page XXVIIIth on the right side)

Now it turned out that all the holes caused by the fire showed as dark grey stains on the lining at the back of the Shroud. (Fig. 4) Under the microscope, these stains turned out to be carbon dust embedded between the fibres. Thus it became obvious that residues from the fire were present in the areas of the holes between the lining and the patches. This clear evidence finally made it possible to come to a decision about whether or not to remove the lining. It is self-evident that the visibility of the image took precedence over possible loss of historical evidence. Fortunately, this reasoning did not have to be applied to the original state of the Shroud, but rather to the sixteenth-century conservation work, also implemented out of concern for the Shroud's preservation. The 1534 conservation work of the Poor Clares is certainly of historical interest and therefore needs to be analysed and noted for future research, but it does not represent a value in its own right. The same is true for the conservation measures undertaken in 2002. All these deliberations finally led the committee to unanimously recommend to Cardinal Poletto that the patches and the Holland cloth lining be removed for reasons of preservation.

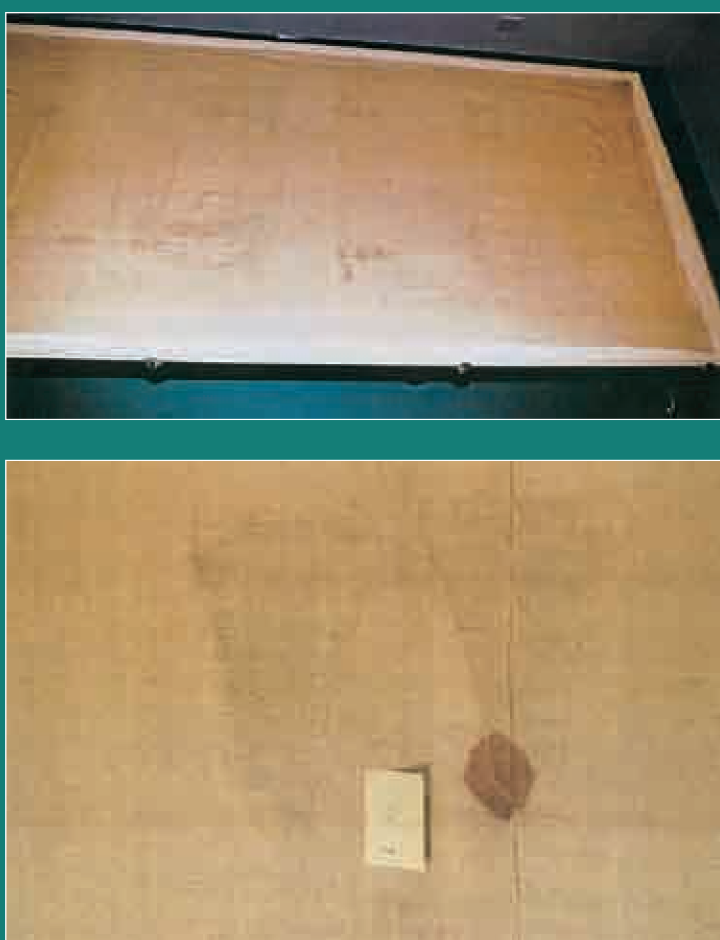


FIGURE 4 Spots on the back side of the Shroud

When the conservation began with the removal of the Holland cloth lining on 20 June 2002, it became abundantly clear how necessary this decision had been. The great amount of carbon dust that surfaced from under the sewn-on patches widely surpassed our fears. Not only were the holes surrounded by a minimum of 5 mm of totally charred fabric, but the black carbon dust was also visibly embedded in all the sound fibres of the areas around the holes, the patches and the lining. In addition, piles of black soot, up to a teaspoonful, were to be found under the patches. (Figs. 5-6)

There was evidence of oxidation of the fabric around the burn holes since the patching. We must assume that the Poor Clares removed all the fragile residue and in particular the soot from the burn marks before they started applying the patches. The extremely careful needlework was done without any signs of marking from soot. At that time there could not have been such quantities of soot. Contiguous areas of soot would not have survived the necessary handling required for the needlework: they would have fallen apart. All the fragile threads that we found would undoubtedly have disintegrated during any work done, just as today they fall apart at the merest touch. The fine soot, which can penetrate the tiniest crevice, would have stuck to the needlewomen's damp hands and left black marks on the Shroud. The nuns could only attach their patches to the good fabric, which they did, as can be seen from the needlework. Where the nuns left too small an overlap in an effort to cover as little of the original cloth as possible, as in the case of the blood stains, the seams came away. Here and there holes formed over the years on the burn marks which did not need any work in 1534 but later required extensive patching or darning.

These signs of advanced oxidation were one of the principal reasons it was decided to remove the patches and the Holland cloth lining. Through the alternation of humid and dry conditions, the presence of acidic burn residue under the patches promoted a microclimate which had already caused oxidation of the cellulose fibres.[5]

Evidence of this process can be seen around the L-shaped holes, for example. At the corresponding point on the back of the lining one can clearly see how oxidation had already affected the lining material, causing it to go brown. In addition, all of the Holland cloth lining was extremely dirty owing to the Shroud's having been much handled on the outside. As a lining, the Holland cloth served to protect the Shroud from dirt, but at the same time

FIGURE 5. a

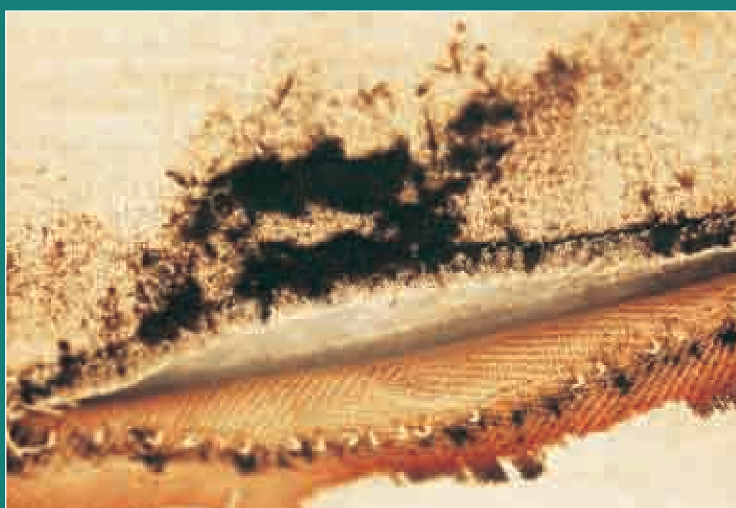


FIGURE 5. b

5. c / FIGURES 5a–c Black carbon dust on the patches, on the surface of the Shroud and on the Holland cloth

it caused the entire Shroud to be maintained in an environment of soot resulting from the burn residues, which penetrated all the fibres.

After the Holland cloth was removed, the back of the Shroud and the back of the patches containing the carbon dust became visible. Thick black soot was embedded between the fibres of the lining, amassed on the patches and on the areas of the Shroud which had been covered. (Fig. 5)

The carbon dust was first removed superficially with the help of a small vacuum cleaner designed for delicate tasks and provided with a built-in filter to catch even the smallest particles (micro-pipette technique). (Fig. 6) The absorbed material was stored in small glass bottles and its provenance noted. Then the detached patches were removed. Approximately 5 mm of the totally burned fabric from the edges of the holes was removed by tweezers to free the Shroud as much as possible from substances that promote oxidation. The edges of the fabric were found to be already oxidized to such a degree that they disintegrated into dust when touched. (Fig. 7) The brittle material was removed, collected and labelled.

With utmost care, and avoiding the traces of blood, the spaces around the holes were then cleaned a second time. It become clear, using a video microscope, that much of the harmful carbon dust was still left in the fabric of the Shroud after the first surface cleaning.

As so often happens in the practice of conservation, the case of the Shroud demanded a compromise. From the point of view of conservation, the ideal solution would be to store the Shroud in a horizontal position at all times. Only in that position could the Shroud be left safely unfixed without any danger. This would also enable both sides (the front as well as the back) of the Shroud to remain accessible in the future. However, the Shroud has its own logic, because any conservation measure had to sustain its continued use as a relic. This meant it had to be guaranteed that Christians from around the world could continue to have 'access' to the Shroud via future exhibitions. Although the fabric itself is in relatively good condition, the Shroud cannot be displayed in a vertical position if it is not fixed on a support fabric because of its many damaged areas. Nonetheless, a horizontal positioning of the Shroud is out of the question for any exhibition, as the flow of visitors would be unmanageable. Securing a longer life span for this unique relic was of paramount importance, and the least damaging means of display had to be guaranteed as well. As the best way of exhibiting the Shroud was (and will continue to be) a vertical display, the Shroud had to be fixed onto a support fabric in order to give it the necessary stability.

The shroud was laid onto a fine, tabby weave, linen fabric (in its most natural state, with no added chemical substances); the Shroud was held in place by hardly discernible couching stitches,[6] mainly around the edges of the holes. The stitching was worked in pure silk threads (organzine), the width of a hair, and worked with appropriately fine needles. It is very easy to undo these fine stitches, if necessary, within a day. No traces will be left of the stitching. The fixing is completely reversible. The silk threads are very fine and flexible which makes them disappear into the weave. They also are just strong enough to respond to any significant strain and break 'before' they cut into the original fabric and thus cause damage.

As was to be expected, the Shroud appears in a new light after the conservation work. (Fig. 8) The exposed burn holes considerably increase the impression of a cloth that has suffered damage; this damage was in evidence up to the fire at Chambéry. Removing the patches has given the Shroud more substance than we expected. The form of a person in agony has become more recognizable altogether because the lines are no longer broken by the patches. The dramatic damage caused by the fire literally reflects how the Shroud had been folded previously. This also serves to lend the cloth more significance. Before starting the conservation work, we were concerned that removing the patches would spoil the Shroud's appearance from the observers' point of view, but this has proved unfounded. Still, our fears that residue from the fire might have a negative effect on preserving the priceless imprint were fully confirmed by what we found under the patches.

Refraining from carrying out necessary preservation work entails no less responsibility than carrying it out! As a rule, this type of task always ends in a compromise. Losing the context of what happened in 1532/34 in Chambéry was a price that had to be paid. This regrettable loss does not concern the substance or the significance of the original Shroud, however. In view of the justified fears, this change had to be accepted, particularly since it was possible to document the circumstances of the Chambéry restoration for posterity. In addition, it is regrettable that material was lost, although despite being removed from its original context it has been safely archived and is available for research purposes.

Should this valuable cloth, this relic, have been left untouched?

That is the kind of question we face with each object when we are responsible for guaranteeing its survival. Obviously the religious character of the Shroud does not call for an exception. On the contrary, we ought to be even more careful with this important relic as far as the risks of future damage are concerned. We ought to minimize these risks as much as possible.

Such decisions should always be based on a complete analysis and by carefully weighing up the results, and taking into account all the object's circumstances.

Professional analyses no doubt form the basis for all our conservation measures, but it would be a failure if we were to carry out 'analysis for the mere sake of analysis'! The result of the analysis itself is not enough; it also calls for courage in action. We are also responsible for 'doing nothing'. In the case of the Turin Shroud, the latter would have been an irresponsible approach.

(Figures by Giovanni Pisano, Gian Carlo Durante, Giuliano Marchisciano.)

FIGURE 6 Removing of the carbon dust with a special vacuum cleaner

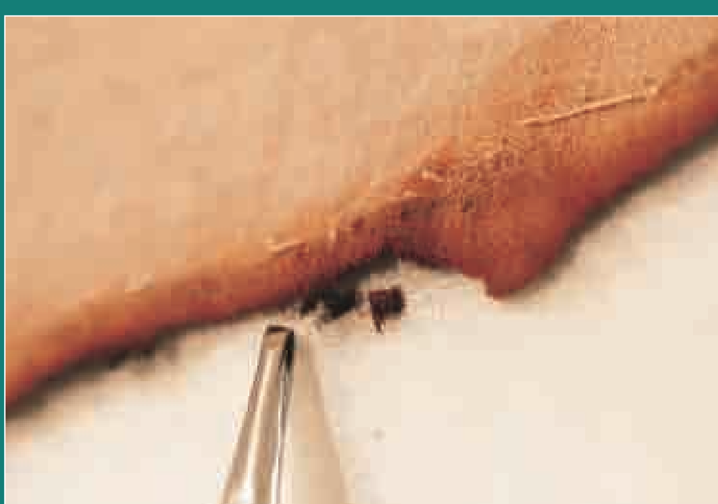


FIGURE 7 Removing the burned fabric by tweezers

FIGURE 8
General view of the front of the Shroud
before and after
the removal of the Chambéry patches

Endnotes

1 Flury-Lemberg, M. (1998). Stato e Problemi di Conservazione della Sindone di Torin. In: B. Barberis and G. M. Zaccone (eds.) *Sindone. Cento Anni di Ricerca, Torino*: 255-67; Flury-Lemberg, M. (2000). The Linen of the Turin Shroud. In: *The Turin Shroud, past, present and future, International Scientific Symposium*, Turin, 2-5 March 2000: 26, figs. 6a,b; Flury Lemberg, M. (2001). The Linen Cloth of the Turin Shroud: Some Observations on its Technical Aspects. SIDON *Nuova Serie*, Torino, Anno XIII No.16: 55-76; Flury-Lemberg, M. (2001). Spuren einer wechselvollen Geschichte auf dem Grabtuch von Turin. *Das Münster, Zeitschrift für christliche Kunst und Wissenschaft*, 1:17-29.

2 According to the historical sources the Turin Shroud was in Constantinaple until 1204 when it disappeared when the city was occupied. Bela III the king of Hungary between 1172-96 married the daughter of the Byzantine emperor Manuel I. In that time there was a very close contact between Hungary and the Byzantine Empire. That can be the reason why the picture of the Shroud can be found in the codex Pray (1192-95) which is still preserved in Budapest, the capital of Hungary See the following: Wilson, J. (1980), *Eine Spur von Jesus*. Freiberg: 49. Csocsan de Várallja, E. (1987), The Turin Shroud and Hungarie, in *Ugarnbuch*, 15: 1-49; Werner Bulst, *Betrug am Turiner Grabtuch*. Frankfurt, 1990: 49; Flury-Lemberg, M. (2001), A cloth of inestimable worth, in G. M. Zaccone (ed.) *The Two Faces of the Shroud*. Turin:137-42; Leconte, A. (2003), Very disturbing similatrics; Poulle, E. The holy Shroud and the dating of the codex Pray, in *Revue Internationale du Linceul de Turin*. Paris, Vol. 25: 2-5, 7-19.

3 Adler, A.D. (1991). Conservation and Preservation of the Shroud of Turin. S*hroud Spectrum International*, 40:5. 'How serious are these problems? Could the quality of the Shroud's appearance seriously deteriorate within the next decade or so? It is not impossible, unfortunately there is some evidence that it is progressing right now. If we are remiss in undertaking conservation/preservation studies and measures on the Shroud of Turin, future generations will have every right to castigate us for failing to meet our responsibilities in these matters. History will not be kind to us!'. Also: Adler, A.D., and Schwalbe, L. (1993), Conservation of the Shroud of Turin, in *Shroud Spectrum International*, 42:7-15; Adler, A.D. (2002), The orphaned manuscript, *A Shroud Spectrum International Special Issue*: VII, 25.

4 Flury-Lemberg, M. (2002) *Sindone, L`Intervento Conservativo, Preservation, Konservierung*. Torino 2003 ODPF.

5 Hofenk de Graaff, J.H. (1994), Research into the cause of browning of paper mounted in maps, in *Contribution of the Central Research Laboratory to the field of conservation and restoration,* 21-43.

6 Flury-Lemberg, M. (1988), *Textile Conservation and Research*. Berne: Abegg-Stiftung: 42.

6

A woman's court dress, probably made in the middle of the eighteenth century, came into the possession of the Hungarian National Museum by way of exchange early in 1984.[1] The costume was altered for a woman in the family so that she could wear it in 1896 for the festivities to commemorate the 1000th anniversary of the foundation of the Hungarian state. It was offered to the museum by a collector of metals and weapons who had a remarkable professional and ethical background, and who had maintained a good relationship with the museum for several years. He recognized the value of the dress immediately, and also provided the museum with useful information about the family, as he was aware of the importance of establishing provenance when acquiring artefacts for museum collections. In exchange for the costume in excellent condition he received two chamberlain's keys dated to the eighteenth century, one from the nineteenth century and three haversacks which had been uniform accessories of a well-known count's family. The family knew that the dress had been worn for the millennial events and that it had been made earlier, probably in the early nineteenth century when the family had been raised to the nobility by Emperor Francis I; it was customary to make a new court dress on ennoblement.

[KATALIN DÓZSA]

An eighteenth-century Hungarian court dress with nineteenth-century alterations:

AN EXAMPLE OF HISTORICISM IN THE COLLECTIONS OF THE HUNGARIAN NATIONAL MUSEUM

Description of the dress

The court dress consists of a skirt, a front-laced bodice (i.e. a bodice with a centre front opening secured with laces), and a stomacher (Inventory number: T. 1984. 259. 1-3.). Size: the bodice - 420 mm long; the stomacher - 410 mm; the skirt - 1170 mm. The fabric is made from a lampas silk woven with red, purple, white, golden and green silk and metal threads on a dark blue damask ground; bobbin lace made from golden metal thread; a machine-made imitation of this lace; and, a machine-embroidered cotton lace on a white tulle base. The lining is made from coarse-textured linen in blue and ecru colours and a plain blue calico; the lacing is of golden spun braid. (Figs. 1-2).

The damask weave of the silk lampas has a pattern of a tiny garland of roses with a bow, arranged in tendrils; the pattern of the brocade is a meandering pattern of naturalistic flowers in a larger scale, with representations of roses in full bloom, rosebuds, rose-hips, and flowers resembling lilies and bluebells on leafy stems. One group of rosehips bends down from a branch in a triple cluster; the other group is arranged in the shape of pomegranates or pineapples in the centre of the repeat. (Figs. 12-13)

FIGURE 1 Dress, front (Inventory number: T. 1984. 259. 1-3)

FIGURE 2 Dress, back (Inventory number: T. 1984. 259. 1-3)

The golden bobbin lace has lobed borders with fan-like patterns. This lace is narrower, lighter in shade and has a matt sheen compared to the machine-made imitation, which also has lobed edges, a wavy pattern, a tripartite row of tulips and open-work squares. The white lace on the open-work tulle has patterns of scattered leaves and flowers. (Figs. 6-7)

In its present form, the cut of the dress is Hungarian style following the fashion of the late nineteenth century. The bodice is made of the blue silk stiffened with baleen ('whale-bone'), and its centre front point runs deep down into the skirt in the front. It is open in the front, and fastened with 11 pairs of gilt, eighteenth-century hooks and lacing. It is decorated with 4-4 golden-coloured open-work studs. There is a white lace ruffle around the neckline. Lace was used around the neckline and the lacing as appliqué, along the sides, following the cut, arranged in several vertical lines framed with machine-made golden lace. The back is almost completely covered in lace; the lace bands (which are probably of eighteenth-century date) are clearly visible in the centre part, particularly the lace band over the baleen stiffening (boning) running down the centre back (compare Figs. 3-5 with Figs. 6 and 7, and see comparison in Figure 9). The centre back ends in hooked suspenders with metal bracing. Under the lace-covered bodice there is a blue linen extension but the original cut is recognisable. The rather puffed, white lace sleeves end in ruffles at the elbow. The stomacher is trapezoid in shape, with slightly arched sides; there is a white lace ruffle around the back of the neckline and golden lace appliqué around the front, with a similar golden lace braid at the bottom of the stomacher. The lining is made from coarse-textured écru-coloured linen; although the original boning had been removed, the inset breast pocket has been retained (Figs. 7-8).

The skirt was made from pieces, and was extended with pleats into a trapezoid shape below the waist. The floor-length skirt front is shorter than the back, which is closely pleated at the waist and it has a tail (train). There is a wide gold lace braid at the hem which conceals the blue calico extension to the original length of the skirt. There are traces of another pleating at the back.

The base fabric of the dress (i.e. the blue lampas) is from the middle of the eighteenth century but the place of manufacture is unknown. The meandering naturalistic floral patterns of the cloth suggest a relationship with Lyonnaise silks which were woven with large, naturalistic floral and fruit patterns, so-called 'floating' ornaments, in a finely shaded, tapestry-weaving-like three-dimensional form, from 1730 until about 1770.[2] This complicated and technically rather difficult procedure was facilitated by a series of

FIGURE 3 Bodice, spread out

FIGURE 4 Eighteenth century bodice (back) and stomacher (underside)

FIGURE 5 Eighteenth century bodice (front) and stomacher (front)

FIGURE 6 Dress, back, detail (Inventory number: T. 1984. 259. 1-3)

FIGURE 7 Stomacher, front (Inventory number: T. 1984. 259. 1-3)

FIGURE 8 Stomacher, showing hidden pocket (Inventory number: T. 1984. 259. 1-3)

FIGURE 9 Two bodices compared: T. 1984. 259. 1-3 on the left, and an eighteenth century bodice on the right

technical innovations, introduced mostly by the most famous weaver from Lyon, Jean Revel. The application of natural patterns was typical of his style. There are also some isolated patches of landscapes in a different proportion, including Chinese pagodas and columns decorated with garlands, among the shaded fruit and floral patterns imitating tapestry-weaving. Patterns without landscapes are typical of the period 1750-1760.[3]

Lyon dominated silk manufacture in the eighteenth century.[4] The designs were spectacular, varied and complicated, and the designers were well respected; some of the designs are still preserved. By 1759, 59 designers were working for the Lyonnaise silk weaver's workshops. Between 1730 and 1770, two design assortments per year were launched and sent to the royal courts of Europe, which meant plenty of orders for these silks. Nonetheless, demand outstripped supply and several high-quality manufacturers worked in Tours and Paris as well. Their patterns were copied and even improved, for example in Spitalfelds in London, England[5], Berlin, Spain[6] and even in Austria. Hungarian silk weaving was stimulated by an embargo and protective tariffs imposed by Maria Theresa; these led to a remarkable development in the Austro-Hungarian weaving industry. If imports were prohibited and the silks were popular, we may suppose that the fabric was not made in France but in Austria; however there is no evidence to support this supposition.[7]

There are other court dresses cut in a similar Hungarian style in Hungarian collections. The most beautiful is probably the one worn by a female member of the Majtényi family in circa 1750 (Hungarian National Museum, inventory number 1935.109). It was sold to the museum in 1935 by Anna Muslay, wife of Rudolf Majtényi. 'The light blue, plain silk bodice is tightly braced with baleen, the front runs down into a gore on the skirt, it has a wide lacing, a round neckline, it is richly decorated with a 3-cm-wide gold lace. The yarn of the lacing is fastened by 15-15 silver hooks … The fabric is sky-blue lampas silk' made in Lyon according to the Inventory, 'it is intertwined with silver, the naturalistic patterns are violet, pink, yellow and green bows arranged in three-dimensional, reticular tendrils'.[8] The apron and shirt of Malines with lace ornaments are modern additions 'made according to original pictures'[9] says the description by József Höllrigl at the first exhibition.

The two other Hungarian court dresses, made of lampas silk with blue, silver and coloured silk threads belong to the collections of the Hungarian Museum of Applied Arts (inventory number, 14954 a-b.) The bodices and skirts were made from identical

FIGURE 10 Eighteenth century stomacher

FIGURE 11 Blue linen pocket (Inventory number: T. 1984. 259. 1-3)

materials: a blue damask ground with floral patterns of large, colourful roses and carnations. The cut of the bodice is identical to that of the dress in the National Museum; it is bordered with silver hooks and gold bobbin lace with fan-like patterns. The white lace around the neckline, as well as the baggy sleeves, are twentieth-century additions[10], just like the nineteenth-century apron made from Brussels lace. It was probably exhibited in 1938; it can be identified as number 37 according to a very brief description but there are no pictures of it. At that time it was matched with a tulle apron made with silver embroidery in 1930.[11] There was another dress exhibit under number 35 in the collections of the Museum of Applied Arts, made in Hungarian fashion from blue damask and ornamental gold lace in the eighteenth century but it was mislaid during the Second world War. It is interesting to note that there is a bodice and stomacher made from lampas silk with floral patterns on a blue ground and bordered with gold lace in the Textile Collections of the Budapest History Museum.

Court dress and its variants

The so-called *grand habit/costume de cour*, that is, a court dress worn for royal ceremonies originated during the reign of Louis XIV. In the French court, such dress was worn by a lady or gentleman who was to be introduced to the king. Ladies had to wear a bodice with a round neckline, elbow-length baggy sleeves and a skirt (*jupe*) with a detachable train (*manteau*) fastened over the skirt. At first such a dress had to be black when worn for an introduction, but as this attire was obligatory for every great ceremony of the court, the range of colours was extended to include red, blue, green, white, etc. The cut of the lady's dress lagged slightly behind current fashions. In the eighteenth century, panniers were worn under the skirt (*jupe*). In the middle of the eighteenth century, the skirt and the train were cut in one piece and the *robe de cour* or (*grand*) *robe á la française* as they were called, were made from silver or golden brocade, or were embroidered. In the late eighteenth century, the back part of the costume, often made of Lyonnaise silk with floral patterns (or its imitations), was often cut in 'sack-back' style, creating the so-called 'Watteau-folds'.

The historical Hungarian costume was created and became popular in the late sixteenth and early seventeenth centuries. Men's costume developed from the mixture of the styles of Eastern kaftan and trousers, and Western fashion, while female dresses combined the elements of Renaissance Italian, Spanish and German fashions.[12] The Hungarian dress was made up of a bodice, a skirt, baggy sleeves and an apron. In the seventeenth century, they were mostly made of embroidered silk or velvet; in the mid-eighteenth century, under the reign of Maria

FIGURE 12 The pattern of the silk (obverse) (Inventory number: T. 1984. 259. 1-3)

FIGURE 13 The pattern of the silk (reverse) (Inventory number: T. 1984. 259. 1-3)

Theresa, they were mostly made of golden-silver patterned lampas silk. They were worn primarily in Transylvania, but were also popular in the Felvidék (Upper Northern Hungary before 1920), and were also worn in the Habsburg Court on the most festive occasions. In 1711 the wearing of court dress for court situations was made obligatory by Charles VI, but the Hungarian-style dress was acceptable even then, so Hungarian magnates and noblemen usually stuck to it. Queen Maria Theresa was crowned wearing a Hungarian-style costume in Pozsony (today Bratislava, Slovakia). The young and beautiful queen was depicted in several pictures in a light blue silk dress woven with gold thread, which was hard to distinguish from the abundant gold lace, precious stones and pearls applied as ornaments to her dress. This style was modified in the nineteenth century to a form which is known as the *díszmagyar,* with false bodice, white tulle or lace sleeves on the bodice, lace apron, and a head-dress or bonnet to which a veil made from the fabric of the apron was fastened.

Hungarian noble ladies eagerly wore clothes made in the French fashion, both in the seventeenth and eighteenth centuries. A good example of this is a *robe á la française*[13] from circa 1760-70, from the Majtényi family which was worn by Anna Vay, wife of Gábor Muslay; she probably had it made when her husband was appointed as the vice-bailiff of Pest County in 1768. The dress was sold to the National Museum by Anna Muslay Majtényi in 1935 (inventory number; 1935.110.) and exhibited in 1938.[14] The dress is made of apple-green silk with lace motifs in green, white and pink silk thread in a wavy line in smaller and bigger lobed tendrils and garlands of flowers in the middle of the bigger lobes. It was decorated with green and pink chenille; the quilted white border was once covered in white lace. The bodice, which has a square neckline, reaches down into the skirt in a gore; it is open in the middle; is fastened with tiny buttons, covered in its own fabric. The double skirt is flat on the back and the front, wide on the sides; the inner skirt is shorter; the other one is open in the front, lengthened in an arch backwards; it has a train. It has a 'sack-back' with pleats called Watteau-folds from the shoulder; the tight elbow-length sleeves end in a double ruffle.

This detailed description is justifiable because it facilitates comparison, but it is worth examining the *robe á la française* of the Musée Galliera mentioned above. It also has a 'sack-back' and is flat on the sides, but the skirt is pleated in the front, the laced bodice runs deep down into the skirt, the-elbow-length sleeves are ruffled and the stomacher is decorated with gold lace ruffles in three rows.

A comparison of the two types of costume reveals similarities and differences. The bodice of the Hungarian dress is always sleeveless, the shirt underneath is always visible, the front is widely boned. It was often decorated with gold lace but it must have been taken from French fashion. The line of the bodice and the cut of the sleeves usually followed the fashion but the skirt did not, for it was usually evenly pleated and round. In the nineteenth century, the skirt was also adjusted to follow the French fashion which was not so difficult until the 1870s, as the richly pleated round skirts were similar to the Hungarian-style dresses, but they did not follow the fashion of tight dresses and bustles between 1870 and 1890. In 1896 the more densely pleated back with train was imitated as it only involved a slight difference from the Hungarian style. The constant features of Hungarian female court dress are the laced bodice, baggy sleeves and full skirts, but their fashionable cut makes them easy to date.

Conclusions

In summary, we can say that the material of the dress, the stomacher, the hooks, the boning of the bodice and – last but not least – the skirt suspenders on the back are of eighteenth-century date. Comparison with an unaltered bodice makes the dating obvious. The skirt was altered to give it a fashionable cut in the 1890s but the original seam and traces of extensions are easily recognizable, which facilitates the 'reconstruction' of the first version. The gold lace is probably a good imitation of nineteenth-century date, although there are some areas of lace that must date to the eighteenth century.

It is clear that a typical Hungarian eighteenth-century court dress was altered very carefully, with the fewest possible changes, for its owner in 1896. Why did the collector think that the dress dated from the early nineteenth century? The family of the original owner traces its nobility back to the early nineteenth century, when one of their ancestors, a gallant Hussar captain, covered himself in glory in the Napoleonic wars and therefore was raised to noble rank.[15] At the time he married into an ancient noble family, so the history of the dress can be easily followed. It is not impossible that someone from the wife's family had been introduced to Maria Theresa, on which occasion the dress was made and later on it was held in great regard and maintained with great care.

Finally, the following questions arise: why did the well-to-do lady of the family not order a new dress instead of modifying a garment from the family wardrobe? Why did she care so much about the cut of the dress? Why was the remodelling undertaken with such great care? First it has to be noted that the alteration is unlikely to have been done in order to save money. The history of Hungarian dress reflects the respect and maintenance of pieces of clothing inherited from ancestors: father to son; mother to daughter. The re-use of clothes held in respect by the family became more and more important from the second half of the nineteenth century because all the ancient garments, fabrics, buttons, laces, hooks and eyes proved the nobility and long history of a family. Thus families competed with one another: the more ancient dresses or accessories the better; an old garment meant more prestige for the owner than a new one. It is therefore quite understandable that the eighteenth-century dress was handled with the utmost care and that the eighteenth-century designs were preserved as much as possible.

Then came the final question: what to do with the costume? One suggestion was to reconstruct it to its original eighteenth-century form, to expand the number of valuable, ancient pieces, as both the original cut and alterations were visible. We realized, however, that we would not be able to reinstate or restore the original state of the Hungarian court dress completely and precisely. It would have been another twentieth-century alteration, a reconstruction to an eighteenth-century form that existed only in our heads. What is even more important, the alteration carried out in 1896 is an integral part of the costume's history and is a spectacular example of the cult of traditional styles.

References

Buzási, Enikő (Ed.). *Főúri ősgalériák, családi arcképek* [Aristocratic ancestors' galleries, family portraits]. Exhibition catalogue. Hungarian National Gallery. Budapest, 1988.

Delpierre, Madelaine (Ed.) *Uniformes Civils français, cérémonial, circonstances* 1750-1980. Musée de la Mode et du Costume. Exhibition catalogue. Paris, 1982.

Földi-Dózsa, Katalin. Die Ungarische Nationalracht als Hofkleidung. In: *Kaiser und König*. Ausstellungskatalog. Collegium Hungaricum - Österreichisches Nationalbibliothek. Wien. 2201: 23-9.

Földi-Dózsa, Katalin. L*e costume de cour de hongrois*. In: Exhibition catalogue. Musée Carnevalet. Paris, 2001: 73-80.

Földi-Dózsa, Katalin. *Az udvari díszruha története.Tanulmányok Budapest Múltjából*. [The History of the Hungarian Court Court Dress. Studies from the Past of Budapest.] XXX. Budapest, 2001.

Fülep, Ferenc (Ed.). *A Magyar Nemzeti Múzeum* [The Hungarian National Museum]. Budapest, 1977.

Höllrigl József. *Magyar viselettörténeti kiállítás* [The History of Hungarian Costumes Exhibition] The Museum of Applied Arts, catalogue, Budapest, 1938.

Join-Dieterle, Catherine; Horvat, Frank. *De la Mode et des Jardins*. Musée Galliera. Paris, 1997.

Kugler, Georg; Kurzel-Runtscheiner, Monica. *Das Kaisers teure Kleider.* Ausstellungskatalog. Kunsthistorisches Museum. Wein, 2000.

Markowsky, Barbara: *Siedengewebe*. Katalog des Kunstgewerbemuseum Köln. Band VIII. Köln, 1976.

Modes & Révolutions. Musée de la Mode et du Costume, Palais Galleria. Exhibition Catalogue, Paris, 1989.

Morral i Romeu, Eulalia; Segura i Mas, Anton. *La Seda en España, Leyenda, poder y realidad*. Barcelona, Madrid, Lunwerg, 1991.

Rothstein, Nathalie. *Silk Designs of the Eighteenth Century from the Collections of the Victoria and Albert Museum,* London, 1990.

von Boehn, Max. *Die Mode. Menschen und Mode im achtzehnten Jahrhundert*. München, 1928.

Endnotes

1 The author worked for the textile collections of the Hungarian National Museum and was the manager of the collection between 1971 and 1994. She would like to thank Lilla Tompos, the current manager of the collection, for her kind contribution to this article.

2 A typical example: the material of a *robe à la française* made around 1750: écru, 1.208. The pattern was made by Jean Baptiste Chevillon, the design can be found in the Bibliothèque de France, Paris. See Join-Dieterle, C, and Horvat, F. 194. no.14. p.34: illustration.

3 Markowsky, 1676: 67.

4 See Join-Dieterle, C. and Horvat, F. Paris 1997: 31.

5 Rothstein, 1994.

6 A similar, salmon-coloured pattern with flowers and tendrils in a reticular arrangement on a floral patterned damask base can be found for example in the collections of the Museu Téxtil de Terassa, Inventory number: 4564, size: 101 x 54 cm, see in: Morral i Romeu and Segura i Mas, 1991 p.28. Cat.No.: 118, picture 129.

7 I have not seen any similar ones in the silk samples of the Museum für Angewandte Kunst.

8 Fülep, 1977. no. 86. pictures 200-1. Description provided by Mária V. Ember.

9 Höllrigl, 1938,18, nos.3-4. illustration X.

10 Addition by Katalin E. Nagy.

11 Höllrigl, 1938: 19.

12 See References.

13 Fodor, I. and Cs. Lengyel B. (Eds.) Magyar Nemzeti Múzeum [The Hungarian National Museum] Budapest, 1992: 83. no. 99. The description, which is mostly identical with the one in the article, was made by the author.

14 Höllrigl, 1938: 18, no.32, illustration IX.

15 The dress was sold by Borbála Piatsek, wife of János Nováky. In Iván Nagy: Magyarország családi címerekkel [Hungarian Families and their Coats-of Arms] Vol. VIII: 169. János Nováky was mentioned in the census of Trencsén County between 1810 and 1830.

7

Dutch textile historians tend to associate black clothing with the culture of the seventeenth-century regents.[1] The Dutch 'golden age' flashes upon the eye in black worsted costumes and silk velvet waistcoats with bright, white starched millstone-like collars. Was this ceremonial black costume an old tradition? Is there any relation to the Dutch Calvinistic burgher society? Or is it just an impression one gets from the Dutch paintings and not really representative of the habits of a seventeenth-century Dutchman? Medieval men and women are depicted in colourful clothing. Red and bright green colours were often used, and of course blue in innumerable shades.[2] Yet, seventeenth-century people seem to love bright and often brilliantly coloured clothing, as well. This love for colours expresses itself in the bright colours in tapestries but also in the many recipes for dyeing bright red, orange, yellow, lilac, etc. Still, black textiles occur abundantly in clothing, not only in the fine black cloth of the governing circles, but also in many other textiles for everyday use. Through the many recipes in a seventeenth-century recipe book from Haarlem in Holland, I would like to show how important black dyeing was in the seventeenth century.[3] Thereafter, dyeing methods, including the dyestuffs and necessary auxiliaries, and the consequences of their use in black dyeing, are discussed.

JUDITH H. HOFENK DE GRAAFF

Dyeing black in seventeenth-century Holland

The 'Haarlem' manuscript

The Frans Hals Museum in Haarlem owns a number of manuscripts related to the city's textile industry. One of these is a large manuscript with recipes for textile dyeing. Although it has never been published, it was studied at the end of the nineteenth century (in 1888), probably by the archivist of the municipal public record office. The first page bears the title: '*Receptenboek om allerlei kleuren te verwen, afkomstig uit een Haarlemse ververij*'[4] 'Recipe book for Haarlem'. The author is unknown, but the manuscript must date from the second half of the seventeenth century. This dating is based on annotations and literature mentioned with the recipes. The regulations introduced for the French textile industry from 1669 by the French minister of Louis XVI, Jean Louis Colbert, are cited many times.[5]

The manuscript consists of about 900 pages of recipes, mostly for dyeing textiles, but recipes for artists' pigments are included as well. The manuscript has three parts. The first part of about 300 pages is a haphazard gathering of all sorts of recipes and notations in different languages: Dutch, French and Latin. The second part, about 550 pages, is in alphabetical order according to colour; the final part of about 20 pages seems to be in a different handwriting and contains only recipes for dyeing textiles.

The first two parts of the manuscript are the most interesting. Every recipe or citation has an abbreviation of the reference to its origin. The annotations represent three different sorts of sources. First there are recipes copied from contemporary printed books. The best known of these international sources are: *l'Instruction Général* by Colbert and the *Kunstbuck* by Alexias Piedemontanus.[6] Some recipes are copied in the language of origin; others are summarized in Dutch.[7] There are also citations from a dyer's book printed in Dutch, by Gerbrandus Nicolai, 1648, which is not only mentioned in this manuscript but also in a contemporary manuscript of Jacoba van Veen.[8]

The second type of source is manuscripts by contemporary dyers, e.g. '*Een invetie door Sr. Jan Janse Tromp my bekend gemaakt*' - 'An invention made known to me by Mr Jan Janse Tromp'.[9] Oral communication is a third source of information. Examples of this type are: 'Mr Daniel Tau Lober, merchant at Rotterdam, says that his father-in-law, by the name of Belle, is a hatter and for dyeing his hats, he uses …' and '… a certain woman said to me that her Master, a hatter, dyed his hats apple blossom colour using blue litmus and sumac'. From some recipes it becomes clear that the author of the manuscript has asked colleagues to give a demonstration of a particular dyeing method as applied by themselves. It is clear that he pays for the demonstration and for writing down the recipe.

From the wording of the recipes it seems that the anonymous author must have been a professional dyer. Under the heading 'blue', descriptions are given of the successive steps in an indigo dyeing process. In the margin are remarks made about the success of the colour obtained and about difficulties that arose. Sometimes the customer's name is mentioned, and also how much was dyed and at what price, and whether it was successful. From this one might conclude that the author was a blue dyer or the owner of a blue dyer's workshop.

Black in relation to other colours

From the content of the alphabetical part of the manuscript one can see how important - compared to the other colours - was the dyeing of black. The colours taking most of the pages are black (92), blue (82), and red (64). However, this partition does not give a completely honest representation of the colours in use. To the number of recipes ranged under the heading 'red' (64), the recipes ranged under the headings: 'Kuffelaer' (13) and 'crimson' (46) could be added.[10] Counted in this way, the order of importance would be: red (113), black (92) and blue (82). From these figures black seems to appear to be more important than blue.

It might be asked whether this preference for black has to do with fashion or if the price of black dyeing might play a role. Much is still unknown about the prices for dyeing and it would require a separate study to explain the differences. Some conclusions can be drawn on the basis of the price of the raw materials and the difficulty and duration of the dyeing process. If dyeing black is performed without a blue 'ground', then it is certainly cheaper than dyeing blue. To dye blue, woad or indigo was used in the seventeenth century. In the period in which the Haarlem manuscript was written - the third part of the seventeenth century - mainly indigo was used. Indigo had to be imported from the Far East or from the West Indies and was relatively expensive. The ingredients for black dyeing - gallnut or alder bark - could be imported but were also available within the country. The process of blue dyeing with woad or indigo - both vat dyestuffs - was more complicated and laborious than dyeing with black gallnut or alder bark - both mordant dyes. If a blue 'ground' was used for dyeing black, the total price must have been higher than for just dyeing blue. This calculation already leads to the conclusion that different qualities of black can be expected.

Woollen cloth and silk

As mentioned above, there are two ways of obtaining a black colour on textiles: a) dyeing dark blue with woad or indigo and a second dyeing with madder on an alum mordant; and, b) mordanting with an iron compound and dyeing with a tannin-containing plant material (gallnut, alder bark or sumac). The dyeing of black with gallnut and iron sulphate was often forbidden for good quality woollen cloth; yet, recipes for such dyeing nevertheless already existed in the early sixteenth century. The earliest source with recipes for dyeing black on silk is '*T Bouck va Wondre*' from 1513, which is written in Dutch. This book is not a real dye book but more a collection of recipes that fall within the scope of a 'book of secrets'. Together with many others, several recipes for dyeing silk and wool are present; of these, four are recipes for dyeing black. Three of these are for dyeing silk cloth or velvet; one is for dyeing yarn. The ingredients in this recipe are the following: gallnut, swarf and filings from iron, copper red (iron(II) sulphate) and gum Arabic.[11]

In the Netherlands - in the main dyeing centres such as Amsterdam, Haarlem and Leiden - municipal regulations were applied primarily to the dyeing of woollen cloth and silk. Other products, such as ribbons, embroidery threads, linen yarns and linen or cotton fabrics, were exempt from the regulations. In the Northern Netherlands, the quality of the dyeing of high quality woollen cloth (which was meant for export) was regulated in detail.[12] In the first part of the seventeenth century, the city regulations required that black be obtained by a first dyeing of dark blue with indigo or woad and a second dyeing with madder on the basis of an alum mordant. This kind of black might have had a reddish hue. There were, however, differences in approach to the use of dye products under discussion between the important dye centres. As early as 1588 dyers at Leiden asked the local government for permission to dye woollen cloth 'in the Amsterdam manner', i.e. with gallnut and iron sulphate. However, the city syndics (Staalmeesters), using the argument that the quality of this black was insufficient, rebuffed this request. The colourfastness of the black dyed with woad or indigo in combination with madder was excellent.[13]

The Haarlem manuscript contains several recipes for dyeing black where the starting point is a cloth already dyed blue. For instance: 'to make good black on the ground of a large double blue sample or on an "old" blue sample or on a single blue sample'. After that the following ingredients are mentioned: sumac, gallnut, madder and logwood. Then copperas is used as the iron compound (Haarlem manuscript 310/r/2). The expression 'blue double sample' refers to the quality system where every year the depth of the blue dyeing was determined by the city government. This was expressed in dyed samples, which were kept in the clothmakers' hall and against which all the blue dyed cloth had to be checked.

The other way of dyeing black was the combination of a tannin-containing plant extract, such as gallnut, together with an iron salt. This iron salt, green vitriol – also called copperas, a name formerly applied to all the vitriols – is iron(II)sulphate. In the period mentioned above, black dyeing of woollen cloth with gallnut and iron(II)sulphate was prohibited but this changed during the course of the seventeenth century. In the second half of the century the use of gallnut and iron salts prevailed, whether or not on a blue 'ground'.[14] This black has a more blueish-black hue. The quality depends very much on the ingredients used. It could be relatively good if the proper ingredients were used. The use of alder bark and iron filings for high quality cloth, for example, was still explicitly prohibited.[15] By the end of the seventeenth century, the change from a dyeing method with a combination of indigo and madder into a method with gallnut and iron sulphate had taken place. At that time a differentiation was also made in the type of black woollen cloth: black and 'kastoorzwart' (castor black). In the recipes one can read that a good quality black woollen cloth was given a blue 'ground' with indigo followed by black dyeing with gallnut, alder bark or sumac and iron compound. However, the castor black was dyed directly on the white wool using a tanning agent such as gallnut or alder bark and an iron salt. Thus at that time a combination of a tanning substance and an iron compound as a mordant was frequently used as a method for the black dyeing of wool as well as silk.

For silk dyeing the situation was different. From antiquity the method most used was a combination of tannin products and iron compounds. In the early sixteenth century it was already permitted to dye silk with gallnut and copperas; this is in contrast to the dyeing of black on wool. In the Netherlands the silk industry commenced in the early seventeenth century, and Amsterdam and Haarlem were the most important cities for its development. The Dutch East Indian Company (VOC) imported raw silk, in the form of silk cocoons or skeins of raw yarns, from Persia and India. Regulations for silk dying were limited and introduced later. They were explicitly focused on the weighting of silk, the dyeing of black and the dyeing of red (crimson).[16]

From very early times silk was weighted with tannin products. For many purposes the raw silk had to be degummed (removing the resinous product which glues the two silk filaments together). Through this degumming process the silk lost approximately 25% of its weight. To increase the weight again and to give the silk a better drape it was treated, for example with gallnut. Another possibility was the use of sumac. In the case of dyeing black, the weighting and black colouring took place in one process. As this process could be repeated several times to increase the weight of the silk, strict regulations governed the amount of weight increase that was permitted. The quality and durability depends much on the amount of extra weight given to the fibres. If the weighting was more than 50% of the original weight of the silk, the silk fibres became brittle and less durable.[17]

In the Amsterdam ordinance of 1607 the traditional way of dyeing silk black with gallnut is already confirmed. In a contract by a 'black dyer' the materials necessary to start a dye workshop are mentioned. The usual dyestuffs, such as gallnut, sumac and copperas, are mentioned. It seems that the ordinances were often violated and in a later ordinance of 1626 it is even forbidden for a black dyer to store alder bark and swarf in the workshop. In the same ordinance it is permitted to treat the silk once with gallnut, but it is explicitly forbidden to repeat this even once or twice.[18] Looking at the recipes in the Haarlem manuscript one gets the impression that the alder bark vat is the most important part in the dyeing process. In almost all cases the alder bark vat is combined with a separate dyeing with gallnut and also copperas is used together with the alder bark vat. This combination is used for fabrics as well as for yarns. A typical recipe for black yarns, taken from the Haarlem manuscript, shows the typical ingredients but also the complexity of the process:

> **For black silk yarns:** If one wants to boil down for black one must take for 70 pounds of silk 28 pounds of soap. However the soap must not be added before the water boils. Then put the soap in the boiling water and boil the solution until the soap is completely dissolved. Put then silk in the soap and let it boil for one hour. After that take it from the kettle with a stick and lay it on the grid [mesh] and leave it to drain well. Then take the yarn out of the sacks, wring them and rinse them thoroughly. After rinsing take 1 pound of alum and dissolve this in a small kettle and pour this in a barrel. In this put the silk for a quarter of an hour and wring it well and rinse well again. After this wring the silk well with a wringing stick and put it on a bench until all the silk has been wrung well. Then put all together in the kettle with gall and leave it there for 34 hours and wring it again and put them on sticks. When all the silk is on sticks then divide them in four sections and hang them in the rack, two above and two below. Now, before going to dye one takes a kettle with rainwater and adds 4 pound of gum (Arabic). Let this dissolve well, but keep stirring to prevent the burning of the gum. After dissolving add this solution to the black kettle and one must add: 7 pounds of copperas, 1 pound of swarf, 2 pounds of syrup and then one can dye the silk. Take every hour one portion. When the dyeing is finished then one must put the silk in the rinsing tub and rinse well. Wring them well and rinse again twice and let them rest in the kettle for a quarter of an hour and rinse again. After this rinsing one must wring it with a stick, put them on sticks and dry. This is good quality black.
>
> To prepare a black kettle. Put canal water (Burgwalswater) in a kettle, bring this to boiling, take then 10 pounds of copperas, 5 pounds of gum, 2 pounds of swarf, 3 pounds of 'syrup' put this in the kettle and stir well and thereof one must boil a 'beveret'. To make 'beveret'; one must take 1 pound crushed gallnut, 4 'loot' (? ounce = ca. 15 grams) of fenugreek, 6 'loot' flee seed, pomegranate skins, 1 'loot' oregano, 8 'loot' alder bark, 16 'loot' swarf and half a pint of brandy, stir well and work as you must. (Haarlem manuscript 322/r/1-324/l/1)

In this recipe the term 'beveret' requires some explanation. The ingredients are of two kinds: the iron particles and iron sulphate on one side, and ingredients of organic nature on the other. The organic ingredients will ferment and produce organic acids, which in turn will react with the iron compound to form iron acetate, formiate, etc. to bring the iron into solution. After being dissolved it can react with the tannin compounds in gallnut and sumac to form the black iron tannate. Another, shorter and more straightforward recipe from the same manuscript is the following:

> **Black silk:** The first day when the silk is taken from the gallnut bath one must put them on sticks, when the kettle is hot then put in it the first morning: 4 pounds of gum and 3 pounds of copperas. In the afternoon put in 2.5 pounds of gum and 3.5 pounds of copperas. Then again 3 times the same. Then in the evening rinse in a barrel with water and leave it for the next day. In the morning add 3.5 pounds of gum and 1.5 pounds of copperas. In the afternoon add again 2 pounds of gum and copperas, then rinse again as before; the next day take 2 pounds of gum and 3 pounds of copperas. In the afternoon again add 1.5 gum and 2.5 pounds of copperas. After this the silk is good, then being rinsed and rubbed. To finish the black silk after it has been dyed black and rinsed well it is very beautiful (Haarlem manuscript 320/1/2)

As can be seen above, the recipes are often very complicated and many ingredients, such as gallnut and alder bark and sumac together with yellow wood (fustic), alum, madder, tartar, orpiment, and gum arabic are added. The importance of thoroughly rinsing after the dyeing process is emphasized. Although recipes can be found for silk fabrics, such as satin and velvet, most describe the dyeing of yarns.

Other textile products

So far only black dyeing of wool and silk has been mentioned, because much of it is known through printed regulations and decrees. The regulations particularly focused on the dyeing of woollen cloth in all varieties and on silk materials. However, in these only the permitted or prohibited ingredients are mentioned. Dyeing methods or special requirements for the dyeing of other textile products are not mentioned. Hence, these seem to be free from regulations. The Haarlem manuscript provides a better view on the seventeenth-century dyeing methods and on the variation of textile products to be dyed. The recipes apply to a range of textile materials, including silk yarns, ribbons, apron cloth and linen. Textiles mentioned are woollen cloth of second quality, serge, camlet, woollen, cotton, linen and silk yarns and mixed fabrics of wool and silk. Another example from the. Haarlem manuscript is for so-called 'Turkish serge'

> **Black Turkish serge:** For six pieces. Bark, one basket, madder six pounds, let it boil for one quarter of an hour, then put the six pieces in this bath and let it boil for one and a half-hour. Take it out and let it cool off. Then take twenty-eight or thirty buckets from your dye bath. Take copperas nine pound, gum four pounds, madder one pound, swarf a scoop, province wood (logwood) one pound and let this boil together, then put your six pieces in the liquid and stir well to prevent them to burn and leave them one hour. Take your material out, let it cool off and repeat the process twice. After that rinse well. (Haarlem manuscript, 293/L/3)

There are also recipes for a rich variety of linen cloth, fustian, stockings, hats, and wool fibres, the finishing of silk textiles and for the degumming of raw silk. Recipes for dyeing 120 pairs of stockings and for only a few pairs both occur. There are also recipes for aprons and work clothes and for blue linen, both in small and in large quantities and for large amounts of trimmings. A most peculiar recipe, but typical for the Haarlem manuscript, is the following one for dyeing black hats.

> **To blacken hats:** For 12 buckets liquid, take two 'loot' mercury sublimate, and put that in a cup of brandy, and leave it for two hours, and the mercury will be solved properly.[19] This I have heard from a hatter in Utrecht, and he put this to the gall liquid and to the logwood during the boiling liquid. For the second time in the black liquid he add copperas, also two 'loot' Spanish green, and after boiling for two hours he takes it out. For the last time in the black liquid he does not put in 'beveret' in the kettle, but boils his hats again one hour in the same liquid and then in warm water very well washed and rinsed, this will become very good black (Haarlem manuscript, 310/r/l).

The most important ingredients in all these recipes for black are the alder bark vat, iron filings and copperas.[20] Many of these ingredients are often used in combination. The frequent use of logwood for the dyeing of linen textiles is striking. In many city regulations this dyestuff is forbidden for woollen cloth.[21] In the Amsterdam decrees for dyeing woollen cloth this dyestuff is explicitly prohibited. It comes on the market under the name of province wood or Campeche wood. From the recipes in the Haarlem manuscript it seems to be used frequently. The importance of the use of dyewoods such as logwood and brazilwood is expressed in the Amsterdam government's monopoly of grinding the wood logs in the city prison (rasphuis). The dyewoods were imported in the form of logs and had to be splintered for grinding (raspen).[22] As a specific example, a recipe for the black dyeing of linen is quoted from the Haarlem manuscript; this recipe would not have been allowed for woollen cloth. The recipe is rephrased and translated:

> **Black, linen or yarn:** Fill a vat with alder bark and pour water on it. Leave it for a month. Take a bucket of swarf and two pounds of filings and add it to the vat. Leave it for a fortnight. Drain the liquid regularly through a tap from the lower part of the vat and pour it back into the vat. Take one pound of gallnut for dyeing six pounds of linen and boil them. Put the linen in this liquid and leave it for one hour. Wring out the linen well, drain the dye from the bark vat in a tub and put the linen in it for two hours. Wring the linen out and put it again into the hot gallnut extract. Leave it for an hour, wring it out again and put it for another two hours into the liquid from the vat. This procedure is carried on until the linen is sufficiently black. (Haarlem manuscript, 294/1/3).

Once again this recipe shows the combination of different tanning substances (gallnut and alder bark) and iron compounds (swarf and filings).

Chintzes and other printed textiles

For the printing of black patterns on cotton, mainly the dark contour lines of a pattern, comparable ingredients are used as for dyeing wool and silk. In printing, the cotton fabric is pre-treated with an extract of gallnut and after that it is printed with a solution of an iron compound (iron liquid). Dissolving copperas in water made this 'iron liquid' but also the liquid from the alder bark vat as previously described was used for this purpose.[23] The Haarlem recipe book does not contain any descriptions for printing cotton fabrics (chintzes). Although much chintz was already produced in The Netherlands in the seventeenth century, this printing seems to be done by another group of craftsmen.

Chemical principles of the dyeing method

Like many other natural dyestuffs, those mostly used for dyeing and printing black belong to the group of mordant dyes. The chemical principle of these is the bonding of the (organic) dyestuff molecule to a metal to form an insoluble complex that is physically and chemically connected to the textile fibre. The bonding to wool and silk (protein fibres) is easier than to linen and cotton (cellulose fibres). The fastness to light and washing of dyed cellulose fibres is less than that of wool and silk. In black dyeing the dye molecule consists of tannic acid and the metal involved is iron. The dye complex is iron (III) tannate. The colouring matter, tannic acid, occurs in various plants. Gallnuts, mentioned in many recipes, are the most important source for tannic acid. They came mainly from the East Indies, Persia and the Levant. The Aleppo gallnuts belong to the top quality, containing 50-60% of tannic acid. Other brands came from Smyrna, Hungary and Austria.

The second most often used source of tannic acid is alder bark. In some recipes oak bark is given as a replacement. Both materials contain various sorts of tannic acids which are chemically not completely identical, but which produce a similar black colour with iron salts. Alder bark was mostly used for the bark vat, as it appears in recipes from Amsterdam, Haarlem and Leiden. The third important tanning substance is sumac. In seventeenth-century Dutch recipes it is often called 'smack'. It consists of the finely ground leaves of the *Rhus coriaria L.,* a native bush in Europe. It is sometimes called Sicilian sumac, which clearly refers to its origin.[24]

The iron compound mostly used is copperas, a mineral with the composition of iron (II) sulphate, which could also be produced by heating mixtures that contained both iron and sulphur. After dissolving the reaction product and evaporation of the water, the iron (II) sulphate was left as a residue. Relevant supplies came from Italy, Hungary and Saxony. In lists of imported and exported merchandise copperas is explicitly mentioned in the chapter on 'Dyes for all sorts of Colours/materials and ingredients'.[25] Two other sources for iron compounds are mentioned frequently in recipes: swarf and iron filings. In dyeing black the weighting of silk and the dyeing take place simultaneously.

The weighting of silk was generally carried out by means of an extract of gallnut, alder bark or sumac. For those silk materials that were meant to be dyed in light colour, gallnut was used. For others, sumac was allowed. This is because the weighting with gallnut did not colour the silk too much whereas the weighting with sumac gave it a yellowish hue. The addition of an iron compound produced the black iron tannate. This form of weighting must not be confused with the methods of weighting used in the nineteenth century. By then, apart from iron compounds, tin-silicate compounds were used, which had a much more negative effect on the quality and the durability of black silk than the gallnut weighting.[26]

Consequences of black dyeing

Almost every textile conservator is confronted with the problem of deteriorated black textiles, e.g. in the black silk in tapestries and embroideries, but sometimes also black parts in chintzes and other printed textiles. The brittle black-silk fabrics of nineteenth-century costumes are a well-known problem. As already indicated, the process of black dyeing and weighting applied in the second half of the nineteenth century is totally different and the causes of deterioration are different as well. Although the causes of the degradation by tin/silicate weighting have been subject to research, results so far have not shed enough light on this matter.[27] In the present paper I will limit myself to black dyeing with tannin substances together with iron compounds.

So far we have seen that there was no one single method for dyeing black with a tannin product and an iron compound. There were great differences in quality of the basic ingredients and in the execution of the dyeing process. On the one hand this was determined by local regulations; on the other hand, the price of the product played an important role when no regulations applied. Cheaper products were often dyed with dye materials of lesser quality. The dyeing of linen and cotton yarns and fabrics was not regulated at all, and the proper dyeing was left to the dyer's craftsmanship and honesty. This difference also shows in the condition of the textiles that are preserved in Dutch museums. Many of the woollen and silk garments dating before the nineteenth century are in relatively good condition. However, one should keep in mind that the textiles in the museums mostly come from the richer part of the population and that very little will be left of cheaper clothing, such as work dress.

It is with good reason that municipal regulations objected to the use of swarf and iron filings. These consist of iron particles of different size, which can harm textile fibres with their sharp edges and are contaminated with impurities, such as sand particles. For dyeing, the iron particles first have to be converted into iron ions before the iron can react with the tannic acid. In the description of the alder bark vat, one can see that the iron tannate is already partly formed in the vat. In the dyeing process iron ions are attached to the fibre and there react with the tannic acid to form the insoluble iron tannate. Remains of iron swarf and filings will stay behind between the fibres depending on the amount of iron particles in the dye bath and the thoroughness of the rinsing process after dyeing. Black silk thread - even in more expensive tapestries or embroideries - is more often deteriorated. This might be due to the dyeing method, as the production of this type of yarn was not controlled by city regulations. It might also be due to the quality of the silk used for the yarns.[28] The same is true for ribbons and trimmings for which production was also not regulated.

The mechanism of degradation caused by the combination of a tanning substance and an iron compound has been studied extensively in the case of iron-gall ink corrosion on paper. Although there are also degradation phenomena in black textiles, there are important differences between the use of iron gall ink on paper and black dyeing of textiles. However, chemically the same processes take place. The degradation is caused by hydrolysis due to acidic components and by oxidation catalyzed by the free iron (II) ions. The great difference between the use of ink and dyeing lies in the method of application. For iron-gall ink the two ingredients - tannic acid and iron sulphate - are brought together and then applied after the compound has been formed. The ink as it is applied on paper contains the already formed black iron tannate, sulphuric acid - the result of the chemical process of forming the iron tannate-, free tannic acid and often an excess of iron sulphate. In the degradation of paper all these ingredients, but particularly the sulphuric acid, play an important role. However, in the textile dyeing process the mordant - the iron compound - is first applied and after that - in a separate process - the tannic acid is applied upon which the black colour is formed. After the dyeing process the textile is rinsed thoroughly. Although a relatively large amount of acid is formed during the dyeing process - and sometimes extra acidic matter is added - the acid is rinsed out subsequently. The quality and the durability of the textile product is therefore largely dependent on careful rinsing. One may conclude that the degradation of black textiles is caused mainly by oxidation, initiated by remains of the iron (II) compounds and less by acidic hydrolysis because the sulphuric acid is removed by the rinsing process. It is, however, possible that iron tannate, on deterioration, decomposes into tannic acid and iron ions, which could cause both hydrolysis and oxidation. The degradation of iron tannate is enhanced by unfavourable storage conditions (too moist). In addition to the dyeing process, the type of fibre material is also a factor in degradation. Linen and cotton are more susceptible to acid hydrolysis than wool and silk. However, wool is much more stable than silk.

Conclusions

In the seventeenth century, woollen cloth of good quality was dyed black by a combination of indigo and madder. In the course of that century there was a shift towards a combination of indigo and gallnut with an iron sulphate or directly without blue ground with gallnut and iron sulphate (castor black). A combination of tannic acid extracted from gallnut and an iron sulphate was used to dye silk black. There were strict regulations for good quality textiles made from wool and silk. For black dyeing of linen, trimmings, and embroidery yarns, etc., various combinations were used that were prohibited for dyeing woollen cloth. Tannic acid extracted from different plants, such as alder bark and sumac, were used in combination with various iron products, such as iron swarf and iron filings. For these textiles the alder bark vat was mostly used. Logwood seems to have been used frequently as well. This dyeing practice was not regulated.

The degradation of black textiles is for the greater part determined by the quality of the dyeing process. There will be little degradation where pure ingredients were used for textile materials with good ageing properties, as in woollen cloth. Silk fabric from the seventeenth and eighteenth century also has a good chance of being in good condition, although silk is more vulnerable than wool. Embroidery yarns, trimmings and silk yarns for tapestries were not subject to regulations, so there is a bigger chance that a cheap and thus poor-quality dyeing process was used. This shows from the material condition of textile museum objects. Chintzes from both India and Europe (and other cotton prints made in the same technique) follow the same pattern of deterioration. Here, too, the quality of the dyers‘ work plays a crucial role.

Endnotes

1 Groeneweg, I., ‘Over zwarte kleding in de gouden eeuw en een langdurig misverstand’. *Jaarboek 1999. Stichting Textielcommissie Nederland*, Amsterdam 1999: 10-26.

2 Heidi Nixdorf, Heide Müller, *Weisse Westen - Rote Roben; Von Farbordnungen des Mittelalters zum individuellen Farbgeschmack*. Berlin 1983.

3 Table of contents of the ‘Haarlem’ manuscript:

Colour and page number

Albus (white)	11	Lavender (blue)	1
Akker (pink)	4	Lijfverf (pink)	1
Amarant	1	Isabelle (brown)	1
Appelbloesem (pink)	2	Mantel (brown)	1
Aurora (gold)	1	Maijt (purple)	1
Bierenbroot (beige)	1	Minime (red)	1
Spillebont Bisschops (red)	1	Moreel (brown)	1
Blau (blue)	82	Muscus (tellow)	3
Cameel (camel)	1	Nage (yellow)	1
Carstaigne (brown)	1	Oranje (orange)	11
Cancel (yellow)	1	Pavel	-
Citroen (yellow)	1	Rassen&Velours	-
Colombin (beige)	1	Pavonacuy	-
De Feu (red)	4	Peers (violet)	4
Feulje morte	4	Pensee (violet)	-
Geel (yellow)	30	Peerl (silver)	-
Gember (yellow)	-	Prince (red)	-
Gout (gold)	-	Purper (purple	13
Girja/grauw (grey)	22	Roggebrot (brown)	-

Groen (green)	7	Rosen coleur (pink)	-
Hair (brown)	2	Rosen root (pink)	11
Groen (green)	8	De Roije (red)	2
Jansgolij (yellow)	1	Rosijne (brown)	-
Incarnat (pink)	12	Root (red)	64
Isabelle (brown)	-	Swart (black)	92
Kermosijn (red)	46	Taneet (purple)	13
Kuffelaars (red)	13	Violet (violet)	13
Lever (brown)	3		

4 On the first page of the manuscript with dye recipes a former researcher has written the following text 'the pieces of paper which are put between the pages are provided with a date which is mentioned in the test on that particular page'. The colours are dealt with in alphabetical order. On the first page of the manuscript the following text can be read: Recipe book to dye all colours, originating from a dye work in Haarlem dating from the second part of the 17th century. This book belonged to the dye works of Jan de Breuk & zoon te Haarlem, silk dyers, whose dye works were closed down in 1875. The name of the author is not known. However, he must have lived in Haarlem because of a note in which it is written that a 'painter' lived near the Bekenestenkerk. To the town of Haarlem 1888.'

The author of this article has numbered the pages of the manuscript, where the verso side of the page received the letter 'l' and the recto side the letter 'r'. On every page the recipes or notation was numbered in their order. This means that the first recipe on the recto side of page 294 received the notation: 294/r/1.

5 Colbert, J.L., *L' instruction général pour la teinture des laines et des manufacture de laine de toute nuance et pour la culture des drogues ou ingredients qu'on emploi*, Paris 1671.

6 Alexias Piedemontanus, *Kunstbuck des Wolerfarmen hern*; A.P. Benuttzte Übersetzung des Italienischen Originales: von. H.J. Wecker, Basel 1575.

7 The recipes in the manuscript, which are taken from the 'Instruction général' by Colbert, are provided with the captions and recipe number. By comparing these numbers with the original source from the seventeenth century it is possible to verify whether the text is taken literally or is a summary.

8 Peek, Marja; de Boer, Hayo, Books of secrets: Methods of research into original sources on art technology, - in: *Contributions of the Central Research Laboratory to the field of conservation and restoration*. - Amsterdam: CL, 1994: 9-20.

9 Recipe number 302B/r/1.

10 In the seventeenth century the discovery was made of how to mordant with a tin salt to obtain a more brilliant red colour with cochineal. Cornelis Drebbel and his father-in-law Kuffelaer where the first to employ this method. This red was therefor also called 'Kuffelaer'. The word 'crimson' is often used for cochineal on a tin mordant. See also; Nie, W.I.J. de, *Deontwikkeling der Noord-Nederlandsche Textielververij van de veertiende tot da achttiende eeuw*. Leiden 1937: 165-77.

11 Frencken, H.G.T., '*T Bouck va Wondre* (1513), Roermond 1934.

12 Posthumus, N.W., *Bronnen tot de Geschiedenis van de Leidsche Textielnijverheid*, 's-Gravenhage 1912.

13 Hofenk de Graaff, J.H., *Geschiedenis van de Textieltechniek - Lakennijverheid - Sitsen - Zijde-industrie*, Amsterdam 1992.

14 Hofenk de Graaff, J.H., Veranderend kleurstofgebruik in Leiden in de zestiende en zeventiende eeuw. *Textiel-historische Bijdragen* 36 (1966) 5-20.

15 Alder bark and oak bark contain various types of tannins, which are chemically related and form a comparable black colour with iron salts. To prepare the alder bark vat in the way it is utilized in Amsterdam and Leiden, alder bark is mainly used. Swarf is the residual product from the grinding of knives and scissors. In addition to iron particles it also contains sand and other contaminants. This might be the reason that swarf was forbidden frequently because it could damage the fibres. The iron particles will be converted into iron oxide in the dyestuff solution and, by adding vinegar, into iron (II) acetate. In this form it can be bound to the textile fibre. The recipe also mentions iron filings, a coarser product. The iron particles are a bit larger in this product and even more dangerous for the fibres.

16 Ordinance for the dyeing of silk in Amsterdam, August 1626 in Noordkerk. Handvesten II, 1151.

17 Silk containing sericin is called raw silk. The gum-like substance, affording protection during processing, is usually retained until the yarn or fabric stage and is removed by boiling the silk in soap and water, leaving it soft and lustrous, with weight reduced by as much as 30 per cent. Silk is sometimes treated with a finishing substance in a process called 'weighting'. Until the second part of the nineteenth century this was done with tannin products, such as gallnut and sumac with or without metallic salts. Later on, the tin/silica process was used to increase weight, add density, and improve draping quality. See Hofenk de Graaff, J.H., 'De Verzwaring van zijde, oorzaak en gevolg], in: *Zijde en Kunstzijde*, Textieldag 6 September 1990, Amsterdam 1992: 17-29.

18 Hofenk de Graaff, op.cit. 189-90. In the margin of the recipe the author has made a note which refers to Robertus Boyle, *Experimenta et considerationes de coloribus*, 1671.

19 Swarf, iron filings and copperas are iron compounds. The grinding of knives produces swarf and iron filings. Copperas is a mineral and contains iron (II) sulphate.

20 Logwood comes from the tree *Haematoxylum campechianum L*. and was imported from Latin America together with brazilwood in the seventeenth century. See Schweppe, H., *Handbuch der Naturfarbstoffe Vorkommen - Verwendung - Nachweis*, Landsberg 1992.

21 Hallema, A., De gevangenisarbeid in concurrentie met het particulier bedrijfsleven en de strijd om het Amsterdamsche tuchthuismonopolie ten tijde der Republiek, *Economisch-Historisch Jaarboek* XIX 1935: 114-201.

22 Hofenk de Graaff op.cit. 93-110

23 Hofenk de Graaff, J.H., *Natural Dyestuffs, Origin, Chemical Composition, Identification*, ICOM Committee for Conservation 'Madrid 1969.

24 'Lijste van de Rechten van Inkomen en Uxtgaen op de Koopmanschappen, Manufacturen en Waren, 21 dec. 1680. Na de Copie van Brussel, in's Gravenhage, Bij Paulus Schelters, ordinaris, Drucker van de Hoogh. Mog. Heeren Staten Generaal der Vereenighde Nederlanden 1706'.

25 Hofenk de Graaff, J.H., 'De Verzwaring van zijde, oorzaak en gevolg', in: *Zijde en Kinstzijde*, Textieldag 6 September 1990, Amsterdam 1992: 17-29.

26 Van Oosten, T., Investigation into the degradation of weighted silk, in: *Contributions of the Central Research Laboratory to the field of conservation and restoration*. - Amsterdam: CL, 1994: 65-76.

27 In the northern Netherlands tapestry weaving was not regulated; this contrasts with the situation in the southern Netherlands where both the weaving and the dyestuffs were strictly regulated.

28 Hofenk de Graaff, J.H. 'Färben und Schreiben. Verwendung und Schadwirkung von Farbmitteln auf Basis von Eisengallusverbindungen auf Textil und Papier. Ein Vergleich', in: *Tintenfrassschäden und ihre Behandlung*, Stuttgart 1999: 77-87.

The article is a revised version of a lecture given at the Textieldag 'Zwart' [Black] and is published in Dutch in *Jaarboek* 1999, Stichting Textielcommissie Nederland, Amsterdam 1999.

Translations of the Haarlem mss are the author's own.

8

The conservation of metal threads and particularly their cleaning presents a special difficulty for textile conservators. The established methods of cleaning metal objects, such as the use of polishing powders or the chemical removal of the stains or corrosion products from the surface, in most cases cannot be applied to textiles containing metal threads. These methods can be detrimental not only for the materials of the metal threads, the solid strips or wires made from several metal layers or the strips made from metal coated organic materials, but also for the fibrous core (on which the strips or wires are often wound) or the cloth itself.

[MÁRTA JÁRÓ]

Metal thread variations and materials:

SIMPLE METHODS OF PRE-TREATMENT IDENTIFICATION FOR HISTORICAL TEXTILES[1]

Review of the results and completed methodology of analysis

Thus, any cleaning or treatment of the textiles with metal threads has to be preceded not only by the investigation of materials of the textile itself (threads and dyes) but also by the identification of the morphology (shape and structure) as well as the material of the metal threads. In most cases morphological and material analyses can be easily carried out if we only need information before choosing cleaning method or to prepare documentation, e.g. whether there was a fibrous core used, or the strip is a combination of metal and organic materials, what the ground material is, etc. However, more accurate data on manufacturing technique, such as the materials of the metal layers in the layered strips and wires, the method of metal plating or metal coating of organic supports, the composition of alloys, can be obtained only through instrumental analyses. The latter group of information might be needed primarily in the detailed technical description of textiles (e.g. in catalogues), and in the identification process with regard to the date and place of origin, or in comparative analyses.

The following paper describes and discusses the varieties of metal threads in terms of the materials and the combinations of materials used in making them, as well as the different kinds of information given by simple morphological and material analyses, and it outlines the opportunities and limits of these investigations.

Morphology and materials of metal threads

Morphology of metal threads

The morphological classifications and descriptions of metal threads have been discussed previously by many experts.[2] Metal threads can have several types of structures but basically they are made up of two units: 1. strips, i.e. solid metal strips or metal coated strips made of organic materials; 2. solid metal wires. They have been used separately, but especially in the case of strips it has been more common to wind them around a fibrous core (yarn), or they have been made into more complicated metal thread structures.[3] The macro-morphological structure of metal threads (the kind of elements used and how they were produced from these elements, e.g. solid metal strip wound around a fibrous core in S-twist) can be determined by a simple magnifying glass or a binocular microscope. These investigations are usually done before treatment as part of the assessment of the state of preservation of the textile by the conservators, and the result is usually included in the conservation documentation. The micro-morphological features (evidences of the manufacturing technique or of the state of preservation of the thread on the surface or on the edge of the metal strip) can be detected in most cases with a scanning electron microscope at high magnification.[4] The macro- and micro-morphological investigations will not be dealt with in the following paper.

Materials used to make metal threads

To date, the different materials used in making metal threads have been identified as:

- metals to make the solid strips, wires or metal coatings: gold, silver, copper and the alloys of these metals, zinc and nickel as alloying elements, tin and aluminium;
- organic materials used as support: leather, parchment (?), animal gut (membrane), paper and synthetic materials, such as Cellophane, cellulose acetate butyrate, polyesters;
- organic materials used as lacquer layer: egg-white, polyvinyl chloride, polyvinyl acetate;
- fibres used as core: silk, cotton, linen, viscose and some other not yet identified cellulose materials, wool and animal hair;
- metals used as 'non fibrous', metallic core: copper and copper alloys, iron.

Classification of strips and wires the metal threads are fabricated from, according to the materials used to make them

For both a simple and a full-scale investigation of the manufacturing technique of metal threads and for the relevant interpretation of data coming from the analyses it is essential to know the materials and combinations of materials to be encountered. To date, around 60 metal thread variations are known.[5] They differ in: their morphology; the colour and material of the fibrous core; the composition of metal(s), the organic media, lacquers, etc. Further analyses will probably reveal more variations. What follows is a discussion of the main groups of metal threads (identified by now), classified according to their materials in order to make it easier to identify them; sketches of the layer structures (if any) of the strips are provided.

Gold and gold alloys

1. Strips and wires made of gold or gold alloys

Silver and silver alloys

2. Strips and wires made of silver or silver alloys

Gilt silver

3. Strips made of single-sided gilt silver (Fig. 1.)

Gold layer
Silver/Silver alloy

FIGURE 1 Layer structure of the single-sided gilt silver strip

4. Strips made of double-sided gilt silver (Fig. 2.) and gilt silver wires

Gold layer
Silver/Silver alloy
Gold layer

FIGURE 2 Layer structure of the double-sided gilt silver strip

Copper and copper alloys

5. Strips made of copper or copper alloys (except for brass, see below)

Copper with noble metal/s or brass coating

6. Strips made of double-sided gilt copper or copper alloys (Fig. 3.)

Gold layer
Copper/Copper alloy
Gold layer

Fig. 3 Layer structure of the double-sided gilt copper strip

7. Strips made of double-sided silver-plated copper or copper alloys (Fig. 4.) and silver-plated copper wires

Silver layer
Copper/Copper alloy
Silver layer

FIGURE 4 Layer structure of the double-sided silver-plated copper strip

8. Strips made of single-sided gilt, silver-plated copper alloy (Fig. 5.)

Gold layer
Silver layer
Copper alloy
Silver layer

FIGURE 5 Layer structure of the single-sided gilt, silver-plated strip made of copper alloy

9. Strips made of silver gilt (double-sided silver-plated and then gilt) copper (Fig. 6.) and silver-gilt copper wire

Gold layer
Silver layer
Copper
Silver layer
Gold layer

FIGURE 6 Layer structure of the silver gilt copper strip

10. Strips made of brass-plated(?) or cemented copper (Fig. 7.)

Brass layer
Copper
Brass layer

FIGURE 7 Layer structure of the brass-plated or cemented copper strip

11. Strips made of double-sided gilt, cemented copper (Fig. 8.)

Gold layer
Brass layer
Copper
Brass layer
Gold layer

FIGURE 8 Layer structure of the double-sided gilt, cemented copper strip

Brass

12. Strips and wires made of brass

Metal-coated leather

13. Strips made of single-sided gilt (gilding with gold, gold alloys or gilt silver leaf) leather (Fig. 9.)

Gold or gilt silver layer
Leather

FIGURE 9 Layer structure of the single-sided gilt leather strip

14. Strips made of single-sided silver-coated leather (Fig. 10.)

Silver layer
Leather

FIGURE 10 Layer structure of the single-sided silver-coated leather strip

15. Strips made of single-sided silver-coated, then lacquered leather (Fig. 11.)

Lacquer layer
Silver layer
Leather

FIGURE 11 Layer structure of the single-sided silver-coated then lacquered leather strip

16. Strips made of one side gilt, reverse side silver-coated leather (Fig. 12.)

Gold layer
Leather
Silver layer

FIGURE 12 Layer structure of the one side gilt, reverse side silver-coated leather strip

Metal-coated animal membrane

17. Strips made of single-sided silver-coated animal membrane strip (Fig. 13.)

Silver layer
Animal membrane

FIGURE 13 Layer structure of the single-sided silver-coated animal membrane strip

18. Strips made of single-sided silver gilt (one side coated with gilt silver leaf), animal membrane strip (Fig. 14.)

Gold layer
Silver layer
Animal membrane

FIGURE 14 Layer structure of the single-sided silver gilt animal membrane strip

Metal-coated paper

19. Strips made of single-sided gilt paper strip (Fig. 15.)

Gold layer
Paper

FIGURE 15 Layer structure of the single-sided gilt paper strip

20. Strips made of single-sided gilt paper strip with preparation layer (bole or lacquer) under the gilding (Fig. 16.)

Gold layer
Preparation layer (bole or lacquer)
Paper

FIGURE 16 Layer structure of the single-sided gilt paper strip with preparation layer under the gilding

21. Strips made of single-sided silver-coated paper strip with preparation layer (bole or lacquer) under the silver (Fig. 17.)

Silver layer
Preparation layer (bole or lacquer)
Paper

FIGURE 17 Layer structure of the single-sided silver-coated paper strip with preparation layer under the silver

22. Strips made of single-sided tin-coated paper strip (Fig. 18.)

Tin layer
Paper

FIGURE 18 Layer structure of the single-sided tin-plated paper strip

Laminated aluminium

23. Strips made of aluminium foil sandwiched between two (in some cases coloured) Cellophane films (Fig. 19.)

Cellophane film
Aluminium foil
Cellophane film

FIGURE 19 Layer structure of strip made of aluminium foil sandwiched between two Cellophane films

24. Strips made of polyester film vacuum-plated on one side with aluminium, coated on both sides with (in some cases coloured) lacquer layer (Fig. 20.)

Lacquer layer
Vaporized aluminium
Polyester film
Lacquer layer

FIGURE 20 Layer structure of the strip made of polyester film vacuum-plated on one side with aluminium, coated on both sides with lacquer layer

25. Strips made of polyester film vacuum-plated on both sides with aluminium, coated on both sides with (in some cases coloured) lacquer layer (Fig. 21.)

Lacquer layer
Vaporized aluminium
Polyester film
Vaporized aluminium
Lacquer layer

FIGURE 21 Layer structure of the strip made of polyester film vacuum-plated on both sides with aluminium, coated on both sides with lacquer layer

Simple identification of the base material of solid metal strips and wires made from metal-coated organic materials used in metal thread making: investigations with microscopy and chemical methods

This part deals with the quick identification of the most frequently used materials of solid metal strips, wires, and metal-coated organic strips in metal thread production.

As the first step of the analyses by optical microscopy, the colour of the metal surface is examined. The second step is to establish whether the strip is made of solid metal or cut from metal-coated organic material. In case of solid metal strips and wires the third step is the identification of the base material and the metal coating (if any) with simple chemical tests, taking into consideration the results of the previous analyses by optical microscopy.

Mechanical or chemical cleaning methods are rarely applied in case of metal-coated organic materials[6] so normally it is sufficient to identify the presence of an organic support material; however further details can be useful for the documentation. With the help of an optical microscope the type of the organic support material can be determined in most cases. The identification process is completed with chemical tests. The synthetic materials can only be differentiated using instrumental analyses. Sophisticated methods of investigation have to be used, in most cases, for the identification of the materials of the metal-coating or the lacquer layers, if any. The colour of the metal layer, however, can give some information on the metal used for coating the organic support. The information gathered from the analyses by optical microscopy and the simple chemical tests can be of help in choosing an appropriate cleaning method and prepare the conservation documentation of the metal threaded textile. Some parts of the simple metal thread analysis have been discussed above[7], but for good measure the whole procedure of the investigation is given as follows.

Sampling, size, storage and transport of the samples

To carry out the analyses, a small amount (about 5 mm long) of sample is needed. Naturally the more samples we have, the more 'comfortable' our work is and the results are the more reliable.

For the most convenient storage and transport of the samples, small glass tubes with a cork or small envelopes made of synthetic material are suggested. The use of adhesive tape, folded paper, glass sheets or sheets made of synthetic material held together with adhesive tape, is not recommended, as the sample may stick onto the surface of the material during opening and can not be removed without damage.

Examination of the samples under a microscope

After the morphological analyses, the metal threads are undone into the basic elements if they are made of strips or wires wound around a fibrous core or if they are of an even more complicated structure. For further investigations the strips and wires are used.

The examinations can be carried out with the help of optical microscopy in reflected light at a magnification of 15-25 times.

Observation of the colour of the metal surface - preliminary identification of the metal/s present

If we examine the colour of the metal surface of the strips or wires or of the corrosion products on them with an optical microscope, we can obtain information not only on the state of preservation of the material, but also on the metal used. The most frequent metal and corrosion product colours observed in case of metal threads are summarized in Table 1.

Observation of the colour and transparency of the organic support: preliminary identification of the material type

As stated earlier, the identification of materials in the case of metal-coated organic strips is important first of all for the technical documentation of the textile.

The colour and morphology of the underside of the strip (if it is not lacquered or covered with

TABLE 1 **State of preservation and colour of the metal surface and the resulting conclusions**

	State of preservation and colour of the metal surface*	Probably used metals or metal combinations**
A	Well preserved, *gold-looking, shiny surface*	Gold (1), gilt silver (3, 4), gilt copper (6), silver gilt copper (8, 9), gilt, cemented copper (11), brass (12), brass-coated copper (10), gilt leather (13, 16), gilt paper (19, 20), laminated aluminium (yellow coloration) (23, 24, 25)
B	*Tarnished (matt), gold-looking surface*	Gilt silver (3, 4), gilt copper (6), silver gilt copper (8, 9), gilt, cemented copper (11), brass (12), brass-coated copper (10), gilt leather (gilding with gold alloy or gilt silver leaf)(13), silver-coated leather (with yellowish lacquer layer)(15), silver gilt animal membrane (18)
C	Partly corroded, *gold-looking, shiny surface with black spots* (corrosion products)	Gilt silver (3, 4), gilt copper (6), silver gilt copper (8, 9), gilt, cemented copper (11), brass (12), brass-coated copper (10), gilt leather (gilding with gold alloy or gilt silver leaf) (13)
D	Partly corroded, *gold-looking, shiny surface with greenish spots* (corrosion products)	Gilt copper (6), silver gilt copper (8, 9), gilt, cemented copper (11), brass (12), brass-coated copper (10)
E	Slightly corroded, *purple coloured, shiny surface*	Gold (alloyed with a large amount of silver: electron) (1), silver gilt animal membrane (18)
F	Well preserved, *silvery, shiny surface*	Silver (2), silver-plated copper (7), silver-coated leather (14, 15), laminated aluminium (23, 24, 25)
G	*Tarnished (matt), greyish surface*	Silver (2), silver-plated copper (7), silver-coated leather (14, 15), silver-coated animal membrane (17), silver-coated paper (21), tin-coated paper (22)
H	Well preserved, *reddish, shiny surface*	laminated aluminium (red coloration) (23, 24, 25)
I	*Tarnished, reddish surface*	Copper (5)
J	Partly corroded, *reddish surface with green and/or blue spots* (corrosion products)	Copper (5)
K	Corroded surface, *light or dark grey coloured corrosion products* (the metal is transformed into corrosion product/s on the surface or completely)	Silver (2), gilt silver (3, 4), silver-plated copper (7), silver gilt copper (8, 9), silver-coated leather (14, 15), silver-coated animal membrane (17), silver-coated paper (21), tin-coated paper (22)
L	Corroded surface, *black corrosion products* (the metal is transformed into corrosion product/s on the surface or completely)	Silver (2), gilt silver (3, 4), copper (5), silver-plated copper (7), silver gilt copper (8, 9), silver-coated leather (14, 15), silver-coated animal membrane (17), silver gilt animal membrane (18), silver-coated paper (21)
M	Corroded surface, *green and/or blue corrosion products* (the metal is transformed into corrosion product/s on the surface or completely)	Copper (5), silver-plated copper (7), silver gilt copper (8, 9), gilt, cemented copper (11), brass (12), brass-coated copper (10)
N	Well preserved, green-, blue-, pink, etc. coloured metallic surface	Laminated aluminium (different coloration) (23, 24, 25)

* For more information on the corrosion products on the surface of metal threads see in: Á. Timár-Balázsy and D. Eastop op.cit.: 135-7.
** The numbers in parentheses refer to the groups of materials discussed in the introduction

metal) can be of help in distinguishing between paper, leather, membrane and synthetic materials:

- Paper is usually white or yellowish.
- Leather is coloured yellowish, brownish, sometimes dark brown on the surface as well as on the cross section of the strip.
- Synthetic materials appear translucent when the lacquer and aluminium layers are scraped off.
- Animal membrane is translucent and much thinner than paper, leather or synthetic materials used as supports.

For further examination, a staining test can be carried out to distinguish between paper and leather (see below). Of course, the variety of the employed raw materials and manufacturing techniques, the degradation of the organic materials, the deterioration of the threads during use or previous treatment can sometimes make the identification uncertain.[8]

Burning test

If the results of the optical microscopy are ambiguous and we cannot decide if the strip is made from solid metal or a metal coated organic material, a small quantity of the sample should be lit (put in a flame) – the solid metal strip will only change its colour while the sample from an organic support material will partly burn or shrink.

Analysis of well preserved, tarnished or partly corroded, solid metal strips and wires

After the preliminary analyses by optical microscopy, the samples in good condition or which are slightly corroded (groups A, B, C, D, E, F, G, H, I, or J in Table 1) are mounted on a microscope slide or on a ceramic sample holder and 1-2 drops of nitric acid solution in 1:1 dilution are added.[9] The examinations are carried out under an optical microscope, in reflected light, at a x25 magnification. Solution is accompanied with the appearance of tiny bubbles. Depending on the process of dissolution (Table 2, column 1) a few drops of different reagents are added to the solution. The possible results and conclusions are summarized in Table 2.

If we compare the results of the examinations with the analysis of the colours (Table 1.) we are given a series of information on the base material of the metal strip or wire or even the metal coating. Further information, e.g. about the alloys or the presence of a silver layer on the copper base under the gold layer can be gathered with simple wet analytical examinations only if we use large quantities of samples and only after a long procedure.

Analysis of solid metal strips and wires covered with corrosion products

If the surface of the sample is covered with corrosion products (but the metal probably has not yet completely transformed into a compound), according to the results of optical microscopy it belongs to groups K, L, or M of Table 1, the first step is to dissolve the corrosion products from the surface using a 'Silver Dip' (thiocarbamide in acidic solution).[10] 1-2 drops are applied to the sample and carefully warmed up (e.g. with a hairdryer). After dissolving the corrosion products the samples are carefully blotted with filter-paper. 1-2 drops of

TABLE 2 **The investigations and conclusions of the 'wet' analyses of the slightly or not corroded metal samples**

Chemical process while dissolving the samples	Further reactions	Results
Sample would not dissolve	-	gold or gold alloy
Sample dissolves, solution is transparent, colourless	+ 1 drop of 10% sodium-chloride solution (common salt) * - *white residue*	silver or silver alloy
Sample partly dissolves, there are more bubbles on one side than on the other, solution is colourless, transparent, there are some gold remains in solution (in case of strips)	+ 1 drop of 10% sodium-chloride - *white residue*	silver strip gilt on one side (single-sided gilt silver)
Sample dissolves partly and slowly, in strips bubbles appear first on edges, solution is colourless, transparent, there are some wrapping-like gold remains (both in strips and wires)	+ 1 drop of 10% sodium-chloride solution - *white residue*	silver strip gilt on both sides (double-sided gilt silver) or gilt silver wire
Sample dissolves, solution turns green, it is transparent		copper or copper alloy (brass)
Sample dissolves partly, solution turns green, it is transparent, some wrapping-like gold remains (in strips and wires)		gilt copper, silver gilt copper, cemented and gilt copper

* The preparation of the solution: dissolve 10 g of sodium-chloride in 50 ml of distilled water and dilute it to 100 ml.

distilled water are added to them, then the 'rinsings' are removed with filter-paper. Afterwards we proceed according to Table 2.

Analysis of solid metal threads completely transformed into corrosion products

In case of completely corroded metal threads (groups K, L and M in Table 1) the colour of the sample can help to identify the base metal. In certain cases the presence of gold coating can be confirmed with a solubility test:

- If the metal has transformed into a thick grey, greyish-black or black corrosion product, we may try to use an acidic thiocarbamide solution. If, after the sample has dissolved, some gold flakes remain in the colourless solution, the strip or wire was made of gilt silver.
- If the metal has transformed into green corrosion products, we may use a 10%-nitric acid as dissolvent.[11] If, after the dissolution of the sample, some gold flakes remain in the green solution, the copper or copper based strip or wire was coated with gold.

Staining test of the organic support material – confirming the use of leather support on the basis of tanning method

In the case of leather supports, chemical tests can be carried out to reveal whether the leather was vegetable tanned or not. After staining the sample with ammonium iron sulphate solution, a deep blue-black coloration indicates the presence of tannic acid in the leather.[12] In the case of blackened, deteriorated leather samples this test does not work. The results of previous investigations show that the leather threads were made of vegetable tanned leather. Thus, if the material of the organic support darkens, it is definitely made of leather. If the test has failed, the material is probably paper or parchment, or even some kind of non vegetable-tanned leather but this is unlikely given the previous results.

Analysis of the metal coating on organic support material

The identification of the material of the metal coating on the organic support may be necessary for the preparation of the technical documentation of the textile. If the coating is yellow, shiny, resembling gold, we may carry out a solubility test to justify the presence of gold (Table 2, row 1.). The other metal coatings (silver, gilt silver, gold and silver, tin, aluminium) normally cannot be identified with certainty with wet analytical methods due to the scarcity and condition of the metal (its transformation into corrosion products).

Conclusions

The conservation-restoration of metal threaded textiles has to be preceded by a morphological and material analysis of the metal threads. Sophisticated methods are used to study the manufacturing technique of metal threads, but before treatment a quick test can be carried out to choose an appropriate method. This quick analysis involves determining the morphology with a binocular microscope and identifying of the base metal and gilding with chemical tests.

For cleaning metal-threaded textiles, a wide variety of mechanical and chemical methods are used. As described above, all these methods have advantages and drawbacks. Using dry methods (abrasives) will remove not only dirt and corrosion products from the surface of the metal, but also thin coatings and some metal as well. The fibrous core and the organic support can be damaged. The corrosion rate of some metals increases using wet methods. If the pH of the solution is not neutral, we can damage the fibrous core and the surrounding fabric.

The cleaning of textiles with metal threads is always a compromise. Knowing the fabric and the materials of the metal thread helps us choose the least harmful method.

Endnotes

1 Our first test series was developed for the international courses for textile restorers organized by Ágnes Timár-Balázsy (1989 and 1994 in Budapest, Hungary). This article is partly based on the unpublished text of the author's contribution presented in the Abegg-Stiftung at the Ehemaligentreffen (meeting of ex-students and teachers), Riggisberg, Switzerland in 1996. A Hungarian version was published in 1997: Járó M.: Fémfonalak készítéstechnikájának gyors meghatározása a textília tisztítása előtt [Quick identification of manufacturing techniques for metal threads prior to the cleaning of textiles] In: *Múzeumi Műtárgyvédelem*, 24 (1995). Budapest, 1997: 91-100. A short summary of the simple analysis methods was published in Chapter 23.2. of the book: *Chemical Principles of Textile Conservation* by Á. Timár-Balázsy and D. Eastop, Oxford, 1998: 409-411.

2 For example: Hoke, E., Pertraschek-Heim: Microprobe analysis of gilded silver threads from mediaeval textiles, *Studies in Conservation*, 22 (1977): 49-62.; Járó M.: The technological and analytical examination of metal threads on old textiles. In: *4th International Restorer Seminar, Veszprém*, 1983. Budapest, 1984, Vol. II: 253-264.; Indictor, N., Koestler, R. J., Wypyski, M., Wardwell, A.: Metal threads made of proteinaceous substrates examined by scanning electron microscopy - energy dispersive X-ray spectrometry, *Studies in Conservation*, 34 (1989): 171-182.

3 For example: Tóth A., Járó M.: Untersuchung der Goldfäden einer ungarischen Prunksatteldecke aus dem 16. Jahrhundert, *Restauratorenblätter*, 13 (1992): 65-68.; Járó, M., Tóth, A., Kiss-Bendefy, M.: Investigation of metal threads and metallic decorations of a 16th century bonnet. In: *International Perspectives of Textile Conservation 1995-98*, eds.: Á. Timár-Balázsy, D. Eastop. Papers from the ICOM CC Textiles Working Group Meetings, Amsterdam 13-14 October 1994 and Budapest 11-15 September 1995, London: 127-132.

4 For example: Hardin, I.R., Duffield, F.J., Characterization of Metallic Yarns in Historic Persian Textiles by Microanalysis. In: Needles, H.L., (ed.), Zeronian, Haig, S. (ed.), *Historic Textiles and Paper Materials – Conservation and Characterization, Advances in Chemistry Series 212*, Washington D.C., 1986: 231-252.; Indictor, N., Koestler, R.J., Blair, C., Wardwell, A.: The Evaluation of Metal Wrappings from Medieval Textiles Using Scanning Electron Microscopy and Energy Dispersive X-ray Spectrometry, *Textile History*, 19 (1) (1988): 3-22.; Járó M., Gondár E., Tóth A.: Technical revolutions in producing gold threads used for European textile decoration. In: *Antiquités Nationales*, Mémoire 2. Saint-Germain-en-Laye, 1993: 119-124.

5 Járó M.: Metal Threads in Historical Textiles. Results and further aims of scientific investigations in Hungary in: Molecular and Structural Archaeology: Cosmetic and Therapeutic Chemicals, eds.: Tsoucaris, G. and Lipkowski, J., NATO Science Series, Kluwer Academic Publishers, 2003, 163-78.

6 See a summary of cleaning methods in Chapter 14 in Á. Timár-Balázsy and D. Eastop op.cit., 242-48.

7 See Notes 1

8 Indictor, N., Koestler, R. J., Wypyski, M., Wardwell, A.: Metal threads made of proteinaceous substrates examined by scanning electron microscopy - energy dispersive X-ray spectrometry, Studies in Conservation, 34/1989: 171-82.

9 To prepare the solution, add one unit of concentrated nitric acid to the same quantity of distilled water and mix it together – the solution is extremely corrosive!

10 To prepare the solution: measure 10 g of thiocarbamide and 30 g of tartaric acid and dissolve them in 50 ml of distilled water. After complete dissolution dilute it to 100 ml. It is an extremely acidulous solution!

11 To prepare the solution: carefully drip 11 ml of concentrated nitric acid (64 w/w %) into 50 ml of distilled water, then dilute it to 100 ml.

12 Mihályffy L.: Bőripari laboratóriumi gyakorlatok (Laboratory exercises in leather industry) Könnyűipari Kiadó, Budapest, 1953

9

Few of the many trials and experiments in cleaning historic, tarnished gilt and silver embroidery or brocades have given due consideration to the textile components present, usually silk or other fibre cores of wrapped metal threads, silk and linen couching threads and support fabrics. Threads and fabrics alike are susceptible to stains as well as to mechanical and chemical damage when conventional cleaning methods have been used, yet this correlation has not been discussed in the extensive literature on the topic.

[KATIA JOHANSEN]

Assessing the risk of wet-cleaning metal threads

Research project

A research project of 2.5 months' duration in 1999 for three conservators, funded by the Danish Ministry of Culture, aimed to determine the feasibility of electrolyte cleaning of corroded gilt and silver threads on museum textiles. The focus was on objects in which metal threads are an integral part of the fabric and can not be removed for cleaning (as for example braid and fringes often can). The primary concern of the study was how the silk cores of the metal threads are affected by the proposed chemical solutions; the state of the silk cores in metal embroidery and brocades does not yet seem to have been investigated systematically in conjunction with cleaning. A promising new variation of a locally applied electrolytic method was chosen for study because of the minimal mechanical stress to the embroidery and apparently minimal amount of water needed. However, in the course of the study, it became apparent that substantial amounts of water were necessary to monitor the electrolytic process, thus negating this method's primary attraction regarding preservation of the silk. (Regarding method and trial results, see Stemann Petersen and Taarnskov 2001). Here, primarily the mechanical factors involved in assessing the risk of a wet cleaning are considered; these are important regardless of the chemical composition of any electrolyte or other aqueous solution. All textile conservators have observed how lightweight silks are stiffened after a wet treatment.

Water on silk is not necessarily detrimental in itself, but silk core fibres of metal threads - more or less trapped in a tightly wrapped casing of sharp-edged metal - can be expected to be damaged by the swelling (about 30% by volume) and shrinking involved in getting wet and subsequent drying *under tension*. The following aspects were considered as parameters for judging which factors might apply in evaluating whether a wet cleaning would in itself damage the core fibres.

Silk

In conservation literature's descriptions of metal embroidery, the fibre core's colour and twist are sometimes indicated, but there is rarely a description of the core's state of preservation. This is unfortunate, since the well-being of these threads ultimately determines the survival of the metal embroidery, whether it is corroded or not. If the core disintegrates, nothing will be left but a multitude of tiny spirals of metal thread – on the floor. Neither has the well-being of couching threads apparently ever been commented upon, although if they disintegrate, the entire embroidery also falls apart. When the thin silk warp threads holding metal threads in place in heavy brocades begin to break, the whole patttern is affected, disappearing gradually or rapidly, leaving only stiff metal thread ends sticking out in all directions.

In the royal costumes from the 1600s preserved at Rosenborg Castle, silk is always the base material for embroidery, a component material in brocades, stitching threads and core material for wound metal threads. The presence of other textile fibres such as cotton, linen, and wool is negligible, thus the importance of investigating silk for this collection.

Silk is a filament produced by insect (moth) larvae to form a cocoon. Wild silk (tussah) is less uniform than cultivated silk, and seems not to have been used for the silk fabrics and threads in the fashionable and sophisticated fabrics and embroidery in the Rosenborg collection. Cultivated silk is smooth and lustrous both as fibre, thread, and cloth. Silk fibres measure 15-25 microns in diameter and can be 40,000 m long, though only 600-900 meters are reelable (Mauersberger 1947; Ryder and Gabra-Sanders 1985). Silk threads used in weaving and embroidery can be unspun (floss), spun (twisted) and/or plied. That the technology of making the silk thread upon which the metal strips are wound is rarely considered is borne out by the fact that conservators have not yet adopted universally accepted designations for the integral parts of a spun or unspun, plied or unplied thread; this alone can be the reason that conservators rarely describe the threads' construction. In order to describe the problems facing a wrapped thread, it is imperative that the threads' constituent parts be recognized, identified, and described. To do so requires the correct terminology; suggestions are given below. In case of doubt, it may be necessary, as always, to draw a picture.

Culling CIETA's *Vocabulary of Technical Terms* (1964) for pertinent terms gives a good description of silk production, which in part explains why silk threads react the way they do. The Centre International d'Étude des Textiles Anciens (CIETA), based in the traditional French silk-producing centre of Lyon (today also one of the last centers of production of metal thread) is particularly concerned with the study of historical silk textiles. The following terms describe important parts/constructions: bave, brin, cabled yarn, double, end, fibre, fibroin, filament, filé, frisé, grège, grenadine, gum sericin, gummed silk, lamé, lamella, organzine, plied yarn, ply (n. and v.), poil, reel (v.), schappe, silk, single, soft silk, souple, spin, thread, throwing, thrown silk, tram, tussah, twist, waste silk and yarn. See further in Sykas (2000) for pertinent and elucidating instruction.

Identification

Microscopy and low-energy X-radiography are most useful in identifying silk fibres as well as defining the structure both of the fabric and of the constituent yarns. Scanning electron microscopy (SEM) provides exceedingly detailed images of both fibres and weaves and can also be expected to indicate whether the silk threads used have been weighted (Indictor and Koestler 1986; Brooks 1996). However, SEM should not be used indiscriminately to browse around on deteriorated textiles, as the electron beam which captures these amazing images can damage weakened fibres (Shashoua 1996). In the present study, SEM images have been taken of a series of samples, both as cross-sections and side views. They confirmed the initial evaluation of the cores done with microscope examination at low magnification.

Other factors affecting the condition of the core thread are the number of filaments present, and the silk's weighting, dyeing, and mordanting. Little information has been found about the weighting of silk thread traditionally used as cores for gilt and silver thread. Testing for weighting is not easily carried out on the short ends available from museum objects. It might be expected that an unweighted - or pariweighted yarn - would be chosen as core material, as it might be considered the best quality for the relatively expensive finished product, but as of now, no information has been collected as to what kind of silk has been used as core material. Burn-tests for weighting are often inconclusive given the small samples that can be obtained, though with practice and combined with other tests it may be possible to discern weighting as against non-weighting. Other factors such as finishing treatments and the fibres' intimate proximity to corroding metal may also influence the outcome of a burn test. It is not necessarily detrimental to the silk as such to be weighted. Weighted silk swells less than unweighted silk in the reagent copper oxide ammonia (kuoxam) and perhaps also in water alone, according to Himmelreich (1975).

One of the chemicals metal conservators have used for removing silver corrosion is EDTA, which unfortunately is also known to have removed colour from dyed silk (though the silver did indeed glitter after the treatment). The EDTA apparently dissolved either the mordants, the dyestuff, or disrupted the bond between the dye and fibre, causing the colour to disappear. Thus, if the yellow dye of a core thread has been mordanted with a metal salt, it may dissolve or change colour in EDTA. Rinsing it out does not lessen the damage, which has already occurred on contact. This might even be acceptable in some cases for cleaning gilt thread, which is traditionally wound on a yellow core, but it is imperative that the silk itself not be structurally damaged by the process.

Among the many yellow dyes traditionally used on silk are: dyer's broom, curcuma, quercitron, saffron, safflower, weld (*R. luteola*), fustic, and Persian berries, none of which give a very lightfast colour. They are often mordanted with alum, tin, or chrome. White core threads (inside silver wrappings) are undyed, as the silk filaments are naturally white, though covered with the very yellow sericin (silk gum) which is removed before the thread is reeled. The white silk may have been bleached, occasionally with sulphur fumes, residues of which might also be detrimental to the silk and certainly for the silver wrapping (Ballard et.al. 1989). There is no sulphur naturally present in silk filaments to cause silver wrappings to tarnish.

Silk and water

Wet cleaning of textiles is an irreversible process whose individual procedures can scarcely be controlled once instigated – not a favorite situation for any conservator. Ground-breaking discussions of the problems involved for wet and drying fibres have been published by Francis (1992), Ballard (1996), Howell (1996), and Tímar-Balázsy (1999), indicating that the physical stresses on silk during wet cleaning and drying are considerable. Water alone can hydrolyze very degraded fibres (Timár-Balázsy 1989). Add to this the following exacerbating conditions:

- the silk fibres may already be damaged mechanically or chemically;
- fibres held in place and compressed inside wrappings of metal, itself impervious to water;
- fibres under tension, held fast at each end of a stitch through layers of fabric;
- silk's natural relaxation and loss of strength while wet;
- potential mechanical damage during cleaning.

Even changes in relative humidity begin to look dangerous for metal embroidery! It is also known now that the drying – or equilibrium – process may take weeks or months for textiles. Choosing a suitable pH for any wet treatment is difficult for silk objects as the pH may vary greatly within the same piece, which may contain areas badly deteriorated by light as well as undamaged areas. Another variable to be considered is the potential effect of the electrical current of the proposed treatment on wet silk fibres. At present it is considered minimal, given the proximity of metal, but neither has this ever been investigated. Scientific investigations of silk have never been undertaken to the degree that metals – vitally important to industry and warfare – have enjoyed.

Any wet treatment of silk – or other textiles – is best initiated with a gradual humidification in a closed container, allowing fibres to absorb water gradually. Their increased flexibility as they absorb water reduces the dangers of sudden and partial swelling and breaking which occur when dry fabrics are immersed. Wet silk threads can be expected to swell in a transverse direction, which necessarily strains them longitudinally. As the metal threads and the stitches holding the *cantilles* (metal wire wrapped as a thin spiral) are already under tension, their shrinking along the thread's length can only mean trouble, particularly at the vulnerable point where the thread enters and emerges from the fabric. When this breaks, the cantille falls off. Re-stitching is rarely possible without deconstructing the entire embroidery.

Even aside from the problems silk itself faces with water and the proposed cleaning processes, the construction of the museum object and the constituent parts of the embroidery may also be susceptible to irreversible damage from a wetting and drying process. Raised embroidery can consist of layers of fabric, cardboard, leather, or wooden shapes, each glued to the next layer. In addition, the reverse of an embroidery, which is itself usually lined so that stitching is not anchored in the ground fabric alone, was often brushed with glue to secure thread ends and give the finished product more body. These materials and the often copious amounts of glue complicate at the least any wet cleaning process. Metal embroidery on velvet, a favourite combination for luxury goods, presents even more complicated problems, as it can be difficult to retain the gloss and evenness of pile-woven fabrics like velvet after wet cleaning.

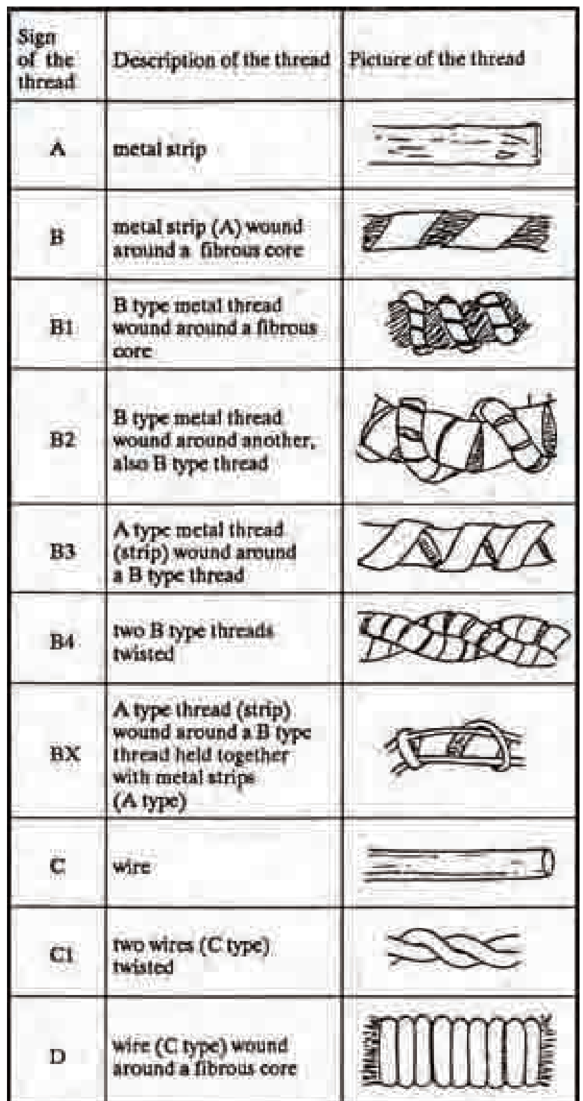
Metal threads in textiles

Metal threads in textiles are found primarily in weaving (in which the resulting fabric is often a brocade) and embroidery. The metal components can be integral or applied, such as sequins, which are attached by stitching. A classic description of traditional gold embroidery techniques, including descriptions of the many types of metal threads, is found in Saint-Aubin's *Art of the Embroiderer* (1770). Descriptions of the technology of making the metal threads themselves, that is, drawing wire, rolling and cutting and wrapping around silk cores, are found in various sources such as guild laws for wiredrawers and silk throwers. Márta Járó of the Hungarain National Museum, Budapest, has participated in an ongoing research program on the manufacturing techniques of Hungarian metal threads for many years, though also here the focus has tended to be on analyses of the metals and their corrosion with little description of the cores (Járó 1991, Fig.1). A recent comprehensive study of metal threads from ecclesiastical textiles in Stockholm mentions, again, only the core material and colour (Bergstrand et al. 1999), though the authors were not unwilling to go back and examine the core threads more closely when appraised of the potential value of this information. New work is ongoing (see note 3).

The silk thread on which cantilles is threaded as well as the silk thread used for couching laidwork is waxed with beeswax as the work progresses. Nuggets of beeswax are seen right at hand in for example the eighteenth-century *Diderot Encyclopedia* illustrations of gold embroidery. The wax was reported to have been kept in the embroideress's bosom, warming the wax to the best consistency. Today beeswax is still used in metal thread embroidery, strengthening and smoothing the working thread during the repetitive motions of pulling it through the tough fabric layers. Though its presence has not been looked for in this study, it might be considered beneficial, to some degree protecting the silk threads from immediate wetting, though, for the same reason, slowing down the drying process once the threads have become wet.

Proposed cleaning method

Cleaning of metal threads has often been a point of controversy between metal conservators and textile conservators, as the two materials have widely different tolerances. At best, treatment has been avoided, but corroded gilt and silver textiles are a sorry excuse for the brilliant and luxurious appearance they had when new. Historians and museum guests alike would like to see such textiles in their original state, even knowing that re-corrosion is inevitable. The silk sewing threads used for couching, stitching, and as core material are always affected by the usual cleaning methods for corroded silver, not least by the mechanical damage resulting from 'scrubbing' and residue of granular polishing agents which cut brittle silk fibres. Several new methods of reducing the speed of re-corrosion have now been developed[1] and should be used, as preventive conservation must have highest priority when the cleaning process is as difficult or dangerous for the object as it is here.



Sign of the thread	Description of the thread	Picture of the thread
A	metal strip	
B	metal strip (A) wound around a fibrous core	
B1	B type metal thread wound around a fibrous core	
B2	B type metal thread wound around another, also B type thread	
B3	A type metal thread (strip) wound around a B type thread	
B4	two B type threads twisted	
BX	A type thread (strip) wound around a B type thread held together with metal strips (A type)	
C	wire	
C1	two wires (C type) twisted	
D	wire (C type) wound around a fibrous core	

FIGURE 1 Types of metal threads, from Járó 1991.

Test material, tensile strength tests

During this study various silk core threads from embroidery and brocades – primarily from the seventeenth and eighteenth centuries – have been examined. No two are alike. The samples are taken from objects in the Royal Danish Collections at Rosenborg Castle, which are unique in that all the costumes are extremely well documented as to date and use, none have been washed, and few of the objects have been conserved. The variety and qualities of silk core thread are numerous, and there is also great variation in their state of preservation. For no apparent reason, some silk cores are literally powdering to pieces, while others, known to have been exposed to much use and/or light, are in seemingly good condition. For the record, it is not apparent that any of these costumes has ever been washed, and only one has undergone an otherwise undocumented cleaning of its silver embroidery, 50 years ago. The weighting of these silks has not been tested, nor has their dyeing and/or mordanting, though these treatments seem to have been more detrimental for the black or dark silks found in the costumes themselves. For gilt and silver threads only yellow and white are found as core material; gilt threads always have yellow cores and silver threads always white. There are some unplied yarns as well as 2-3-4-ply yarns of various constructions. Generaly, the more plies in a thread, the rounder and smoother it is; theoretically an advantage for a core structure (Sykas 2000:124). The number of core filaments varies from 6 to over 80. It seems that the tightly plied yarns are in poorer condition than the unplied yarns. Other aspects are how tightly and closely the metal has been wound onto the core and how sharp the edges of the metal are – and of course, how the metal thread has been worked in the textile and how the textile itself has been treated.

As far as the new cleaning method itself is concerned, at first it was carried out locally using anodes and cathodes, with cotton wool swabs, directly on the object. The most appealing aspect, which formed the basis of the investigation, was that little wetting occurred. The method was developed by Karen Stemann Petersen and Bodil Taarnskov (1999) at The National Museum of Denmark. Various different electrolytes were chosen according to their efficiency and assumed compatibility with silk's pH. The method has been used with fair success on gilt braids removed from various museum objects which can be submerged; however, because it became necessary to use a greater amount of water during treatment than expected, this method cannot now be recommended for textiles which do not otherwise tolerate wet cleaning.

A number of tensile strength tests were performed on new silk embroidery thread.[2] (Fig. 2) Threads were

FIGURE 2
Test results of tensile strength, treated and untreated new silk.

tested dry; wet, after 20 minutes, after 1 hour and 24 hours soaking; dry, after having been soaked for the same intervals above; and dry, after the same intervals of soaking and additionally artificially aged by light and heat. The most damage was shown after the artificial ageing, which drastically reduced the silk's extension before breaking from about 22.6% to between 12.9-16.3%. Lustre and colour were also affected by wetting and subsequent drying, a result which must be investigated as it indicates that at least the surface of the threads has been altered. A way of measuring the thread's swelling when wet within the metal wrapping would be useful, to indicate what kind of mechanical damage might occur during the wetting and drying. The EDTA-solution appeared to be the most detrimental of the liquids used. The sample material for these tests was an undyed, unspun new floss silk, approximately 30 filaments, embroidery yarn, unweighted. The tests indicated that water itself accounted for most of the loss of the silk's tensile strength. Measuring silk's flexibility under the same conditions may also have provided important information.

Determination of degradation: how to evaluate old silk

Of primary importance for implementing the proposed treatment is a way to measure the actual degradation of the silk threads and cores. Only exceedingly small samples are ever available for testing, as gold embroidery rarely has extraneous thread ends on the reverse which can be taken for tests. Preferably some form of systematic analysis could indicate what the primary causes of the degradation are. Photochemical damage may differ from mechanical damage or damage from alkalies, all of which may in addition have differing impact on weighted and/or dyed silks. The relative importance of whether the silk is weighted, how much and with what still needs to be described (Bogle 1979). Changes in the weighting, dyes and mordant may also occur during the degradation of the fibres over time or when water is present. Chemical methods of evaluating silk degradation, such as measuring the viscosity of the silk fibres may be a good indication of changes in the ratio of amorphous-crystalline regions and thus a way of measuring degradation.[3] Other methods include thermal analytical and infrared microanalytical techniques. Until these laboratory methods have been developed and simplified, however, visual and tactile evaluations need to be cultivated and respected as viable alternatives.

Terminology

No official terminology for threads and their components seems to be widely used by textile conservators. As thread is today industrially produced, some of the aspects – and terminology – of handmade materials are no longer pertinent. For example, *doubling* was originally twisting a strand in one direction, doubling it back on itself and allowing it to twist itself together: simple when done by hand, but not on machines involving twisting two separate elements and reversing them onto each other. In addition, describing a thread of known materials and production method is easier than identifying a core thread of which very little is visible or available for study. As always, we must be careful to distinguish between technique and product, and we must learn to be very specific. Other terminologies may be more useful in other languages, but differing use of terms can always be ironed out if illustrations are provided. For an excellent discussion, see Sykas (2000).

Emery's system (1966) divides thread constructions into two major groups: those made of continuous filaments (like silk) and those made of fibres of limited length. Silk filaments are not spun, as such; spinning is the term for drawing out short fibres while combining them in a twisting process. Filaments can simply be grouped without any twist required, in three ways:

1. **single**: the simplest usable unit. Silk worms secrete filaments in pairs, called baves, which are too fine and fragile to be used alone, so the term single usually denotes a group of 3-10 pairs of silk filaments, whether twisted together or simply combined.
2. **combined**: the process of combining two or more continuous filaments for use as a unit without twisting them. Sometimes described as doubling.
3. **twisted together**: the process of twisting together two or more filaments, or unit-groups of filaments, to form a twisted yarn is described as throwing. The equivalent for spun yarns is *plying*.

Spun fibres, for example short pieces of silk filament, are made into a continuous strand by twisting them together and drawing them out. Shorter lengths of wild or waste silk are spun.

1. **single** yarn is the simplest continuous aggregate of spun fibres that is suitable for fabric construction
2. **combined** yarn of two or more spun yarns used as a unit but not twisted togther (paired, triple, multiple)
3. **plied** yarn is formed by twisting together two or more single yarns. The process is called plying,

dry, twisted sample			
74,614–22,8%			
dry, twisted sample, acclimated (24 hours constant climate) untreated			
74,760–22,56%			
dry, untreated sample, artificially aged			
66,345–17,13%			
wet samples	**20 min**	**1 hour**	**24 hours**
water	57,202–30,98%	58,107–32,00%	57,679–31,39%
solution #1	57,994–30,97%	59,715–32,49%	58,101–31,72%
solution #4	56,774–31,22%	56,996–31,9%	55,447–31,18%
solution #6	58,846–32,53%	57,013–31,53%	56,506–31,75%
dry samples after soaking (as above)			
water	73,158–24,05%	74,201–25,04%	72,543–24,46%
solution #1	72,578–24,51%	74,368–25,00%	68,931–21,41%
solution #4	73,269–23,95%	72,818–24,20%	72,487–23,49%
sollution #6	74,809–24,65%	72,935–24,12%	70,543–23,36%
dry samples after artificial aging by light/heat			
water	64,592–17,31%	65,599–17,97%	62,132–16,8%
solution #1	58,080–14,20%	57,748–13,65%	55,657–12,87%
solution #4	61,564–16,04%	61,022–16,02%	58,957–14,73%
solution #6	63,897–16,98%	63,164–16,86%	62,005–16,29%
dry, untwisted sample, acclimated			
81,072–30,19%			
dry, untwisted sample, artificially aged			
71,638–25,87%			

FIGURE 2 Test results of tensile strength, treated and untreated new silk.

and the direction of plying is usually opposite to the direction of the spin of the single yarns employed.

4. **re-plied** yarn is a three-process construction formed by re-plying or twisting together two or more plied yarns, the direction of the twist usually opposite to that of the plying.

Wendrich uses the terms yarn, string and cable to refer to the three successive processes of spinning, plying and cabling (Fig. 3). A drawback in using this terminology, developed for describing basketry which is often of large dimensions, is that 'cable' seems – in terms of size – a misnomer for a composite thread used as core, even though the construction may be the same (Wendrich 1994).

When examining core threads on museum textiles, it is generally impossible to ascertain whether we are dealing with filaments or spun fibres because we can only see short lengths at a time. However, we can describe the thread's components and direction of twist, tightness (or angle) of twist, and if microscopes are available, the approximate diameter and number of fibres in each strand. It should be noted that winding a metal lamella onto the core imparts some twist in itself which may be auxiliary to the core's original twist. How tightly the metal is wrapped around the core and how close its spiral will also affect the well-being of the core fibres. In general it seems that tightly plied core threads are often in better condition than those with fewer and looser plies and might thus be less susceptible to damage from wet treatment.

Direction of twist is the classic S, Z description. Threads without obvious twist can be called I (Fig. 4). In the short samples available to us for examination, twists per centimetre can rarely be counted, so the tightness of the twist must be judged by the angle (helix angle) alone. The angle of twist refers to the angle that the slant of the twist makes with the longitudinal axis of the yarn. Generally angles up to 10° are called loose; 10-25° medium; 25-45° tight

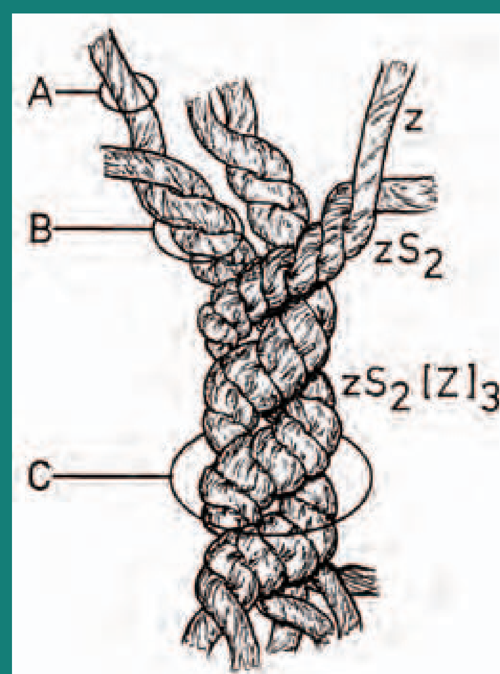


FIGURE 3 Construction of a spun, plied and cabled thread, from Wendrich 1994. Z-spinning, S-plying, Z-cabling: denoted zS2[Z3].

(Fig. 5). For conservation purposes it is better to measure the angle of twist than to count the number of revolutions per given length (which is rarely possible anyway). Threads of different thicknesses can have the same angle of twist but with fewer revolutions per measure of length; they are equally tightly twisted, but the different number of twists per meter would differentiate the two yarns greatly in the textile industry. (Fig. 6 from Taylor 1997).

Documentation of a thread's construction should, according to Emery, always end with the final – visible – twist emphasized with a capital letter (e.g. z-S, s-s-Z, s-z-s-Z). Enumeration of a thread's integral parts according to their direction of twist is probably the clearest form for identification, although there are undoubtedly some sequences that defy this system. It may be clearer to indicate the number of components by numerals, for example zS_2 as developed by Wendrich. This would describe a string composed of two z-spun yarns, plied in S-direction. A notation of 2zS has been seen for the same thread; it will undoubtedly be a matter of preference and experience that determines the kind of notation one chooses. Once notation becomes common, it will become clearer which type is more readily understood. In any case there is no need to invent more notation systems! For clarity, any notation should be accompanied by a sketch.

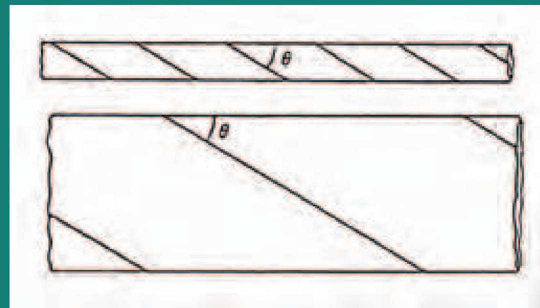
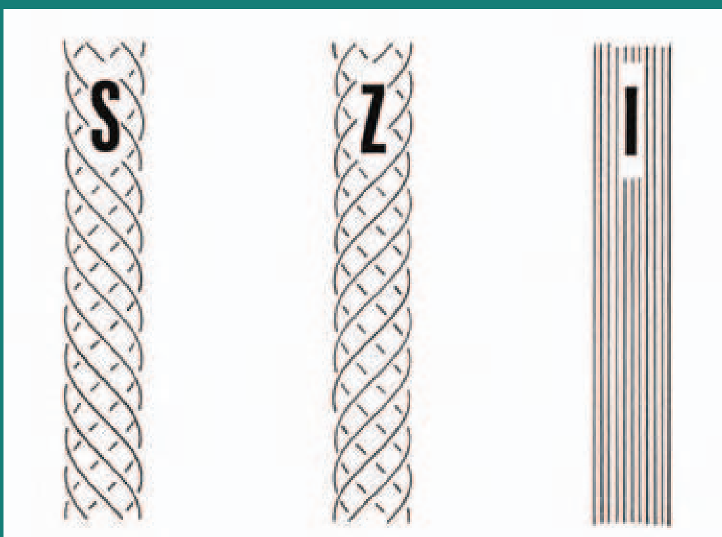


FIGURE 7 The same angle of spinning and different number of twistings in a given length.



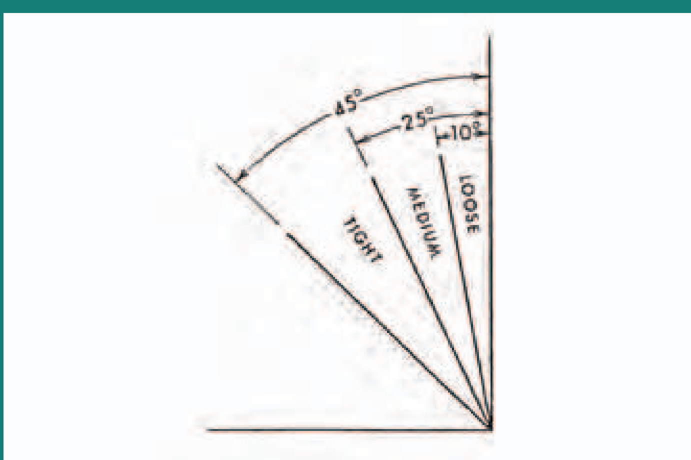


FIGURE 5 Designation of angle of twist, Emery 1966.

FIGURE 6 Same angle of twist but different number of revolutions per length, from Taylor 1997.

Conclusion

As indicated, certain information is necessary to evaluate whether metal threads can withstand a wet cleaning. In lieu of potential chemical analyses to measure a specific core thread's state of degradation, it will be necessary to continue to evaluate each thread subjectively. To do so, one must become experienced, and this happens only after gathering specific information through systematically examining and recording a large number of samples and following up after any wet treatment. The following points indicate how to accumulate the knowledge and quality of observation that are necessary, and which factors must have higher priority in our documentation:

- Learn to identify, describe, and draw the component parts and materials of a metal thread embroidery.
- Try to assess the state of degradation of the silk threads found as core, as stitching and couching, and as warp and weft in brocades. A knowledge of the object's previous treatments and exposure to light is valuable, but there are surely great

differences of condition even within the same object.
- With a microscope it will be possible to see if there are many broken silk filaments protruding from between the metal spirals on a wrapped thread. Broken metal threads sticking out of brocades can be seen without a microscope. Both instances indicate previous and probable ongoing mechanical damage to the silk.
- The microscope will also help to reveal whether the silk core is tightly packed inside the metal, which means the silk does not have room to expand when exposed to water.
- Threads that are tightly twisted and/or plied have an innate torsion which will be a damaging factor when wet, 'relaxed' fibres begin to dry.
- The presence of wax on silk stitching threads will delay wetting but will concordantly also extend the dangerous (that is, uncontrollable) drying phase.
- Weighting, dyeing and mordanting agents on silk might be damaged by the chemicals used to dissolve silver corrosion.
- Preventive conservation should be stressed – handle as little as possible, wear clean gloves when handling, protect from light and air, isolate from materials that promote tarnishing of metal threads (such as rubber), investigate the use of scavengers of agents of deterioration, charcoal blankets, etc., to slow down corrosion.
- Increase efforts to explain to the public why metal embroidery and brocades on display now look dull (everyone understands air pollution) and haven't been 'shined up'; include photographs of hidden areas of embroidery which still are shiny; set light to catch just a bit of sparkle somewhere on the object.

Postscript: a traditional method

Saint-Aubin describes the following cleaning method for metal embroidery:

Strong perfumes easily darken Embroidery work, especially when it is executed in silver thread. This Embroidery is cleaned with dry bread crumbs heated in a small, clean saucepan. The hot bread crumbs are sprinkled on the embroidery. They are then rubbed with the palm of the hand. They are spread out in such a way that they cover the entire work. This is then all covered with several layers of clean linen. When the crumbs are cool, the frame holding the Embroidery is turned over, tapped on the reverse side with a switch [light-weight brush or stick], and then brushed clean. It is at this point that glue or starch is spread over the underside of the Embroidery. Cleaning may also be accomplished by the use of burned and finely sifted talc or of dry pulverized cuttlefish bone. Certain people know the art of lightening tarnished gold and bringing back its colour and shine without harm to the base material of the Embroidery. This, however, is a secret process passed on from father to son, a talent that one family in Paris depends on to earn its living ... One can also bring colour back to faded gold, in some instances, by exposing it to the smoke from feathers or burning hair ... There are other processes derived from the above depending on the materials used and the talent of the person using them. I have attempted to point out in this Work the most familiar of these.'

Given modern micro-vacuuming techniques to remove insect-attracting residue, it may again be worthwhile to experiment with breadcrumbs!

Acknowledgements

I am grateful to the Danish Ministry of Culture for having provided funding for this project, and to the former director of The Royal Collections, Mogens Bencard, for supporting the application. Thanks also to colleagues Karen Stemann Petersen and Bodil Taarnskov at the National Museum for their interest and participation.

References

Ballard, M.; Koestler, R.J.; Blair, C.; Santamaria, Claudia; Indictor, Norman, 1989. Historic Silk Flags from Harrisburg. In: *Historic Textile and Paper Materials II, Conservation and Characterization*, *Developed from a symposium sponsored by the Cellulose, Paper and Textile Division at the 196th National Meeting of the American Chemical Society, Los Angeles, California, September 25-30, 1988* / Zeronian, S. Haig (ed.); Needles, Howard L. (ed.); Washington, D.C.: American Chemical Society: 134-142.

Ballard, M. 1996. Hanging Out: Strength, Elongation, and Relative Humidity: Some Physical Properties of Textile Fibres. In: *Triennial meeting (11th), Edinburgh, 1-6 September 1996: preprints*, ICOM. Committee for Conservation. Paris, France. London: James & James: 665-9.

Bergstrand, M.; Hedhammar, E., Nord, A.G.; Tronner, K. 1999. All that glitters is not gold: an examination of metal decorations on ecclesiastical textiles. In: *Triennial meeting (12th), Lyon, 29 August - 3 September 1999: preprints. Vol. 2*, ICOM. Committee for Conservation. London: James & James: 621-4.

Bogle, M. 1979. The deterioration of silks through artificial weighting. *Textile Conservation Notes* No.11, North Andover, Massachusetts.

Brooks, M.M.; O'Connor, S.; McDonnell, J.G., 1996. The application of low-energy X-radiography in the examination and investigation of degraded historic silk textiles: preliminary report. In: *Triennial meeting (11th), Edinburgh,* *1-6 September 1996: preprints*, ICOM. Committee for Conservation. Paris, France. London: James & James: 670-9.

Centre International d'Étude des Textiles Anciens (CIETA) 1964. *Vocabulary of Technical Terms. Lyon: CIETA.*

Emery, I. 1966. *The Primary Structures of Fabrics*. Washington, D.C.: The Textile Museum.

Francis, K. 1992. Observations on the drying behaviour of textiles. *The Textile Specialty Group Postprints,* AIC, 1-9.

Himmelreich, W.; Otto, F.; Pospischil, E. 1975. *Prüfmethoden für die Labors der Textilindustrie*, Leipzig.

Howell, D. 1996. Some Mechanical Effects of Inappropriate Humidity on Textiles. In: *Triennial meeting (11th), Edinburgh, 1-6 September 1996: preprints,* ICOM. Committee for Conservation. Paris, France. London: James & James: 692-8.

Indictor, N.; Koestler, R.J. 1986. The identification and characterization of metal wrappings in historic textiles using microscopy and energy dispersive X-ray spectrometry: problems associated with identification and characterization. In: *Scanning Electron Microscopy* II. Chicago, USA.

Scanning electron microscopy in the diagnosis of "diseased" stone / Lewin, Seymour Z.; Charola, A. Elena, In: *Scanning electron microscopy*, Vol. 1: SEM INC., 1978,

Járó, M. 1991. Among many others, *Newsletter of the Working Group of Textiles, ICOM Committee for Conservation*, 2.

Mauersberger, H. (ed.) 1947. *Matthews' Textile Fibers: their physical, microscopical, and chemical properties*, New York: J. Wiley & Sons.

Metcalf, S. July 1997. Weighing up silver objects: evaluating past and future conservation methods / Metcalf, Simon, *V & A conservation journal*, N. 22, 1997, p. 4-5.

Ryder, M.L.; Gabra-Sanders, T. 1985. The Application of Microscopy to Textile History. *Textile History.* Vol. 16 No. 2.

Saint-Aubin, C. 1770. *Art of the Embroiderer*. Complete French text, translation and annotation by Nikki Scheuer, Los Angeles County Museum of Art, 1983.

Shashoua, Y. 1996. Investigation into the Effects of Cleaning Old, Dyed, Naturally Soiled Textiles by Aqueous Immersion. In: *Triennial meeting (11th), Edinburgh, 1-6 September 1996: preprint,* ICOM. Committee for Conservation. Paris, France. London: James & James: 714-20.

Stemann Petersen, K.; Taarnskov, B. 1999, poster presented at the ICOM Conservation Triennial in Lyon, 1999.

Stemann Petersen, K.; Taarnskov, B. 2001. Electrolysis of silver and gilt silver threads on silk textiles. *Exposure 2001, Preprints of the Conference on Metal Corrosion 7-10 November 2001, Hildesheim, Germany*.

Sykas, P. A. 2000. Re-threading. Notes towards a history of sewing thread in Britain. In: M. M. Brooks (ed.) *Textiles Revealed: Object Lessons in Historic Textiles and Costume Research*. London: Archetype.

Taylor, A. 1997. *Technology of Textile Properties.* London: Forbes Publications.

Timár-Balázsy, Á. 1989. Deterioration process of fibres in different chemical actions. In M. Jaro (ed.) *Conservation of metals. Problems in the treatment of metal-organic and metal-inorganic composite objects. International restorer seminar. Veszprém, Hungary, 1-10 July 1989.* Veszprém: Istvan Eri. p. 77-82.

Timár-Balázsy, Á. 1999. Drying behaviour of fibres. In: *Triennial meeting (12th), Lyon, 29 August - 3 September 1999: preprints. Vol. 2,* ICOM. Committee for conservation. London: James & James: 661-6.

Wendrich, W. 1994. *Who is Afraid of Basketry? A guide to recording basketry and cordage for archaeologists and ethnographers*. Leiden: Centre for Non-Western Studies.

Endnotes

1 Pollutant monitoring in storage and display. Pollutant adsorbents such as zinc oxide (ICI Katalco) and charcoal cloth (Charcoal Cloth International Ltd). See Metcalf 1997. Protecting metal embroidery with a metal lacquer cannot be recommended.

2 Tests done at the Danish Technological Institute, Herning, Denmark. The tensile strength test was according to the ISO 2062:1993. The artificial ageing was done in a Xenotest 450, ISO 105-B02:1988.

3 Important work in this area is progressing at the Canadian Conservation Institute, Ottawa, Canada and has also been examined at the Victoria and Albert Museum, London. New work is being done (2002) by Tamsin Collins, UK on cores of metal threads. Paul Garside and Paul Wyeth, UK, are also investigating silk deterioration (2002).

10

Fashions change from season to season under the dictates of the leading design houses, and the process can be easily followed worldwide. However, in the period considered in this paper, changes in the cut of clothes and shoes happened much more slowly than today. People's clothing was influenced not only by current trends but also by certain important events in history. This was also true of Hungary, where both Eastern and Western influences were felt due to its special geographical position.

MÁRTA KISSNÉ BENDEFY

Eastern and Western influences on Hungarian footwear of the thirteenth-seventeenth centuries

TO THE MEMORY OF ÁGNES TIMÁR-BALÁZSY WHO KINDLY SUPPORTED MY RESEARCH FOR TWENTY YEARS

This paper summarizes some of the conclusions from our study of the types and technology of Hungarian footwear between the thirteenth and seventeenth centuries; the study has been undertaken for nearly ten years by the author and Judit Bakay-Perjés.[1] Our research has been based on finds from archaeological excavations of Hungarian sites and on objects that were taken into historic collections; most of the finds are complete shoes and boots, and are primarily men's footwear.

Unfortunately, due to the temperate, continental climate and soil conditions in Hungary, most organic materials decompose in the ground. Before the 1950s leather finds, which were rare and mostly fragmentary, could not be properly treated to 'restore' them, so only a few survived. Later excavations, mostly from castles (e.g. Tata, Buda, and Szolnok) and cemeteries, produced a larger number of leather goods, primarily footwear,[2] which were successfully 'restored'.[3] In our research we have examined some of these finds and some of the historic footwear in the Textile Collection of the Hungarian National Museum.

In order to implement a suitable examination methodology, a special documentation approach had to be developed; it provides more data on the fragmentary footwear from excavations than before, focusing on technological aspects. The most frequently applied stitches and seams on leather were documented to create an information resource pack. In developing the documentation methods (including the drawing of the different types of seams), European standards were followed as much as possible. The long-term objective is to give the documentation a coherent, easily comprehensible format for everyone.[4] A certain part of the project was sponsored by the Hungarian National Scientific Research Fund.[5]

The paper starts by showing changes in shoe types, using archaeological finds, contemporary illustrations and analogous material; this section is followed by a comparison of different types based on their technology.

Changes in shape

As the different types and shapes of Hungarian footwear have been thoroughly described in several publications on the history of arts and fashion, what follows is a brief summary to make the technological details more comprehensible.[6] The clothing and footwear of Hungarians, who arrived in Central Europe from the east in the ninth century, were typically Oriental in every aspect. However, in the following centuries most Hungarian rulers fostered the spread of Western culture and customs within Hungary. This influenced fashion as well, first among the upper layers of society; Western fashions then became more and more popular.

Unfortunately, only a few identifiable leather fragments have been found from before the thirteenth century. But, from the thirteenth, fourteenth and fifteenth centuries, complete shoes as well as fragments survive, and reconstructable footwear fragments have been discovered by archaeologists.[7] (Figs. 1 and 2) The excavations led by Dr. Dóra Nyékhelyi[8] on the Budavár site in the Teleki Palace between 1998 and 2000 led to a real breakthrough in research on mediaeval footwear. The finds from the site are in especially good condition so they can be used to corroborate and correct some previous assumptions (Figs. 3 and 4).

On the evidence of contemporaneous depictions and archaeological finds, low-cut shoes, ankle-shoes and boots were equally popular in Hungary in the thirteenth to fifteenth centuries. They followed the shape of the feet, but the toes were pointed and they were fastened with lacing, latchets, buttons or buckles. In the fourteenth and fifteenth centuries, stockings with leather soles were sometimes worn. The boots as well as the shoes were tightly shaped

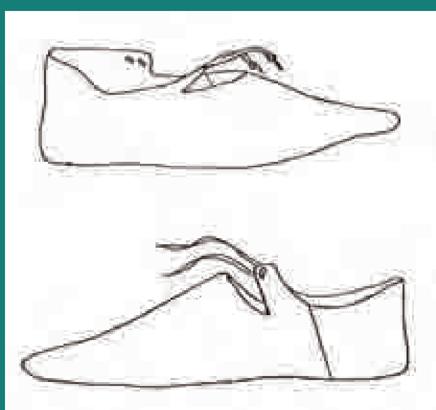


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FIGURE 1 Two typical shoe-types which turned up in an easily reconstructable state. The ones on the top are fastened with a pair of side latchets, the bottom ones with one pair of latchets.

FIGURE 2 Low-cut shoes in an illustration from Hungary dated to 1360-70.

FIGURE 3 Footwear extending above the ankles from the fourteenth-fifteenth century. Budapest History Museum, BTMKO.2001.3.1.

FIGURE 4 An illustration with ankle-shoes, fifteenth century.

to the feet. Usually they were short, ankle- or calf-length (Fig. 5). By the end of the fifteenth century, long, pointed toes were replaced with the more fashionable rounded ones in most parts of Europe. Long tongues were applied, with latchets from the sides tied at the front over the tongues. The vamp was often decorated with slits that had leather strips threaded in.[9] (Fig. 6).

From the late fifteenth century, as a result of persistent Turkish attacks, a new military garment developed which was more suitable to fast movement than the earlier cavalry uniforms. This shared many features with the Turkish light cavalry. Hungary was divided into three parts in the early sixteenth century: the central and southern parts were ruled by the Turks for more than 150 years; the northern and western parts belonged to the Habsburg dynasty; the eastern part, Transylvania, was an independent principality. Naturally the extent of Western and Eastern influences was different in these three parts. The above mentioned Western-style footwear was found among the finds from the northern and western parts (e.g. Tata and Sárospatak), while the Oriental-type shoes originating in Turkey were found mostly in excavations in the central part of Hungary.

Oriental footwear is rather different from the Western types described above. There were three main types: boots, slippers and leather socks. Men, mostly the soldiers, wore boots, often with slightly turned-up toes. The front part of the boot was almost knee-high while the back was often lower-cut to let the rider move more freely (Fig. 7). These boots were usually heel-less; the soles were protected from wear with iron heels or heel-protectors. Slippers, like the boots, were heel-less, or had low iron heels. They were worn both indoors and outdoors (Figs. 8 and 9). Leather

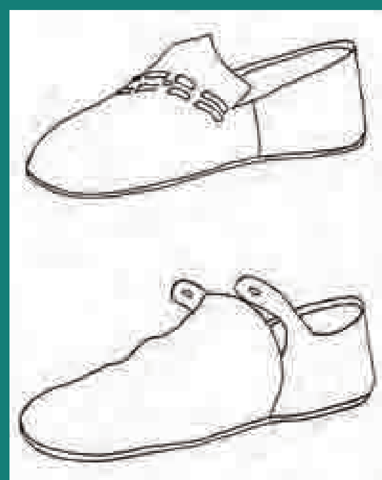

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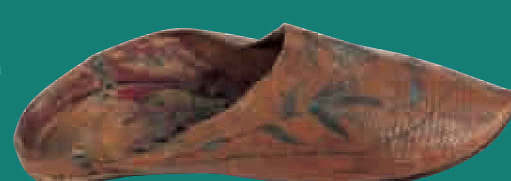
FIGURE 5 An illustration of short, soft boots, c.1480, Christian Museum, Esztergom.

FIGURE 6 Typical Western footwear from the sixteenth century; reconstruction sketches from excavations at the Tata castle site.

FIGURE 7 Boots from the seventeenth century, Hungarian National Museum, (HNM) 1964.617.1.2.

FIGURE 8 Turkish slippers from the sixteenth century, HNM.

FIGURE 9 Slippers have been used even with long-legged boots in some Oriental countries. A detail of a miniature from India from the early seventeenth century



stockings were short, usually only ankle-length and they had side slits with lacing. They were made of soft, usually yellow or red leather. Slippers were worn over them if they were worn outdoors. The colours and decorations of the stockings and slippers were carefully matched (Figs, 10 and 11).

The combination of slippers and leather stockings resulted in a new type of footwear which extended above the ankle, had side latchets, and the seam on the vamp imitated the shape of the slippers worn over the leather stockings. This type was made with heels of iron in an Oriental fashion, or of leather-covered wood, indicating a return to a Western style (Figs. 12-14). In the late seventeenth century, Hungary was liberated from Turkish rule but the 150-year-long period left a permanent mark on men's wear. Oriental cut and technology can be detected in popular boots up to the end of the nineteenth century.[10]

Characteristics of technology

After this review of changes in footwear between the thirteenth and seventeenth centuries, the next section focuses on manufacturing techniques used to make footwear at different periods. As might be expected, differences in form also involved technical changes.

Shoemaking

In order to recognize technical details, it is essential to know the techniques that were used to make shoes in a given period. The leather was spread out by the shoemaker, who cut the pieces of the shoe so that they were suitably strong and the minimum amount of waste was produced. After the upper had been cut, the leather was shaped on boot lasts made of wood

CLOCKWISE FROM UPPER LEFT:

FIGURE 10 Men's leather stockings with matching sandals from the middle of the seventeenth century, HNM 1964.613.1.2.3.4.

FIGURE 11 Yellow leather stockings and slippers, detail of a painting, HNM 1611.

FIGURE 12 Men's footwear with iron heelpiece from the seventeenth century, HNM.

FIGURE 13 Men's footwear with leather-coated wooden heels from the seventeenth century, HNM, 1954.618.1.2.

FIGURE 14 Count József Csáky 1794, The Hungarian National Museum. The side- laced ankle-shoes became part of the Hungarian nobleman's attire.

to model the feet. However, they were not necessarily the exact shape of the foot but rather followed a certain fashionable shape. If the sole was cut symmetrically, the shoe could be worn on either foot. The soles and the uppers could be sewn from the face (the edge of the upper turned outwards) or from inside out; in the latter case, after sewing the leather was turned back (the edge of the upper turned inwards). During the assembly of the sole and the upper it is very important to leave no bare stitches on the sole as the threads would fray very soon during walking. There were several ways to protect the threads. If the shoe was assembled in a 'turn-shoe' construction, the seam was in the inner, protected side. If the shoe was sewn from outside, a groove was cut into the sole so that the thread was hidden and protected.

Seams were made with one or two needles. Seams with two needles are better because the resulting seams are more even and much stronger. In making shoes, awls were always used, and blunt needles; earlier even bristles were used. Sewing threads were twisted into the fibre ends of the bristles and they were fastened with tar and wax. Shoes were sewn with twisted linen thread which was tarred and waxed to make the thread smoother and water-resistant. Thicker threads were used for the soles; thinner threads were used for the uppers. A narrow, leather strip, triangular in section (known as a rand) was often sewn between the upper and the sole on the outer edge, in order to strengthen the stitches, which were made stronger and more water-resistant in this way. Heel-stiffeners and linings were often used inside the shoes. They were applied to stiffen and strengthen the uppers made of soft leather (at the heels, toes, lace-holes); they also gave protection to the feet in places where seams, decorations and iron fittings could have hurt them. [11]

The cut of soles

The sole of Western-type shoes was asymmetrical in the thirteenth and fourteenth centuries, the front gradually narrowing, often to a pointed toe. (Fig. 15) The 'waist' of the sole was gradually narrowing as well. The leather was not very thick; it was usually from calf or young cattle. Earlier some researchers thought that there were insoles in the shoes or the soles were pasted together from two layers of leather. After re-examining the finds we found, however, that the leather pieces thought to have been the sole and the insole were originally one piece but as a result of decomposition in the ground they had delaminated. This phenomenon is quite usual in archaeological leather finds (both soles and uppers), and it was probably due to a fault in manufacture.

From the late fifteenth century, the sole became more symmetrical, the toes were wider and rounder. The soles of Oriental footwear were always symmetrical. The forepart of the soles was often round with a pointed, slightly turned-up toe. The 'waist' was usually narrow; in certain cases it was extremely narrow, although sometimes it was straight. (Fig. 16) The sole leather of soft shoes was made of calf but for outdoors they were made of thicker, stiffer ox hide. A particular feature is that usually there are different types of stitch-holes at the front and at the back of the soles, because there were two different types of

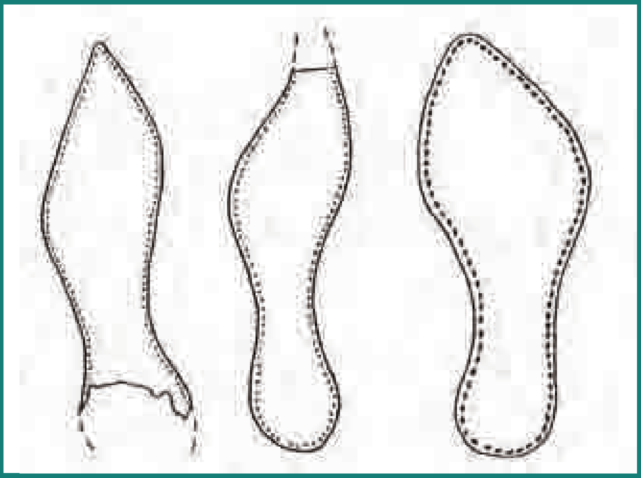


FIGURE 15 Typical Western sole types from the thirteenth to fifteenth centuries from the excavation sites in Buda and Tata.

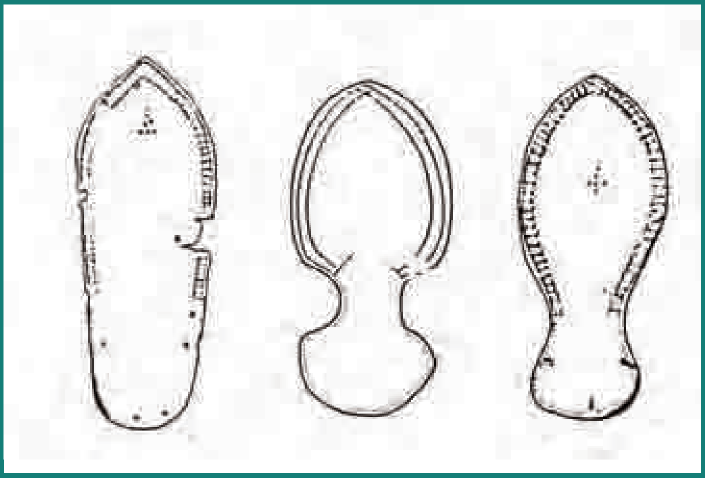


FIGURE 16 Typical Eastern sole types from the sixteenth and seventeenth centuries, Tata, Szolnok.

stitching used within the same sole in the Eastern type of footwear (see the description of stitching). The hard, Eastern type soles were often strengthened with iron nails and iron heelpieces at the back. As can be seen in Figure 17, this type of iron fitting was not only applied to boots but also to slippers.[12] The sole of the leather stockings very often had a peculiar mushroom-like shape. (Fig. 21)

The cut of uppers

The upper of the Western-type shoes from the thirteenth-fifteenth centuries is asymmetrical, often of wrap-around construction, and it was usually sewn together on one side. This seam was usually in the inner side of the shoe and it was either perpendicular to the soles or it was slanted.[13] The vamp and the quarters were cut from one piece with small inserts to make up the missing height or width. (Fig. 18) Low-cut shoes were often cut in a bent shape so that they would fit the feet well. Rands were often used between the soles and the uppers to strengthen the seam. (Rands are not the same as welts.) Calf or goatskin was used for the upper, as it was made of one piece, only soft leather could be used to ensure a good fit. Shoes were fastened with laces, latchets, buttons or metal buckles. A tongue was often sewn into shoes which were fastened above the ankle which made the shoes more closed and more comfortable. Strengthening pieces were applied; stiffeners at the heel were typically triangle shaped, while at the lace-holes they followed the line of holes.

FIGURE 17 Slippers with iron nails and heelpiece at the soles from the sixteenth century.

FIGURE 18 The cutting design of ankle shoes (see also Figure 3).

From the end of the fifteenth century, shoes were low-cut, their uppers were not made from one piece but they were made up of a vamp and quarters, which were cut symmetrically and they were sewn together on each side of the shoe. The quarters were often made up of two parts. The part of vamp closer to the throat was round or triangle-shaped. The shoes were slip-on or they were fastened with side latchets from the leg part. The vamps were often decorated with slits or leather straps. Inside the heel there was always a leather stiffener, which followed the shape of the quarters. Similar ones were often used at the toe of the vamp, if the round shape was to be emphasized according to the current fashion, or the protection of toes was more important. At the end of the leather straps and the side seams, thin leather linings were applied to protect the feet. The upper was mostly of goat, calf or sheepskin. Sometimes the flesh side was turned outside, which gave a velvety, nappy effect to the shoes. (Fig. 20)

The complete uppers of Eastern type footwear, primarily boots, are rarely found in excavations because the larger pieces of leather were cut off and re-used before they were completely worn out. Nonetheless, their cut is clearly visible on the boots found in the crypts of the Parish Church of Sárospatak: it is symmetrical, sewn at the sides, and the leg-parts are knee-length. (Fig. 19) The uppers of boots and leather stockings were cut with a central axis and they were made of three parts: the vamp, the front piece and the back piece of the leg part. The leg parts were sewn on the sides. (Fig. 21) If the waist of the sole was very narrow, the vamp was shaped to make up the missing width at the sole. (Figs. 22 and 23) The upper was mostly made of goatskin. There were always stiffeners and linings in the vamp. The latter were cut of two pieces, typically long, up to the throat of the boot to protect the feet at the point where the vamp and the leg were sewn together. Slippers were cut similarly but instead of the leg part a low quarter was applied at the back. (Fig. 24)

CLOCKWISE FROM UPPER LEFT:

FIGURE 19 Ladies' boots from the turn of the sixteenth and seventeenth century, HNM Rákóczi Museum.

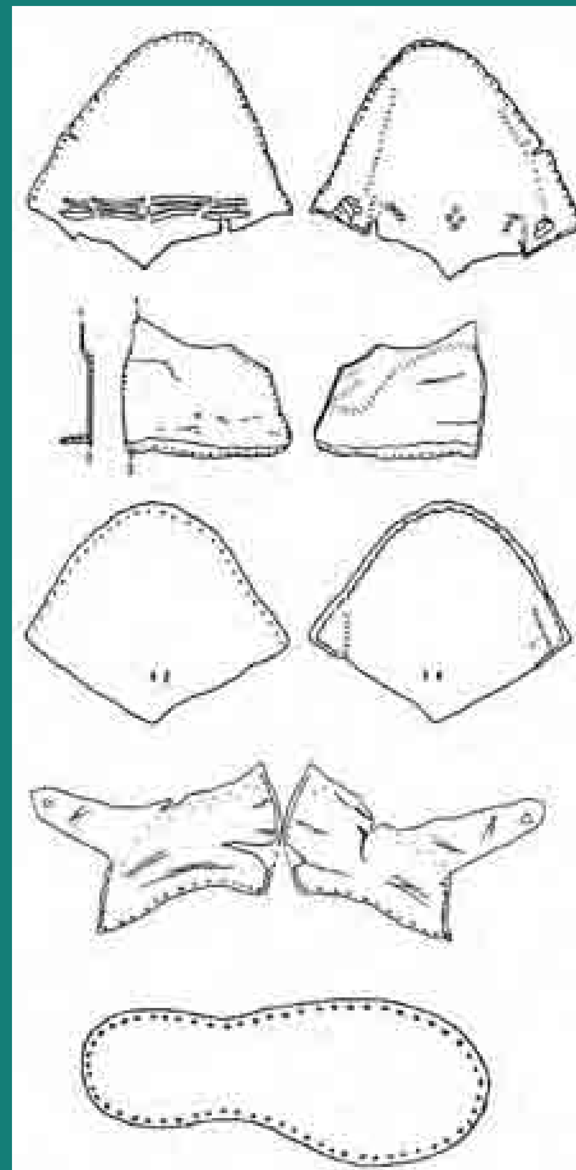
FIGURE 20 The cutting designs of typical Western-type vamps, quarters and soles from the sixteenth-seventeenth centuries.

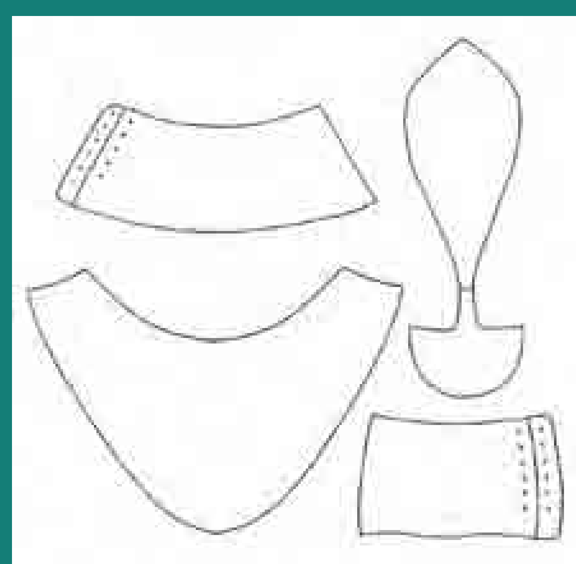
FIGURE 21 The cutting design of side-laced leather stockings, seventeenth century.

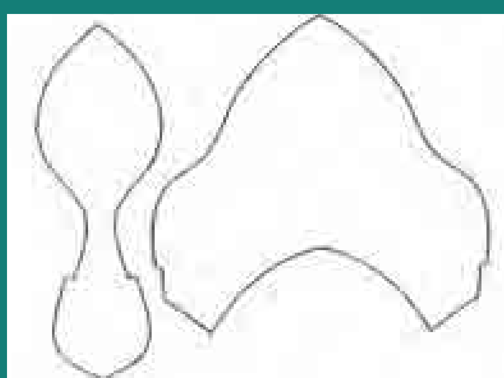
FIGURE 22 Boots, seventeenth century, detail. HNM 1954.617.1.2.

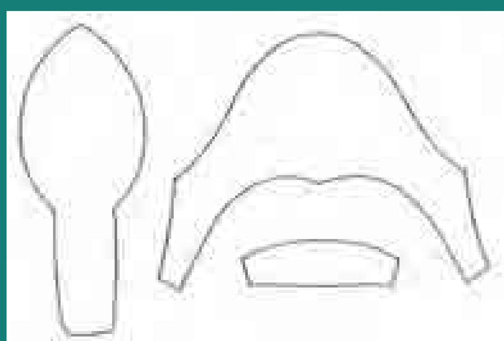
FIGURE 23 Cutting pattern of the sole and vamp of boots, seventeenth century. The missing width of the sole was made up with the special cut of the vamp.

FIGURE 24 Cutting pattern of a slipper, seventeenth century.



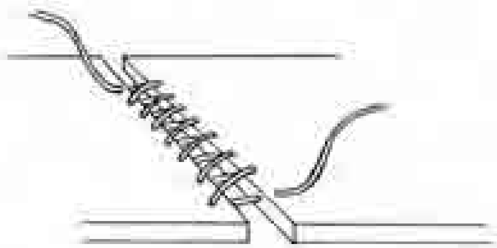




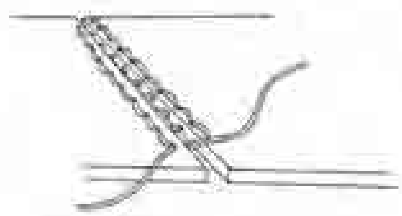


Seams and stitching

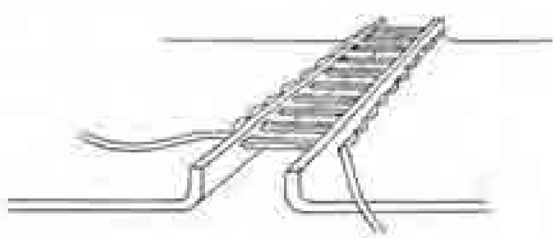
It is impossible to introduce all the stitches and seams used in the given period, but the following list identifies those that are most typical in the Hungarian archaeological and historical finds. Figure 25 a-g shows the different types of seams.



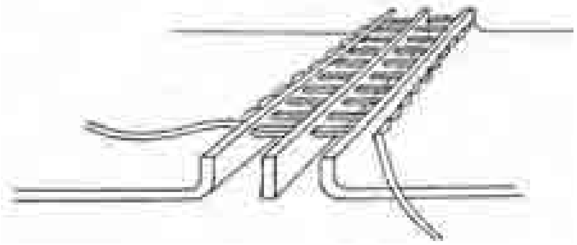
25a: Edge/flesh butt seam. Sewn with one needle, invisible from the face. It was used mostly to assemble the pieces of uppers.



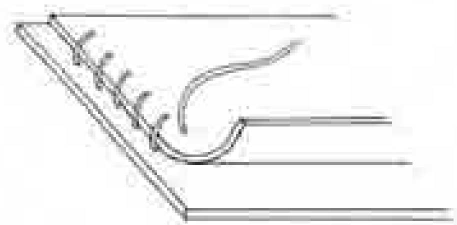
25b: Edge/flesh butt seam. Sewn with two needles, invisible from the face. It was used to assemble the pieces of uppers. It is stronger and more even than sewing with one needle.



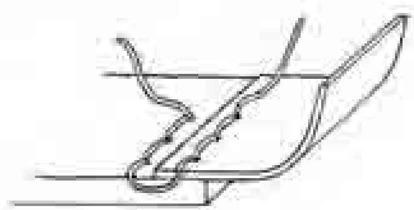
25c: Sewing with two needles: both pieces of leather with grain/flesh seams. It was applied in turn-shoe constructions when the upper was sewn to the sole inside-out.



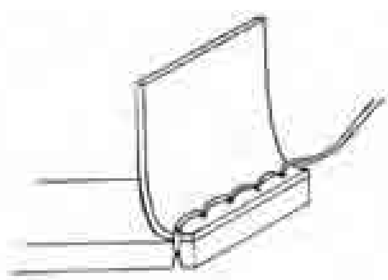
25d: Sewing with two needles, with rand on both pieces of leather with grain/ flesh seams. It was applied in turn-shoe constructions when the upper was sewn to the sole inside-out.



25e: Binding stitches with tunnel stitches: sewn with one needle. Stitches do not penetrate the leather completely so they are invisible from the outer side of the shoe. They were used to fasten stiffeners, linings, and lace-hole reinforcement.



25f: Tunnel stitches in the sole, grain/ flesh seam in the upper leather. Sewn with two needles. It was applied in turn-shoe construction when the upper was sewn to the sole inside-out. The vamp of Eastern boots and slippers was attached to the sole with this stitching.



25g: Grain/flesh seams both in the upper and the sole. Sewn with two needles. There is a groove cut in the sole where the sewing thread is hidden. It was sewn from outside, not inside out. It was usual in the heel-parts of Eastern boots and slippers.

Between the thirteenth and fifteenth centuries, the uppers of Western-type shoes were sewn with edge/flesh butt seam from inside out, usually with one needle (25a), in some cases with two needles. (25b) The edges of leather were joined, the stitches did not penetrate the material completely, so they were invisible from the face of the leather. The assembly of the sole and the upper was carried out in a turn-shoe construction, using two needles (25c), but in case of children's shoes they could be sewn from outside as well. Rands were quite often used. (25d) Rands were usually 4-6 mm wide. Linings and stiffeners were sewn with binding and tunnel stitches inside the shoes (25e).

From the late fifteenth century, the vamp and the leg were joined with two needles from inside-out, with grain/flesh seams in the whole depth of the leather (25c). The assembly of the sole and the upper was carried out with two needles, mostly in turn-shoe construction (25c) but there have been some uppers found with edges turned out which indicate that the soles were sewn from the face. Linings and stiffeners were sewn with binding and tunnel stitches inside the shoes (25e).

The uppers of Eastern-type footwear were also sewn with edge/flesh butt seam from inside-out, but usually with two needles (25b). The assembly of the hard sole and the upper was carried out with two different stitches: on the fore part to the end of the waist a turn-shoe construction was used, with tunnel stitches in the sole (25f) then the shoe was turned back to the face and the heel was sewn with two needles from outside and the thread was applied in a little groove cut in the sole (25g). A different technique was used at the heel because the long-legged, thick-soled boots would have been very difficult to turn inside out if the sole had been sewn all around. The little part left open at the heel made it easier to turn the shoe inside out, and the remaining part was sewn from outside. It is interesting to note that slippers were sewn with the same seam although there was no specific reason for doing so. As the leather was very soft, the soles of leather stockings were sewn with the same stitches as for the assembly of the pieces of the uppers (25b). Linings and stiffeners of Eastern-type footwear were sewn with binding stitches just like Western-type shoes (25e).

Summary

Our research has proved that most of the Western shoe-types from Hungary can be found in almost the same form in England, Germany, the Netherlands, and many of them in Poland as well. The Eastern types, which were popular in Hungary, were often found in Turkey and Russia, but they were unknown in Western Europe. Some similar pieces can be found in Spanish museums but these were definitely imported by the Moors and did not become part of the aristocratic footwear as they did in Hungary.

This review is based on the objects we have examined so far. We would certainly like to continue our work. Our aim is to survey the complete material of Hungarian footwear from archaeological and historic finds, in order to get an even more detailed picture of the technologies of manufacture and compare the results with the typical features of European footwear in terms of production technology.

A shortened but unpublished version of this paper was presented at the ICOM CC Leather Working Group Conference, held 18-20 October 2000 in Vic, Spain, under the title: Kissné Bendefy, Márta, and Bakay-Perjés, Judit: *Western and Eastern influences on Hungarian footwear in the Middle Ages.*

Acknowledgements

I would like to thank all those colleagues who have contributed to my project, primarily Judit Bakay-Perjés, with whom I have carried out the major part of this research. I am grateful to: the Hungarian National Museum, and its branch in Sárospatak, i.e. the Rákóczi Museum, as well as its branch in Visegrád, i.e. The King Matthias Museum; the Kuny Domokos Museum in Tata; and to archaeologist Dr. Dóra Nyékhelyi of the Budapest History Museum for their kind permission to publish various objects that have not been published before.[14]

Endnotes and References

1 Judit Bakay-Perjés is the chief-restorer of the Budapest History Museum.

2 B. Szatmári, Sarolta: Előzetes jelentés a tatai vár ásatásáról [A preliminary report on the excavations at the castle of Tata] *Archaeológiai Értesítő* 1974: 45-53. Holl, Imre: *Mittelalterliche Funde aus einem Brunnen von Buda, Budapest,* 1966: 98. Órásné Melis, Katalin: A budavári Dísz tér 8. számú telken feltárt kút leletei [The finds of a well from the site at 8 Dísz Square]. Budapest régiségei 23. Budapest, 1973: 209. Gervers-Molnár, Vera: Sárospataki síremlékek [Finds from graves in Sárospatak]. Művészettörténeti Füzetek 14. Budapest 1983: 101.

3 Szalay, Zoltán: Régészeti és történeti eredetű bőr lábbelik konzerválása [The conservation of archaeological and historic leather footwear]. *Múzeumi Műtárgyvédelem* 1. Budapest 1970: 127-168. Virág, Lajosné: Bőr- és faleletek konzerválása és restaurálása [The conservation and restoration of leather and wooden finds] *Budapest régiségei* 23. Budapest 1973: 211-218.

4 Goubitz, Olaf: The drawing and registration of archaeological footwear. *Studies in Conservation* 29 (1984): 187-96. Goubitz, Olaf: Calceology: a new hobby: the drawing and recording of archaeological footwear. In: *Recent Research in Archaeological Footwear.* Association of Archaeological illustrators and surveyors, Technical Paper No. 8. Northampton, 1987. Grew, Francis; de Neergaard, Margrethe: *Shoes and pattens*. Museum of London 1988: 145. Goubitz, Olaf; van Driel-Murray, Carol; Groenman van Waateringe, Willy: Stepping through Time. *Archaeological footwear from prehistoric times until 1800*. Stiching Promotie Archeologie, Zwolle 2001: 396. Schnack, Christiane: *Mittelalterliche Lederfunde aus Konstanz (Grabung Fischmarkt)* Stuttgart, 1994: 105.

5 Bakayné Perjés, Judit; Kissné Bendefy, Márta: *XIII.-XVI. századi bőr leletek technikatörténeti és technológiai vizsgálata* [Studies in the technology and technological history of leather finds from the 13th-16th centuries]. Záróbeszámoló. OTKA T.021204 számú Kutatási Pályázat 1996-1999, Budapest, 2000.

6 Gáborján, Alice: A szolnoki hódoltságkori ásatási lábbelianyag magyar viselettörténeti vonatkozásai [Footwear from the excavations in Szolnok from the period of the Turkish Conquest and its references to the history of Hungarian clothing]. *Ethnographia* LXVIII, 4. Budapest 1957: 543-570. Órásné Melis, Katalin: A budai középkori lábbeliviselet, XIII.-XIV. század. [Mediaeval footwear in Buda, 13th, 14th centuries]. *Archaeológiai Értesítő* 1973: 88-101. Órásné Melis, Katalin: Régészeti adatok a későközépkori lábbeliviselet kutatásához [Data for the studies of late mediaeval footwear]. *Archaeológiai Értesítő* (1974): 275-289.

7 Írásné Melis, Katalin: 1973, op cit. HOLL, Imre: *Kőszeg vára a középkorban* [The castle of Kőszeg in the Middle Ages]. Fontes Arch. Hung. Budapest 1992 p.67. Mocskonyi, Melinda: Lábbeliviselet a XII.-XIII. századi Sopronban [Footwear in Sopron in the 12th-14th centuries]. A Sopron -Előkapui bőrleletanyag feldolgozása. In: *Soproni Szemle* (1997): 335-355.

8 B. Nyékhelyi, Dorottya: Découverte d'un puits médiéval Place Saint-Georges. In: *Un château pour un royaume. Histoire du château de Budapest*. Katalógus. Musée Carnavalet, Histoire de Paris. 15 juin-16 septembre 2001. Paris 2001. (The conservation and detailed documentation of the footwear is in progress, publication is due later.)

9 Yarwood, Doreen: *The Encyclopaedia of World Costume*. London, 1978: 471.

10 Gáborján, Alice: op. cit.

11 Swann, June: *Shoemaking*. Buckinghamshire 1986: 32. Brezovcsik, József: *Kiveszőben lévő cipőkézművesipari technológiák* [Disappearing technologies in shoemaking]. Bőripari Tudományos Egyesület Kiskönyvtára nr.IV., Budapest 1960: 66. Grew, Francis; de Neergaard, Margrethe: op. cit.

12 A Turkish illustration, In: *Istambul in the 16th century*, Akbank Culture and Art Publication, Istanbul 1994.

13 Írásné Melis, Katalin: op. cit 1973.

14 The photographs were taken by Gábor Nyíri and Judit B. Perjés, the sketches were made by Márta Kissné Bendefy and Andrea Láng.

11

The [Hungarian] Museum of Military History commemorated the 150th anniversary of the Hungarian Revolution and the War of Independence1848-49 with a large-scale exhibition in 1998. Several relics from that period were restored, including two atillas: Hungarian-style braided military coats. One atilla belonged to Ernő Kiss (1800-1849), the Martyr of Arad; the other to Richárd Guyon (1812-1856), a Hungarian General of English descent. (Figures 4-5, and 6-7)

[MÁRIA KRALOVÁNSZKY]

Problems of the second restoration of two general's atillas (military coats) from 1848-1849

Both atillas are made of pale-blue wool broadcloth with golden braiding and red felt cuffs. The lining of Ernő Kiss's coat was completely missing. Richárd Guyons's atilla was lined with white silk above the waist and with red wool below. The pale-blue wool cloth of both atillas was rather moth-eaten with lots of smaller or larger holes which had been previously restored. Unfortunately no documentation could be found of the restoration, so it is not known when or by whom the atillas were stabilized.

The restoration of Ernő Kiss's coat had involved gluing and sewing in some areas (Fig. 1), while the other coat had only been sewn. In the former case, underlay-patches, some just the size of the holes or slightly larger, had been glued in place. The patches were cut from grey and blue fabric or blue silk in some cases. The patches, which were sewn to the fabric with a few stitches, were held firmly by the glue which must have been soft originally, but is now extremely hard. Tiny holes were simply pulled together with thread.

During the sewn conservation of Richárd Guyon's atilla, patches of blue rep fabric were placed under the holes, and the edges of the holes were stitched to the cloth with a conspicuous thread in a radiating pattern which looked almost like embroidery (Fig. 2). Certain parts of Ernő Kiss's atilla had been undone to make the underside of the cloth accessible for gluing. In contrast, in the case of Richárd Guyon's coat, none of the original construction was undone because the patches were tucked into the holes and then sewn to the wool cloth. However, the quilting, the interlining, all the layers and even the silk lining had been sewn together when the patches were sewn in place.

The pale blue cloth of the atillas is of a plain-weave, fulled wool with a smooth, felt-like surface; the latter is achieved by raised the nap of the wool, shearing the nap, and combing the shorn surface in one direction on the face of the fabric. This results in a material which is thick, compact and rigid. The new wool fabric selected for the recent conservation treatment was imported from Italy. It was made of

FIGURE 1 Sewn and glued patches on the underside of the sleeves (The atilla of Ernő Kiss)

FIGURE 2 The holes in the cloth after supporting and sewing (The atilla of Richárd Guyon)

FIGURE 3 The attila front, after removal of the patches (the atilla of Ernő Kiss)

pure wool but with a twill weave; the nap was raised only on the face of the cloth and it was unshorn, and thus the surface was uneven and irregular. The cloth was also thin and soft. The fulled wool cloth used to make the atillas was woven from blue and écru fibres spun together, resulting in a streaked colour on the surface. The new wool fabric was originally white, making it easier to dye, but this made it impossible to reproduce the streaked colour of the original cloth. Lighting, therefore, affects whether or not the new wool fabric blends well with the cloth of the atillas.

The conservation of Ernő Kiss's atilla

The atilla had to be partly, and later completely, dismantled in order to remove the glued patches of the previous restoration (Fig. 3). The golden braids were unstitched as well, since there were moth holes underneath the braid and it was easier to clean and support the moth holes that way. The only substance that dissolved the glue was acetone but even that was only effective on the surface layer; it was ineffective where the cloth was deeply impregnated with glue. The wool was cleaned in an aqueous solution of a non-ionic detergent (Prewocell).

The cloth was so thick that placing patches of new cloth behind the holes would have resulted in deep shadows on the surface. For this reason, a patch-implantation method was selected by the author. The implant was cut (from the new, suitably dyed cloth) to the size of each hole and secured with a thin cotton thread with closely placed, invisible stitches worked within the whole depth of the fabric, from the underside. (Figs. 8 -9) All the holes visible to the eye and the larger gaps (2184 of them) were in-filled in this way; then a full support of thin wool cloth was sewn to the underside. (Figs. 10-11)

FIGURE 4 The atilla of Ernő Kiss before conservation

FIGURE 5 The atilla of Ernő Kiss after conservation

FIGURE 6 The atilla of Richárd Guyon before conservation

FIGURE 7 The atilla of Richárd Guyon after conservation

The incorrect seams of the previous conservation were corrected during the re-assembly of the atilla. After the original interlining was put back, the braiding was sewn on again. The original quilting of the chest area, which was marred by moth frass, was not retained but was re-made from cotton wadding, imitating the form of the original. The lining was missing, so a new one had to be made. Richárd Guyon's atilla provided a model for the lining; thus, the upper half to the waist, as well as the sleeves, of Ernő Kiss's atilla were lined with twill-weave silk while the bottom half and the front row of buttons were lined with red wool cloth.

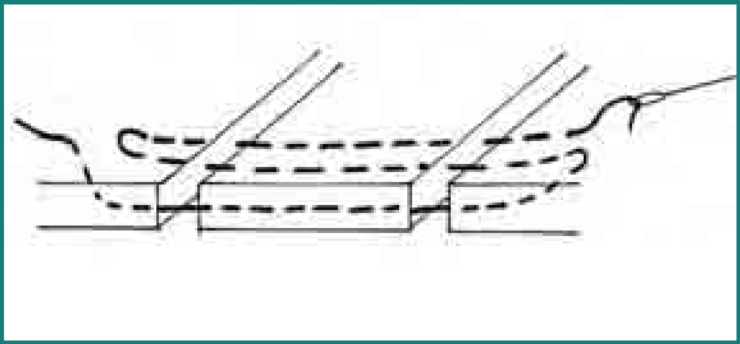
The conservation of Richárd Guyon's atilla

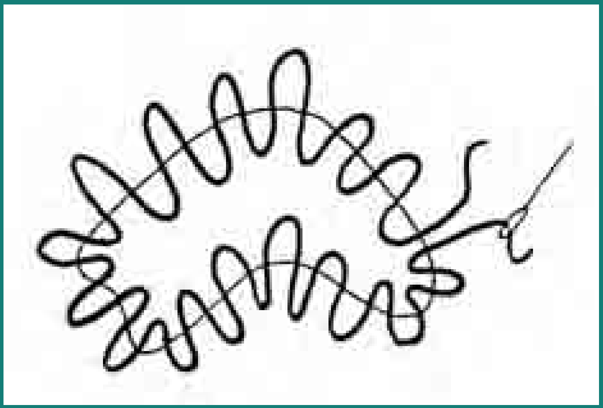
The coat had to be completely dis-assembled so that the patches of the previous repair could be removed. The braids were taken off, cleaned and repaired as well. The wool cloth was washed in an aqueous solution of a non-ionic detergent (Prewocell). The wool cloth of Guyon's atilla is much thinner than the other atilla and there were more, rather tiny holes in it.

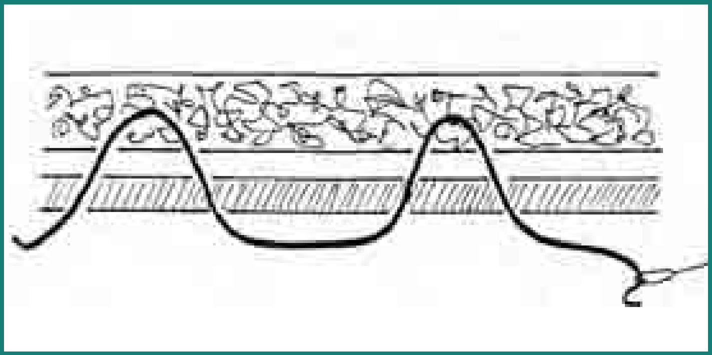
Thus the implantation method was ruled out, leaving the option of supporting and sewing around the holes. The edges of the holes were secured with thin silk thread after the new, suitably dyed cloth was placed under the original fabric. The thread disappeared into the raised surface of the fulled wool cloth, resulting in a beautiful, even surface. (Figs. 12-13)

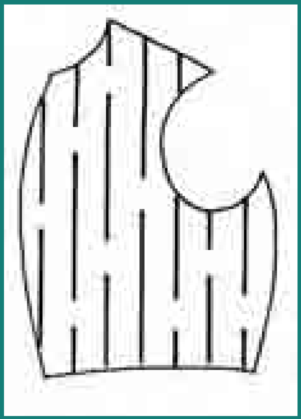
The original form of the atilla was reconstructed by relying on the findings of the dis-assembly. The original interlining was repositioned, and the braiding was sewn back. The moth-eaten, defective quilting was replaced with new cotton wadding. Guyon's atilla was thickly padded not only in the chest but also at the shoulders and shoulderblades. The next step was to restore the lining. The silk lining of the upper half had been sewn all over, was full of holes because the previous repair to the wool cloth reached deep into the linings and interlining; there were also repairs to the torn silk

After consultation with the curator, the old lining was replaced with a new one; the original has been









CLOCKWISE FROM UPPER LEFT:

FIGURE 8 The invisible stitches worked in the depth of the fulled wool cloth

FIGURE 9 The fastening of the implant from above

FIGURE 10 The fastening of the underlay fabric on the underside of the fulled wool cloth

FIGURE 11 Areas where the underlay fabric was tacked onto the face of the atilla

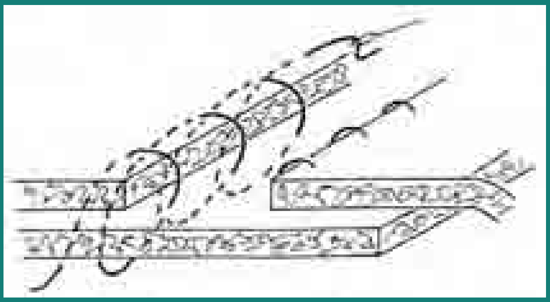
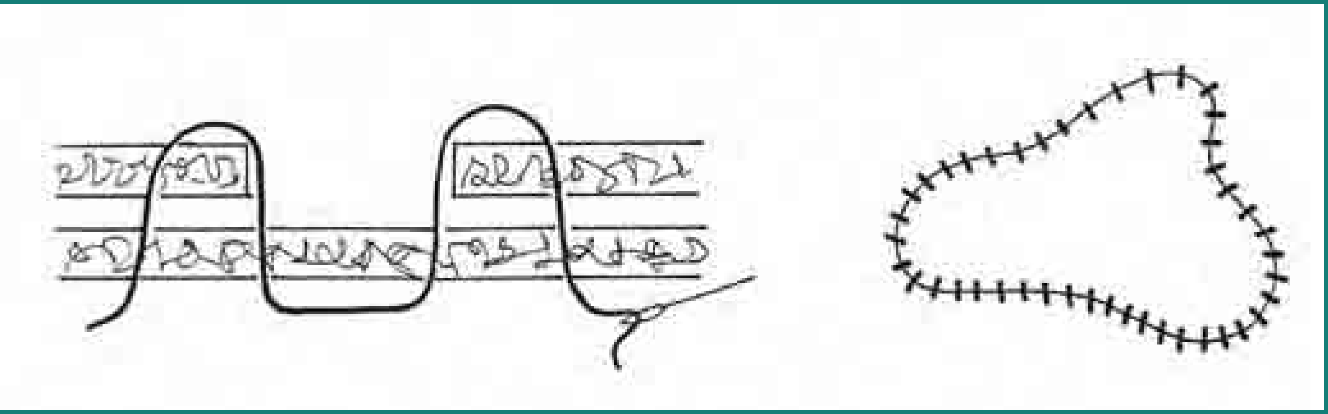


FIGURE 12 Stitching the edges of supported holes in the fulled wool cloth

FIGURE 13 Section and top view of the supported and stitched holes



retained for record purposes. The red wool lining of the lower part of the atilla was ragged, friable and imperfect. It would have required a full support and extensive stitching, and even then the fraying threads of the cloth would still have been obvious. It was therefore decided to cover the old cloth with a new one. The original fabric was secured with several lines of tacking stitches to the new one. Should there be another conservation treatment in the future, the original lining, now concealed inside the atilla, could be uncovered and restored in a better and more efficient way.

Choosing the right support and infilling material is likely to remain problematic even in the long run, because although suitable natural fibre textiles are available, they differ in texture, quality and dressing from the old ones.

Questions and problems raised during conservation

The atillas of Ernő Kiss and Richárd Guyon may not have been restored to their original magnificence, but they have at least become cleaner and more aesthetically pleasing. In the event of further conservation in the future, the dis-assembly of the original garments and removal of the supporting and infill materials will be much easier, particularly as there is detailed documentation about the process.

Still, the question remains, why had the atillas been restored in that particular way? The demands of conservation and the science of conservation have changed radically in the past fifteen to twenty years, so we should not judge the work of our professional ancestors in the light of current views. One day our methods may also seem outdated or even incorrect. Let us think in advance about the judgement of our work in twenty years' time. Might the methods used in the first conservation of the two atillas have been cutting-edge solutions in that time?

Might the colours of the threads and patches have blended well before they faded? Or could the supporting and infill patches and the stitching have been selected on purpose to make them conspicuous? Was the choice of patches so different from the original cloth a matter of choice or did they just not have any other suitable material?

The method of gluing must have been a quick and modern method in its time, but since then it has turned out that this glue must be applied with utmost caution. The conclusion from these atillas is that for clothing, where the textile has to 'move' or bend, gluing should be avoided.

A glued surface cannot follow such motion: it either breaks or comes off. Each type of textile, especially this kind of fulled wool cloth, can be sewn, as shown by the unglued atilla. Gluing should also be rejected because it damages the cloth if it cannot be removed. In our case, when the glue stuck to the raised surface of the wool it was possible to remove it with acetone but when it impregnated the cloth it was impossible to dissolve. Unfortunately these areas had to be cut out in order to allow them to be replaced with the new support and infill fabrics.

Another warning for sewing conservation is that when patches are tucked in behind holes and then stitched in place, the underlying layers of fabric (e.g. interlinings and linings) can be caught up by the stitching. The patches either have to be sewn very carefully or the lining has to be undone to give access to the underside of the material.

12

In Austria today, academic training in conservation and restoration is offered at two institutions: the Academy of Fine Arts and the University of Applied Arts, both located in Vienna. Conservation training at the Academy of Fine Arts has a long tradition; its roots can be traced back to 1829 when the famous Austrian painter Ferdinand Georg Waldmüller, then Director of the Academy's Picture Gallery, suggested such a school, though it was not implemented until 1908 when the first specific courses were available. The art historian Robert Eigenberger (who was also Director of the Picture Gallery) established the full training programme in 1934.

[GABRIELA KRIST]

Academic training of conservator-restorers in Austria:

PAST EXPERIENCES AND FUTURE PERSPECTIVES

The primary goal of the Chair for Conservation and Restoration Technology was research into the history of painting and sculpture. The first diplomas were awarded in 1937. Graduates were expected to be primarily responsible for the restoration of works of art in state collections and to be employed in museums and collections. Eigenberger headed the Master Class until 1965; this was the professional cradle for a whole generation of leading Austrian conservator-restorers. Eigenberger's successor (and also student) was the art historian and restorer Helmut Kortan (1965-86). He recognized the need to add paper conservation as an additional focus to painting and sculpture restoration. Gerald Kaspar held the chair from 1986-93, and altered the name to the Master Class for Restoration and Conservation, which has been maintained by his successor Wolfgang Baatz who assumed the Chair in 1994.

This extensive experience in academic training for art conservators has placed Austria in a leading position in Europe. In 1933, the Courtauld Institute of Art, UK and in 1937 the Institute of Archaeology, University College London, UK began formal teaching of conservation in London. In Italy, Rome's Istituto Centrale del Restauro was established in 1939, although actual courses were not held until after the Second World War. After the war ended, the extensive damage throughout Europe considerably increased the demand for trained conservators, and led to the establishment of numerous new schools, including the Academy of Fine Arts in Prague, Czechoslovakia, and the Torun University and Academy of Arts in Cracow and Warsaw, Poland.

The general spirit of new beginnings also engendered pertinent professional organizations. In 1959, The International Centre for the Study of the

Preservation and Restoration of Cultural Property (ICCROM) was founded in Rome as a centre for international education and continuing education for conservators working with objects, monuments and sites. Earlier, in 1948, another UNESCO initiative fuelled the establishment of the International Council of Museums (ICOM) as the international umbrella organization for museums. Similarly, the International Council on Monuments and Sites (ICOMOS) was set up in 1964, originally intended as a professional society for architects and architectural engineers, but today a forum for discussions concerning all the professions working with monuments preservation. During the second half of the twentieth century, these international organizations have spearheaded the development of conservation and restoration as a profession in itself.

But to return to Austria: at the 'Angewandte', which grew out of the Museum for Applied Art (angewandte Kunst) at the end of the nineteenth century, issues of conservation and restoration were not raised until much later. The former Master Class for Work in Gold and Silver, Glass and Enamel provided the core courses in the early days. Established in 1964, it was headed by the conservator and goldsmith Otto Nedbal until 1974. In 1980, Hubert Dietrich joined the Angewandte; as the head of the Paintings Conservation studio at the Kunsthistorisches Museum, he expanded the Angewandte's traditional focus on metals to include painting conservation. It is to his credit that the long tradition of Austrian paintings conservation, as practiced at the Kunsthistorisches Museum by Josef Hajsinek (Chief Conservator 1939-68), was continued and incorporated into the academic training programme.

Dietrich headed the Master Class until 1999. New education legislation bestowed university status on the former Hochschule für angewandte Kunst. This necessitated considerable internal re-structuring; the former Master Classes were re-named as 'Chairs' and Departments and arranged into pertinent institutes. Today, the Chair for Conservation and Restoration has been linked with the scientific and technical laboratories to form the core of the Institute for Conservation Sciences and Restoration - Technology. Since the new legislation also included changes to the course of studies, a new curriculum had to be devised; this took effect in October 2001 at the Angewandte. This also occasioned organizational alignment with the Academy of Fine Arts, in particular the creation of new and necessary courses which had been discussed for decades and for which preservation authorities for museums and monuments had long been calling.

Today, the Angewandte offers the following tracks for specialization: conservation and restoration of paintings, objects, textiles, stone and archaeological finds. At the Academy of Fine Arts, the specialist areas defined for conservation training courses are paper, wall paintings, polychrome sculpture and, overlapping or parallel to the Angewandte, paintings. Both Austrian programmes require 10 semesters and a terminating Diploma exam; successful candidates are awarded a Master of Arts, a title which in Austria is equivalent to that of other academic disciplines, i.e. which affords professionally and financially equal ranking to other university graduates in the Civil Service. Many other countries envy us for this achievement.

The basic courses (during the first section) at the Angewandte focus primarily on technical and artistic requirements. For all the specialist areas, this includes basic courses in drawing (from nature), painting techniques, wood-working and tools. Depending on the individual needs of each special field, there are further required courses, e.g. introductory weaving for textile conservators or basic stoneworking techniques for those specializing in stone.

The practice of conservation is defined as the core artistic subject material for individual training, and is the basis for teaching throughout the five years. Right from the beginning, students learn on original works in the atelier. Learning by observing, by recognizing the technical and technological structure of the objects as well as the damage which might have been caused by age, handling and/or inherent material degeneration are always primary topics during the first semesters. Teaching conservation practice extends from conveying simple techniques and preventive measures for care to dealing with the complex restoration problems that are the emphasis of the later semesters. During the fifth year, students select an object for their Diploma project, an item which presents a gamut of conservation challenges as well as offering possibilities for theoretical formulation.

It goes without saying that the artistic and art-historical aspects are also considered within the framework of the Diploma project, as well as all the pertinent scientific examinations (to be carried out independently as much as possible) for the clarification of technological problems and causes of damage. Theoretical coursework in the liberal arts and sciences complement the practical work experience in the curriculum. All areas of specialization have defined the joint required coursework, such as colour theory, pigment chemistry or an introduction to materials, as well as lectures in art history and business and management skills for conservators. The added advantage of close cooperation with the scientists on the staff is considerably aided by the fact that their laboratories are located in the same building. Furthermore, the specialists and well-equipped laboratories for wood, textile and metal technologies are available to assist students and teaching personnel.

There is also a well-established cooperative link with leading Austrian institutions in the field, especially with museums and with the Austrian Federal Office for the Care of Monuments: its restoration workshop at the Arsenal has not only provided pertinent space and infrastructure for the establishment of the stone conservation specialization, but also offers students interesting practical work experience in Vienna and the provinces. Museum collections in Vienna also function as clients and include the Institute for Conservation in their current projects, e.g. for installing and dismounting exhibitions.

The planning of the courses for textile conservation started about ten years ago and was, to a large extent, always based on the advice of my friend Ágnes Timár. Her extensive international experience in the training and continuing education of conservators, particularly in practical application of scientific methods, was an important resource for the establishment of our new study programme. A long-time friendship and professional association came to a sad close with Agi's death; it therefore gives me particular pleasure that her spirit lives on and continues to develop in the budding textile conservators, as well as in my memory.