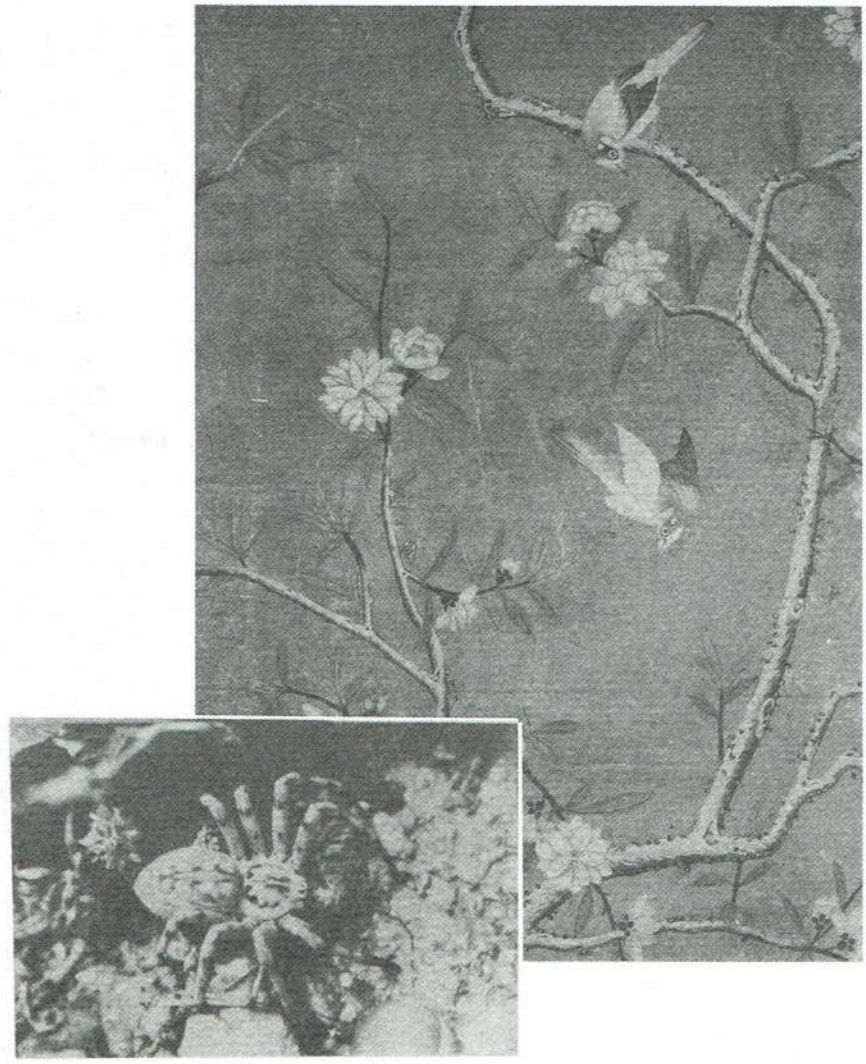
SPIDERWEBS AND WALLPAPERS:

international applications of the Japanese tradition in paper conservation



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USE OF JAPANESE-STYLE TECHNIQUES IN CONSERVATION OF EGYPTIAN PAPYRUS

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Abstract

For some particular problems in papyrus conservation, I was led to adapt some Japanese paper conservation techniques. After a brief presentation of the particular structure of papyrus, we shall see the typical alterations and the problems induced by that material and by former methods of conservation. Two typical problems were resolved with Japanese-style techniques: one was a facing technique using *gampi* paper and *funori* in order to remove old, thick cardboard linings; the other was a lining technique with *kozo* paper, inspired by the second layer of *karibari* board making, for very fragile and disorganized papyrus. That experience proved the fecundity of confrontation between techniques, materials and artefacts from different areas and ages.

Keywords: papyrus, facing, lining, *funori, gampi, kozo.*

Introduction

Papyrus is the most ancient vegetal writing support. It was used from at least 3100 BC until the 11th century AD, with a peak during antiquity. While primarily produced in Egypt and then in south Italy, it was exported throughout the Mediterranean and the Roman empire. The Egyptian climate, however, was the only one favourable to its conservation, and almost all the items that have come down to us were found in that country. They are now kept not only in museums but also in libraries and universities.

In working on papyrus conservation since 1988, I used Japanese materials, essentially papers and wheat-starch paste, from the beginning. The growth of my knowledge about typical papyrus problems on one hand and about Japanese materials (essentially thanks to the Japanese Paper Conservation course) on the other allowed me to improve my practice, to choose and adapt some typical Japanese techniques.

I Introduction to papyrus

A - Structure and manufacturing technique

This will be described very briefly [1], but we have to bear in mind that there are no good ancient descriptions of the production techniques, and that current theories are the fruit of the research of several scientists. Papyrus is made with the pith of the stem of *Cyperus papyrus L.* Strips are cut and placed on a table side by side to form a first layer of fibres. A second layer of strips is laid at right angles to form the sheet which is dried under high pressure.

Figure 1. Plants of *Cyperus papyrus L.*

Schema 1. Disposition of papyrus strips during the making of a sheet.

Natural gums and starch [2] play a role in good adhesion between the two layers, but the physical structure of the pith and the internal distribution of the cellulose fibres [3] also have an influence. If papyrus pith has a high content of cellulose fibres, we see that they are not refined. Natural gums and lignin are present in the material.

The problem of pressure is important. There is not much information on the ancient Egyptian presses and their power. I was particularly interested in visiting a conservation studio in Kyoto where we saw the technique of beating a dried sheet of paper between two pieces of leather to smooth its surface and increase its density. As we know, it is not possible to beat papyrus sheets when they are still wet without greatly decreasing their strength and increasing brownish discoloration. The Kyoto beating technique could be a good illustration of one approach to obtaining good quality sheets, very smooth, flexible and fine.

In my opinion, the way of making rolls with squared sheets of Japanese paper (as we learned during the JPC) is also a good illustration of the making of papyrus rolls. Starch paste was used for the joins [4]. Water-cut edges cannot be done with papyrus, but to obtain finer and smoother joins, the future join is prepared when the sheet is made: on the upper side the strips are a little bit longer on one edge, creating a sort of fringe [5]. The joins are then made with three layers of fibres instead of four.

Schema 2. The structure of the sheets and their disposition in the roll.

Papyrus rolls could be several metres long [6]. Letters or little magical texts were the only ones to be folded. The Egyptians never used single sheets of papyrus, but always rolls or pieces of them [7].

B - Alterations

Today, the colour of papyrus goes from very clear beige to a deep brown. We can observe that the browner it is, the more friable it tends to be. Its flexibility is very poor. All the documents carry fractures and lacunae. We have met very few problems of mould.

The ink used throughout the pharaonic period was carbon ink, which is very permanent. Irongall ink appears only during the Greek period [8]. The major problem caused by pigments is that induced by blue and green synthetic pigments such as verdigris. They fade, become brown, and the surrounding papyrus also becomes brown. Very often we find that the pigment and the papyrus have disappeared, as if burnt, leaving a hole in the shape of the drawing.

Most of the problems encountered are caused by unsuitable old restorations. Scientists were often only interested in unrolling the documents and reading the texts. The support material itself was badly known and poorly understood. We have already seen a lot of various and sometimes

surprising conservation treatments applied on papyri [9]. They can be organized in two sections: local and global treatments. The latter are divided between impregnation and, more frequently, lining with flexible materials (paper, goldbeater's skin) or rigid ones (wood, cardboard, gelatin, Plexiglas).

Some of these treatments were very dangerous for the papyrus or favoured its degradation. Today, old repairs are removed with some difficulty and adapted ones have to be put in their place. In two special but hardly rare instances, I was led to adapt Japanese-style methods: for the removal of poor-quality backings with the help of a facing technique and for consolidating very fragile items with a new lining.

II - Application of Japanese-style techniques

A - Facing technique with *gampi* and *funori*

1. Presentation of the problem

Very often, papyri were lined on cardboard of varying thickness. They were then easy to manipulate for examination or exhibition. The cardboard used was of poor quality, and the method does not avoid mechanical problems of abrasion. It is also not suitable for the typical, two-layer structure of papyrus: if the under layer is well glued to the board, the upper one is not. Because of the deformations of the board, it tends to split and to break down. So we now find lacunae in the upper layer where the script is, unless the second, under layer had remained intact, glued to the board.

Schema 3. Lining on cardboard.

Schema 4. Deformation of cardboard and splitting of papyrus.

To remove the cardboard, we have to use some water, even if a small amount, to make the peeling easier and dissolve the glue used for the lining. On removing the backing support, we obtain a sort of puzzle of fragile pieces of various sizes, more or less distorted by the moisture. When planning the removal of a backing on papyrus, it quickly becomes obvious that a facing is necessary - first to protect the surface from abrasion during the work and second to avoid the dispersion and loss of fragments.

We also have to bear in mind the fragility of the carbon ink when wet (on papyrus, the carbon particles are not absorbed by the fibre network, but stay on the surface). The facing glue has to be good for conservation, because we are not sure if it can be removed completely. The facing has to be flexible enough to follow the dilation induced by the humidity introduced into the papyrus. We need to remove the facing progressively to allow the reorganization of fibres and fractures before consolidation.

2. Technical procedure

For the facing, we chose *gampi* paper, 19 g/m², because of its very smooth surface which will not catch the particles of carbon ink. To avoid the problem of dimensional variations with humidity, we cut little rectangular pieces, the highest edge being parallel to the sense of the fibres. When covering the papyrus surface, we overlap the edges, creating 5 mm joins. Thus, the facing will be able to adapt to the dilation of papyrus in all directions.

Schema 5. Piece of *gampi* paper and disposition on the papyrus.

For the adhesive, we chose *funori* (0.5% of dried seaweed in water). Its gluing power is not very great, but strong enough to maintain the *gampi* paper, and not too much to stick the ink. It has performed well after artificial ageing tests [10]. It forms a very flexible film and will be a good consolidant for papyrus. It will increase the flexibility and the solidity of the document, so we can avoid rinsing it at the end of the treatment.

We generously apply the *funori* on the smooth side of a piece of *gampi* with a soft brush. We place the smooth side of *gampi* in contact with the dry surface of the papyrus and carefully apply the paper with the same brush. Then we let it dry naturally. The next paper will be put with its edge slightly overlapping the first one.

Schema 6. Disposition of the pieces of paper for the facing.

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Figure 2. Facing put on the Louvre papyrus E 8419.

When the whole surface is covered and wet, we can begin peeling the backing. We progressively humidify the cardboard and peel it off with tweezers. The purpose is to obtain a very thin last coat of paper. We have observed that if the last coat is too thick when being peeled, the cohesion between paper, glue and papyrus fibres is too high, and the splitting extends inside the papyrus structure. If the paper is thin enough, we just have to humidify it and peel it with tweezers without taking off papyrus fibres.

Figure 3. Removal of the backing on the Louvre papyrus E 8083.

When all the verso is cleaned and dry, we can begin removing the facing and the consolidation. After generously wetting one piece of paper with the soft brush and water, we can then remove the paper with tweezers. We leave it to dry. No loss of ink has occurred but the paper is brownish, as it has absorbed the degradation products of papyrus. Then we can reorganize fibres and fractures and perform local consolidations [11]. The work goes on alternately - removing one piece of facing and then consolidating the verso. At the end, the consolidated document can be put between blotting paper for flattening after a light moistening between Gore-Tex.

B - Lining of fragile items

1. Presentation of the problem

Some very fragile documents cannot be consolidated with local consolidations only and need a complete new lining. The lining has to be flexible and able to follow the dilations of the material to avoid splitting. It naturally has to meet current rules of conservation: reversibility and good ageing qualities.

Figure 4. Detail of the fragile Louvre papyrus E 4892 with facing after removal of the lining.

For this purpose we use *kozo* paper (18 g or 29 g/m², depending on the thickness of papyrus). It is flexible enough and the surface is not too smooth. Moreover, the *kozo* fibres catch the papyrus surface fibres so the use of very thick wheat-starch paste can be avoided. The paste will be used very diluted to increase flexibility. We think it fits naturally with papyrus, since starch is also contained in the papyrus plant. A starch-based paste was also used for the joins.

The remaining problem is that we cannot take the facing off the whole recto at one time. It must be done progressively to avoid losing any pieces and to allow the fibres and fragments to be realigned in a good position. We then remembered the making of the second layer of *karibari* (*dobari*): a layer composed of several squared pieces of paper, with water-cut edges, pasted and placed one after the other. We decided to proceed in the same way for our lining.

We remove one piece of the facing, then we put a sheet of Mylar on the recto. We turn the document and put it on a light table. We can reorganize the fibres and the pieces of the puzzle. When all is ready, we prepare a piece of *kozo* slightly smaller than the free area. It is important to leave enough space for correctly reorganizing the other areas of the document. We put diluted wheat-starch paste on the raw side of the paper and apply this lining on the papyrus. Often, we cannot put starch on the papyrus itself because of its fragility and of the risk of shifting some small pieces. We leave at least two centimetres of paper as margins around the edges of the papyrus. We can then turn the document over again, remove the sheet of Mylar and check that the fragments are in a good position.

Schema 7. The first pieces of lining.

The second row of pieces of *kozo* lining paper is staggered so as to break the continuity of the joins, as is done for the second layer of *karibari*. When the entire verso is covered, we leave the document to dry freely. We remove the facing in the same way as in the first example.

At the end, the lined papyrus is not flat. We put strips of Japanese paper around the lining. We slightly humidify the document between two sheets of Gore-Tex and let it dry in tension, repeating the operation until we obtain a good result. We finish with a last moistening and drying

between blotters under weights to restore good cohesion to the layers and fibres of papyrus. The lining is flexible enough and well adapted to the papyrus in that it follows the flattening of the document very well.

In the case presented here, we decided to cut the lining close to the edges of the papyrus. In the lacunae, the paper was toned with coloured pencils.

Figure 5. Detail of the Louvre papyrus E 4892 at the end of the work.

Conclusion

Although papyrus is cellulose-based material, it is different from paper. The conservator has to study its internal structure and manufacture to understand its characteristics and ageing. In the two cases presented here, Japanese-style techniques offered in our opinion a good approach to the problems encountered. Beyond the quality of the material, especially for ageing and suppleness, I would like to stress the advantage of the flexibility of the techniques themselves. The conservator is able to choose the concentration of the products and the thickness of the papers. Moreover, one can progress very cautiously and slowly, controlling both the good condition of the document and the quality of its repair.

In these cases, the adaptation of Japanese techniques was a very fruitful approach to the problems. The results are satisfactory in terms of good adaptation to the papyrus, reversibility, ageing expectation and aesthetic aspect. I hope it will testify that confrontation between techniques, materials and artefacts through ages and worlds is particularly fecund and necessary to progress in the conservation field.

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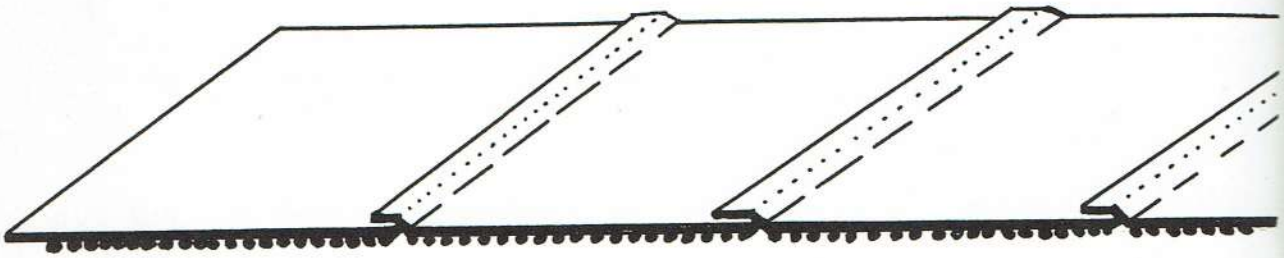
1. For more details, cf. Lewis, 1974, Ragab, 1980, Parkinson & Quirke, 1995.
2. Cf. Reynolds, 1967.
3. Cf. Mosiniak & Roland, 1987, 1985.
4. This has been shown by research conducted by Ms. de Bignicourt at the CRCDG in 1995.
5. Cf. Menei, 1993.
6. The longest one known is the great Harris papyrus, 41 m long, in the British Museum (Cerny, 1947).
7. So we can find a join just in the middle of small documents.
8. Cf. Delange, Grange, Kusko, Menei, 1990.
9. Cf. Menei, 1994.
10. In 1990, we performed tests of whiteness, opacity, flexibility, resistance to double fold, and resistance to pressure on fresh and artificially aged material in the laboratory of the Centre de Recherches sur la Conservation des Documents Graphiques (CRCDG) in Paris. Results are unpublished but available for consultation in my senior thesis at IFROA.
11. We use small strips of *gampi* paper and wheat-starch paste.

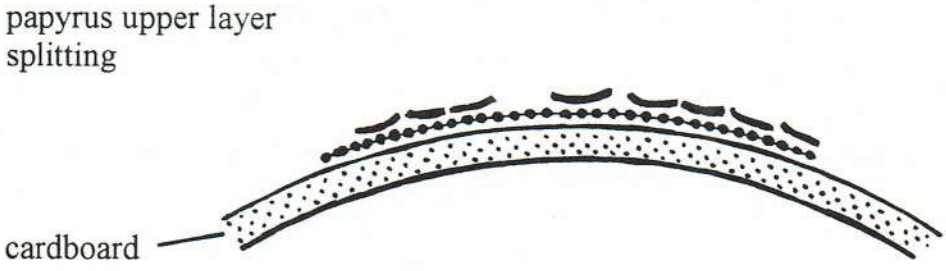
Schema n° 1 : *Disposition of papyrus strips during the making of a sheet.*

Schema n° 2 : *The structure of the sheets and their disposition in the roll.*



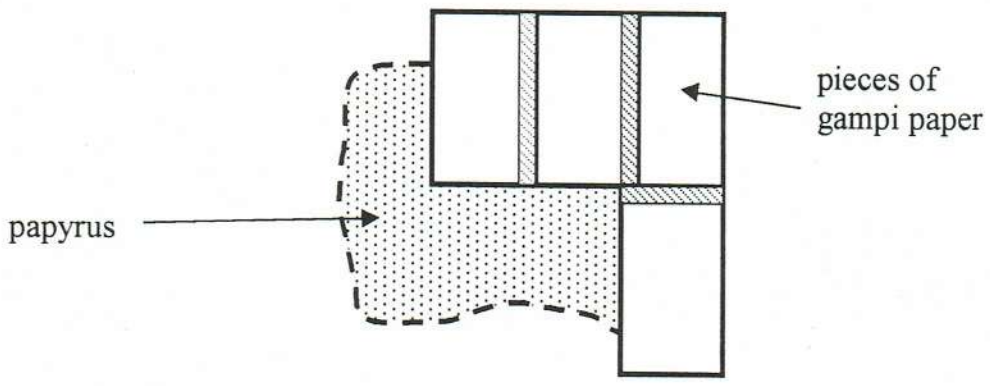
Schema n°3 : *Lining on cardboard.*

Schema n° 4 : *Deformation of cardboard and splitting of papyrus.*



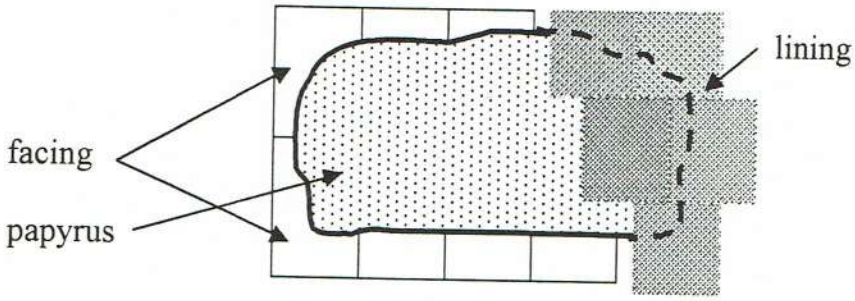
Schema n°5 : *Piece of gampi paper and disposition on the papyrus.*

Schema n°6 : *Disposition of the pieces of paper for the facing.*



Area where the papers are superposed 

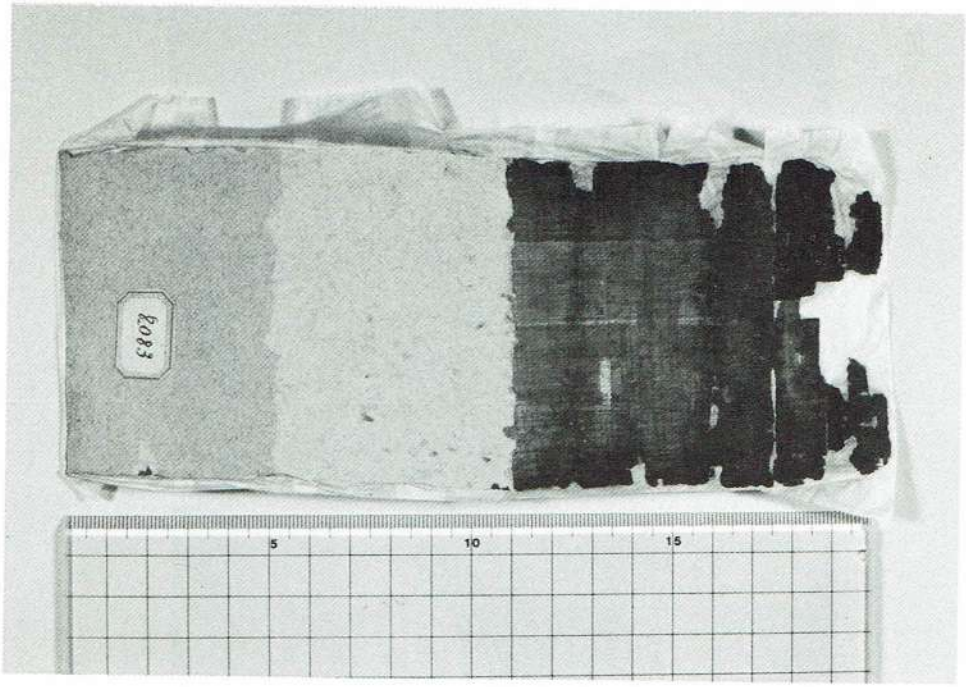
Schema n°7 : *The first pieces of lining.*



[Figures]

Figure 1. Plants of *Cyperus papyrus L.*

Figure 2. Facing put on the Louvre papyrus E 8419.



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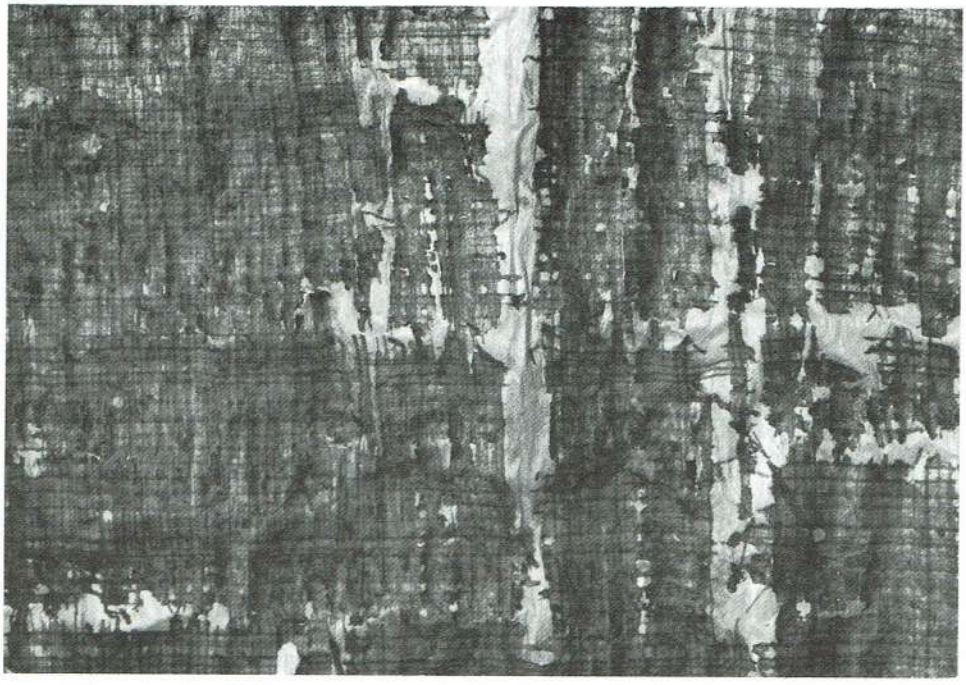

Figure 4. Detail of the fragile Louvre papyrus E 4892 with facing after removal of the lining.

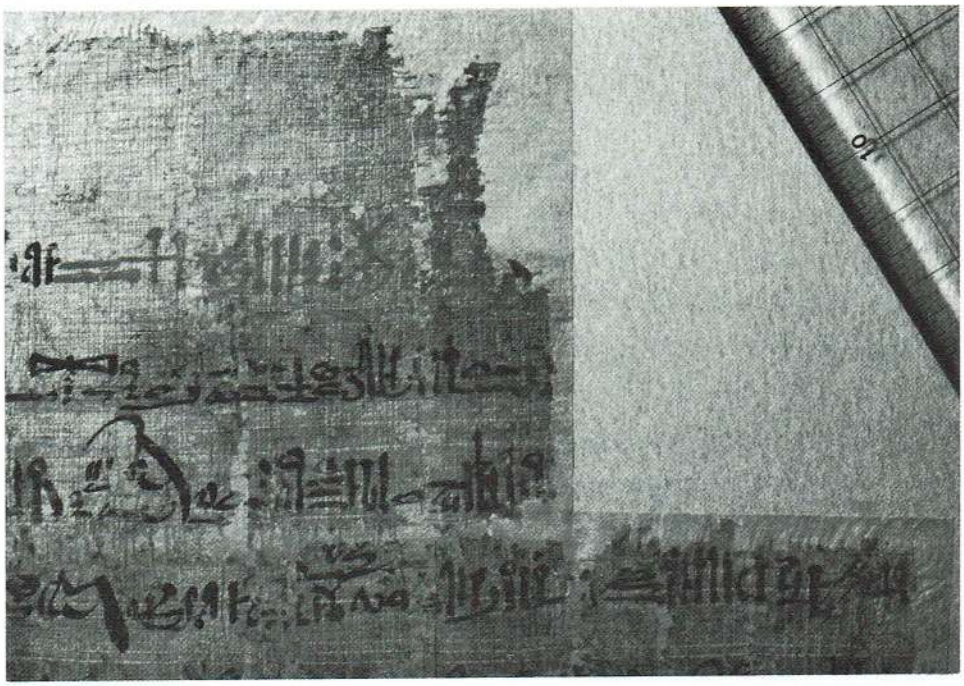

Figure 5. Detail of the Louvre papyrus E 4892 at the end of the work.