

Study of Inlay Mounting of Prints and Drawings at the Louvre Museum: The Results of Several Decades of Experience

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Introduction

The Louvre's 'Cabinet des dessins' was set up at the beginning of the nineteenth century (Serullaz, 2012). The drawings were first kept as single sheets or in albums. The use of individual mount-boards with bevelled windows to preserve drawing sheets was extended in the mid-twentieth century as a response to an increasing number of consultations and exhibitions. The first great exhibition exclusively dedicated to drawings took place in 1967, displaying the most beautiful drawings purchased by P. J. Mariette, the great art collector (d'Origny et al., 1967). Since the number of drawings requiring mounting increased significantly, it became necessary to create a workshop specializing in mounting in 1955 and later, in the 1990s, a conservation workshop, which is currently managed by Valentine Dubard. About 30 freelance conservators are now regularly called upon and assigned projects focusing on the conservation and preservation of works of art on paper. In this capacity, the group of freelance conservators has encountered various types of inlays in the collection. Some were probably done in the mounting workshop since the 1970s and have since caused minor preservation problems. Conservators in the 1990s improved the inlay technique, as curators did not want to abandon it altogether: it had the advantage of protecting the edges of the drawing in the event of consultations while allowing the display of the whole sheet of paper: Despite these improvements, distortion problems still existed and in 2009, the head of the workshop initiated research into the materials being used and their utilization. In 2013, further research was carried out including the investigation of new inlay papers and tests to evaluate their long-term physical changes.

History of mounting drawings in The Louvre

Before 1940 most drawings were preserved without mounts, simply attached onto loose sheets stored

within portfolios or albums.¹ Others were fully lined onto traditional mounts such as the mounts devised by Mariette.² Until the 1950s, drawings were rarely displayed and not often consulted. Curators at that time continued to favour albums when dealing with large numbers of newly received drawings; they were attached to the bound leaves by means of points of adhesive or hinges when recto/verso. This technique enabled them to store a large number of drawings in limited space. After the 1950s, albums began to be disassembled to allow the works to be displayed individually. Drawings were then attached by means of hinges along the top edge of the sheet onto a rudimentary mount made of two sheets of fine grey cardboard with a window framing the edges of the drawing in order to maintain it laying flat. In 1969, the 'Cabinet des dessins' moved into the Pavillon de Flore and gained storage space as well as a now famous reading room.

In the 1970s, drawings were preserved and displayed within mounts made of a backboard attached by one long hinge to a thicker cardboard with a bevelled window. An inlay device was developed, probably in the mounting workshop, allowing the display of the whole sheet with its borders visible (Fig. 1). The inlay method derives from the well-known technique used to recreate margins around prints that had been cut along the edge line of the printing plate.³ Inlays are made of a sheet of paper, hollowed out in its centre, the size of which is adapted to the standardized dimensions of the prints and drawings department mounts onto which the drawing is fixed (Fig. 2). The inlay is attached with a hinge adhered to one of the long sides of the preservation mount. This device meets the department requirements and, in the event of a large number of consultations, enables:

- the creation of a wide opening in the mount window around the edges of the drawing so that they remain visible;

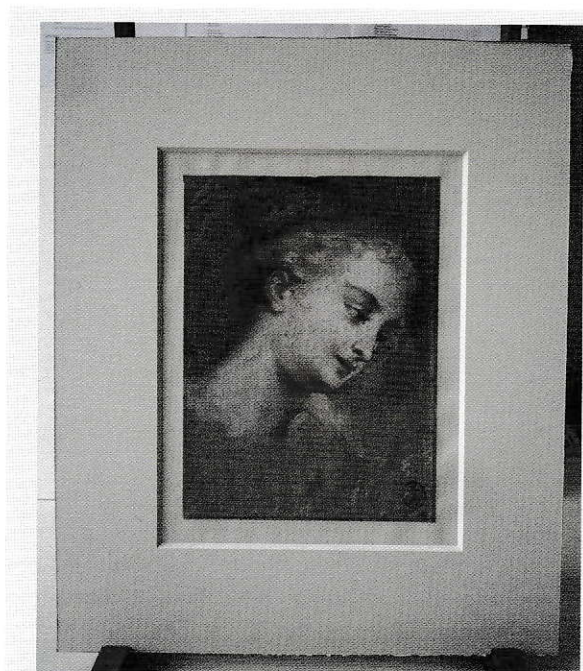


FIGURE 1 Drawing of the collection inserted in an old inlay and a standard preservation mount

- the protection of the edges of the original sheet against tearing while handling;
- access to the verso and consequent examination of inscriptions and drawings without the need to touch the work of art;
- vertical storage of the drawings in space-saving preservation boxes.

Choosing the right inlay paper and the fixing method is vitally important. The main problem essentially lies in the interaction of two different papers, i.e. the original drawing paper and the inlay paper, as both papers may react differently to hygroscopic variations. Moreover, drawing papers vary a lot in terms of thickness, colour, and reactivity. Therefore, various methods for mounting and fixing have been developed over the last 40 years to improve this technique (Rayner et al., 2005 and Kosek and Angelo, 2004). For artistic purposes, research was also carried out

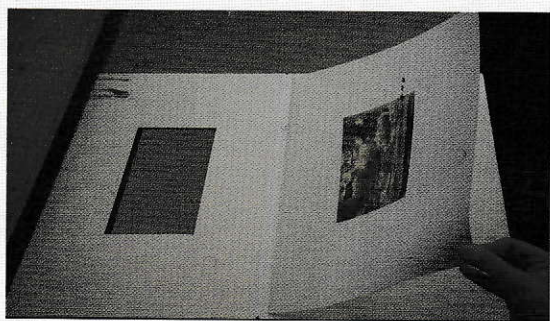


FIGURE 2 Drawing inserted in an inlay attached by means of a hinge into a mount made of a backboard and a bevelled window

to determine the choice of colours and textures best suited to enhance the works of art.

Historical background of Inlays

The oldest type of inlay we have encountered appears to date back to the 1970s. It is comprised of a sheet of laid paper with a window cut to overlap the original drawing by 5 mm on all four edges. The adhesive used for attaching it to the drawing or print looks like a thick wheat starch paste spread generously, sometimes over-generously (Fig. 3).

In the 1990s, it was noticed that the laid paper used for inlays had yellowed significantly, suffered distortion around the drawing and produced significant warping along its edges, causing local surface wear and mechanical weakness (Fig. 4). For artworks on fine papers, the rigidity of the laid paper produced folds and distortions. Moreover, the adhesive used proved hard to remove, as it was difficult to humidify and soften. At that time, André Le Prat, the founder of the conservation workshop, researched new types of papers and new attaching methods (Bartelloni et al., 1995). The conservators, who are now responsible for making the inlays, were then able to choose between various paper weights and tints, but primarily between the Lana paper and the grey Rives paper (Table 1). Various tests were also carried out with thick Japanese paper (sheets of about 40 g m^{-2} then available in France) before the use of lined Japanese paper became popular for thinner drawing papers (Table 1). Lined Japanese papers were made in the workshop, following a method used in Japan, which consists of adhering together two sheets of Japanese paper with wheat starch paste, laying them one over another, letting them dry in the open air and then stretching them flat on a wooden board or a karibari. The operation can be carried out with two or three sheets of paper to achieve the desired thickness. Wheat starch paste stabilizes the inlay produced and reduces its sensitivity to fluctuations in relative humidity.

A new attaching technique was also introduced: an inlay sheet is cut back by 1 mm from the outside of the drawing leaving a gap between the edges of the drawing and the window. The artwork is secured using a strip of 15 g m^{-2} Japanese paper, pre-coated with Tylose MH300P (methylhydroxyethylcellulose, 5%) (Figs. 3, 5 and 6). Using pre-coated paper does not negate the need to use adhesive again to attach the paper strips but it prevents the adhesive from seeping too fast through the fine paper; less adhesive is used during the second application, so that it does not penetrate the already saturated Japanese paper and the strips do not stick to blotters when placed under a press to dry.

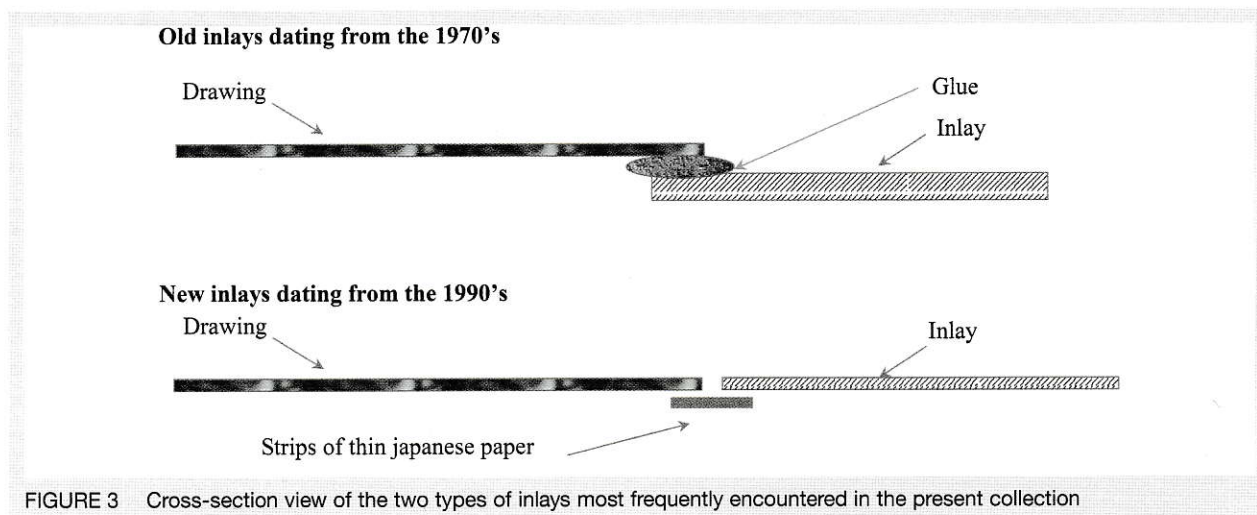


FIGURE 3 Cross-section view of the two types of inlays most frequently encountered in the present collection

This system increases the reversibility of the mounting and reduces over-thickness on the edges. However, after several years of using this technique, some problems remained:

- the distortion of the inlay around the work of art cannot always be avoided (Fig. 7);
- the original artwork paper sometimes cockles;
- the result is unbecoming when sheets have irregular edges because it emphasizes irregularities;
- in the workshop budget, the cost of lined Japanese paper is very high: the Japanese paper chosen is a paper produced in a roll, less expensive than single

sheets but the production costs from conservators must be taken into account;

- the Lana paper is no longer manufactured (the current workshop stock comes from a previous special order and will be difficult to replace);
- the grey Rives paper is no longer manufactured either and no stock is available;
- in many cases, the range of papers directly available in France remains insufficient to match the diversity of thicknesses and colours of the original art work papers.

Insight into Inlays

In 2009, André Le Prat, then Head of Conservation, was very aware of the aforementioned problems and initiated a research project to evaluate the methods used. This project began with Valentine Dubard and Laurence Caylux, and continued with Eve Menei in 2013; those results are presented here. The study was divided into two parts, first, the evaluation of current practices in the workshop, and, second, the



FIGURE 4 Inlay dating from the 1970s: distortions can be seen around the drawing as well as warping along the edges of the work

Table 1 The five papers commonly used in the workshop since 1990

Name	Fibres	Reference	Weight (g m ⁻²)
Lana machine-made paper	Cotton	No longer manufactured, stock	200
Grey Rives machine-made paper	Cotton	No longer manufactured, no stock	250
Two-layered machine-made Japanese paper	Kozo	RK 19	32 (x2)
Three-layered machine-made Japanese paper	Kozo	RK 19	32 (x3)
Strips of two-layered machine-made Japanese paper	Kozo	RK 19	32 (x2)



FIGURE 5 Drawing of the collection inserted in a recent inlay

selection of new papers and the creation of mounting reference models.

Evaluation of existing papers and working procedures

The first phase of the work was focused on the creation of comprehensive files with samples of each paper used in the workshop. The files also contained information obtained from direct enquiries to manufacturers or suppliers concerning the products used during their manufacturing (it was particularly difficult to obtain precise information on additives added during the production process of Asian papers). We also compiled detailed files on current protocols as an aide-memoire for the workshop with access allowed for all conservators.

Selecting new papers and producing reference models

The second aspect of the research project focused on finding new papers and creating mounting reference models. We investigated and selected eight new papers: three Korean papers, one of them hammered,⁴

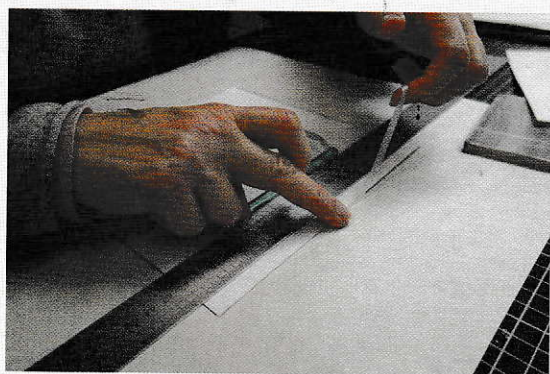


FIGURE 6 Attaching the drawing verso to an inlay with fine strips of Japanese paper, pre-pasted with methylcellulose

four Japanese papers and one western paper whose characteristics we thought made them suitable as inlay paper (Table 2 and Fig. 8). Ariane de la Chapelle, research engineer in the Graphic Art Department, helped us choose sheets made by the French paper mill Moulin du Verger due to her research into the manufacture of ancient western papers. To select the Eastern papers, we benefited from the experience and advice of Valentine Dubard and Tomoko Kawamura.⁵

Making mounting reference models appeared to be the most efficient way to compare the characteristics and application of new papers with the papers previously used,⁶ i.e. the Lana paper and the two- or three-layered RK 19 Japanese paper. The inlays were either in the form of complete sheets or separate strips pieced together. This second type of inlay consists of assembling rectangular pieces of paper around the work and not using a complete sheet, thus diminishing the cost of the fabrication of large-sized inlays (Fig. 9).

For the reference models (or mock-up), we used 12 paper samples comparable to the paper of the artworks from the collection in order to make our evaluations under similar conditions: twelve 20 × 20 cm squares of a hand-made western laid paper (Moulin du Verger 133 g m⁻²) were cut out as the artwork samples. The different inlay papers were cut out in a 40 × 40 cm format. These dimensions were chosen because they match the average size of inlays in the collection. Using a square format avoids favouring one paper direction and enables to evaluate potential distortions within the same width.

We selected the adhering method that is most commonly used in the workshop: strips of 15 g m⁻² Japanese usumino paper, pre-coated with Tylose MH300P. After fixing, the inlays were left to dry between blotting papers in the press. After several weeks of drying, all these models were put in neutral cardboard mounts and then kept in storage boxes for several weeks before being evaluated (Fig. 10). These will stay in the workshop as teaching material and serve the purpose of creating a practical record.

Results

It is still very difficult to match two different kinds of paper together, that of the original artwork and the inlay. Where the inlay paper is thicker and more rigid than the paper of the original work of art, the latter is usually the one which distorts. Even if it is visually unbecoming, it is preferable to have a distorted inlay with a flat drawing. Among the new papers used, the Jeonju Korean paper seems an



FIGURE 7 Distortions can be seen around the drawing inserted in an inlay in Lana paper dating from the 1990s

appropriate physical and economical choice. The thick Japanese paper by M. Ichibei also performed well. It seems that hammering the 1902 Korean paper did not improve the stability of the inlay. Lined Japanese papers are rather stable but create small distortions to the drawings. Inlays made of separate pieces remain an appropriate economical alternative even though some light distortions can

Table 2 Eight new papers selected for the production of inlays

Name	Fibres	Reference	Weight (g m ⁻²)
Hand-made western paper	Linen/cotton	Moulin du Verger	133
Machine-made Japanese paper	Mitsumata	RK 42	60
Two-layered machine-made Japanese paper	Kozo	RK 28	39 (x2)
Hand-made Japanese paper	Kozo	Ichibei medium	66
Hand-made Japanese paper	Kozo	Ichibei thick	105
Hand-made Korean paper	Kozo	Fides 1901	57
Hand-made hammered Korean paper	Kozo	Fides 1902	57
Hand-made Korean paper, 140 x 200 cm	Kozo	Jeonju Seong Il hanji	80

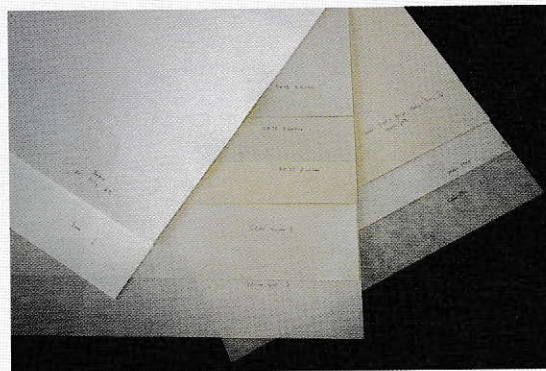


FIGURE 8 New Western, Korean, and Japanese papers selected to produce reference models

be seen on the artwork and the inlay. This wider range of papers available makes it possible for the conservators to make the most accurate choice with regard to the thickness of each original paper. We are well aware of the limits of these first conclusions. The demonstration models, although useful as a first series of tests, are not representative enough of the many variable data that should be considered in order to create a set of samples that would be statistically valid to cover the vast range of papers found in the original artworks. Observations and tests must be multiplied, improved, completed, and checked. Additional data should be considered, in particular the fibre's direction, the weight, the fixing method, etc.

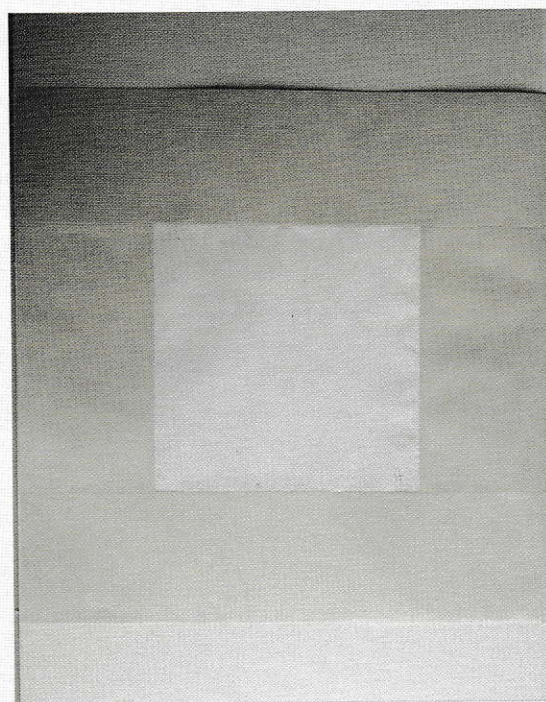


FIGURE 9 Inlay made with rectangular pieces of Japanese paper around the work and not using a complete sheet

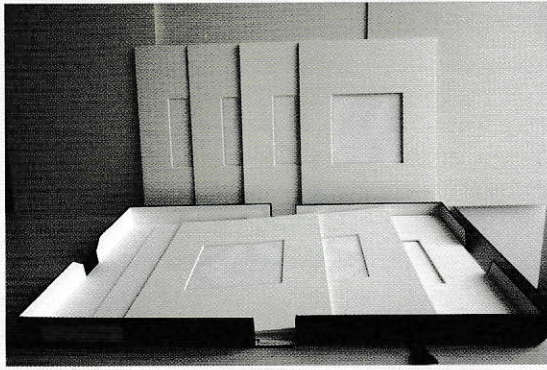


FIGURE 10 Inlay models made of various papers incorporated in preservation mounts to be evaluated and kept as a practical record for the workshop

Related Research on Adhering Techniques

Besides making reference models, we investigated two other techniques:

- the method used for adhering Japanese paper strips that fix the drawing to the inlay;
- the hinges attaching the inlay to the mount (see Fig. 2).

Tests on fixing the thin Japanese paper strips to the drawing and the Inlay

The attachment must be strong enough to support the drawing, but sufficiently light so as to avoid creating stress and consequent distortions in the sheet in case of significant hygroscopic variations. In the event of physical impact, it is also preferable that the fixing strip be the one to detach or tear in order to maintain the integrity of the original paper.

Table 3 Various tests carried out on fixing drawings to inlays

Type of paper used for fixation strips	Adhesive used	Fixing method
Usumino 15 g m ⁻²	Tylose MH300P, pre-coated	Overall
Usumino 15 g m ⁻²	Tylose MH300P, not pre-coated	Overall
Usumino 15 g m ⁻²	Tylose MH300P, pre-coated	Overall, strip cut in small pieces placed 1 mm from one another
Usumino 15 g m ⁻²	Wheat starch paste	Micro dots
Bib tengujo 11 g m ⁻²	Klugel G	Overall, applied through after positioning of the strip

Several methods for adhering thin Japanese paper strips were compared (Table 3). In particular, we tested the microdots technique (Masuda, 2002) in order to use less adhesive and reduce stress. We also used smaller separate pieces of paper strips in order to reduce stretching and stress on the original paper. Adhesives were mixed with blue food colouring making them more visible on tests and models.

Results

The microdots technique works best with wheat starch paste compared to methylcellulose; the adhesive does not penetrate the Japanese paper and the pasting points remain apart. However, this introduces more moisture. This method is very appropriate for thicker and heavier papers. Using small separate strips of paper is time consuming and does not offer any noticeable improvement as regards to distortions. Using very thin Japanese paper strips (5 g m⁻²) and alcohol-based adhesive seemed very appropriate for thin sensitive papers.

Tests on fixing inlays into mounts by means of hinges

Looking at drawings attached to inlays in mounts, we could see distortions cockling along the hinge (Fig. 11). The edge of the inlay, adhered with adhesive to the Japanese paper strip, becomes rigid while the rest of the sheet is moving and expanding.

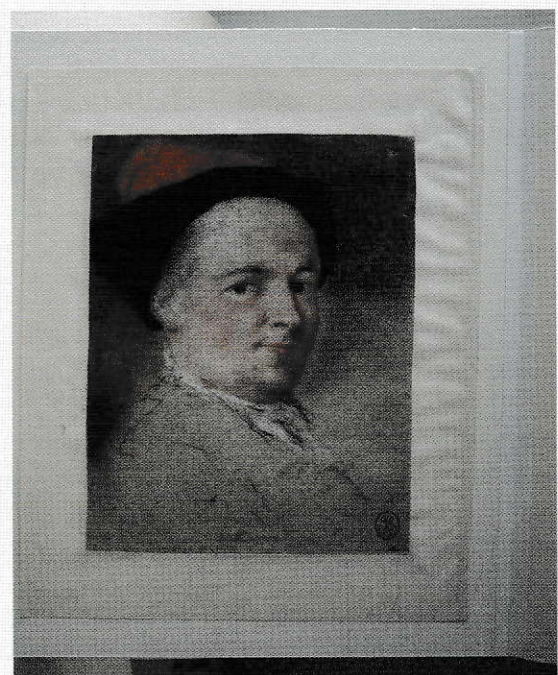


FIGURE 11 The fixing hinge of the inlay in the mount creates curls along the right edge



FIGURE 12 Teflon stencil plate used for pasting out hinges with micro lines. A blue food colouring was added to the adhesive to make the pasted lines visible

After attending H. Phibbs' course on mounting,⁷ we decided to put into practice various methods for fixing hinges using less adhesive in order to make them more flexible and reduce humidity while pasting. Our aim was to find a method which could be implemented rapidly and easily. Tests were carried out with various tools,⁸ among them were teflon stencil plates which were found to be the best method of creating micro lines. Rather thick wheat starch paste was applied with a flat edge brush through a perforated Teflon plate (1 mm thick piece) (Fig. 12). Several devices were tested with various slit widths and intervals⁹ and the best results were obtained with 2 mm wide slits and 5 mm intervals. The slit size must be longer than the area to be pasted in order to avoid over-pasting where the brush reaches the slit end.

Since the teflon stencil plate process seemed to be highly promising, we made models in order to evaluate how inlay papers react depending on the fibres' direction and the fixing method. We pasted RK19 Japanese paper hinges that were 2 cm wide¹⁰ onto the largest edge of Lana paper strips that were 30 cm long and 18 cm wide and acting as inlays.

Results

Micro lines pasting using Teflon stencil plates reduces stress significantly and does not create any distortion, whatever the fibres' direction may be. Moreover it is reversible, almost dry, which would also be very convenient for attaching historical inlays onto neutral cardboard mounts or for fixing drawings to be displayed temporarily.

In close cooperation with the mounting workshop, we are currently investigating whether or not this technique can be adapted to its working procedures and also whether the results can meet the requirements of staff members in the drawings reading room.

Conclusion

The inlay technique continues to correspond to the requirements of the Department of Prints and Drawings in the Louvre. However, this system is not fault-proof or universal. Conservators have to thoroughly adapt their inlay choice to each drawing. They must adapt the colour, the thickness and the flexibility as well as adjust the attachment method. Over the years, the Louvre conservation workshop has maintained a critical approach to methods used and has pursued research into improving the inlay technique, along with determining procedures to be adapted to each original work on paper. Thanks to this research, conservators working in the workshop now have a wider range of papers and attachment methods at their disposal.

Research is far from over. Regular monitoring of the collection is necessary in order to evaluate the techniques and qualities of the inlays chosen. The current head of the workshop is well aware of the necessity of continuing this research with the cooperation of the different players in the Department of Prints and Drawings (curators and mounters).

Acknowledgments

We would like to thank Valentine Dubard, Head of the Prints and Drawings Department conservation studio of the Louvre Museum for involving us in this stimulating project. This study would not have been possible without the support and interest of the paper conservators, our colleagues, currently working in the studio. Professor Masuda and Hugh Phibbs have been very inspirational throughout our research.

Suppliers

FIDES International Co., 217 Yeouido-dong, Yeongdeungpo-gu, Seoul 150-874, Korea. +82-16-9770-5433, www.ifides.com (Korean paper 1901 and 1902).

Paper mill Ichibei Iwano in Echizen, Japan (papers directly purchased from the mill).

Paper mill in Jeonju, South Korea (Jeonju Seong II hanji paper directly purchased from the paper mill).

Paper mill Le moulin du Verger BP7 16400 PUYMOYEN – France. Tel: +33 (0)5 45 61 10 38, www.moulinduverger.com (hand-made western paper).

Sennelier, 3 Quai Voltaire, 75007 Paris, France. Tel: +33 (0)1 42 60 72 15, www.magasinsennelier.com (Lana paper now only available in 250 g, paper B.F.K. Rives grey now only available in 280 g).

Stouls and Atlantis, 1 avenue Louison Bobet
94120 Fontenay-sous-Bois, Tel: +33(0) 1 60 93 15 60,
www.cxd-france.com (Tylose MH300P, wheat starch
paste, Klucel G, Japanese machine-made paper in
rolls, 100% kozo, 32 g m⁻² RK 19, 60 g m⁻² RK 42,
39 g m⁻² RK 28, Bib tengujo 11 g m⁻², Usumino
15 g m⁻²).

Notes

- [1] For this historical part, we would like to thank Mrs Arlette Serullaz for her kind responses to our questions and her account on past practices.
- [2] Mariette's mounts (1694–1774) are characterized by the drawing being laid overall on an indigo blue cardboard surrounded by gilded bands and ink lines. A cartouche usually indicates the name of the artist.
- [3] For example, in *Essai sur la restauration des anciennes estampes et de livres rares* (Bonnardot, 1846: 74–75), the author describes a process of «collage à jour» which he uses on prints having lost their margins as well as on intact prints or gouaches to provide them with a display device anticipating our inlay (Luquet, 2012).
- [4] The paper is hammered when still wet with a mallet in a repetitive beating motion. The paper fibres are smashed and, as a result, become less sensitive to fluctuations in relative humidity, which makes the paper more stable.
- [5] Tomoko Kawamura is a paper conservator in the Yamaryo Art Conservation Studio, in Tokyo. She works with Valentine Dubard, Head of the Prints and Drawings Conservation Studio in the Louvre Museum, on a project about the knowhow and vocabulary of paper-making in Europe and Japan.
- [6] The grey Rives paper used in the past is no longer manufactured and not available. Therefore, it was not used to produce the models.
- [7] Phibbs (2011). Le montage de conservation et d'exposition des œuvres sur papier, dossier de formation permanente réalisé par le service de formation permanente du Département des restaurateurs de l'Institut National du Patrimoine.
- [8] Home-made stamps, wood hammers, various sorts of brushes, cooking tools, various sieves.
- [9] 2 mm slits placed at 5 mm intervals or 1 mm slits placed at 2 mm intervals.
- [10] 100% Kozo paper (32 g m⁻²), ref Atlantis RK19, commonly used in the workshop to fix inlays into mounts.

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