INTRODUCTION

The pair of six-paneled folding screens, with hinging based on Japanese byôbu, date from the early 18th century, and show battle scenes from the Portuguese war of independence in the 17th century. They were commissioned by one of the generals involved in the war to commemorate the resulting Portuguese independence from Spanish dominion (Pinto 1996). It is reported that they were still in the hands of the family that had commissioned them when they were exhibited together in 1882 at an international Portuguese and Spanish art exhibition. The exhibition catalogue describes the screens as painted on cardboard (Pinto 1996).

When in 1979 one of these six-paneled screens was acquired by the Museu Nacional de Arte Antiga (MNAA, National Museum of Ancient Art), it was not in a condition to be exhibited. Before being exhibited in the permanent Oriental collection of the museum in 1986 it underwent a Western-based conservation treatment, which consisted in the removal of several layers of wallpaper that had been pasted over the verso of the panels on top of numerous previously-repaired areas. The second screen of the pair, which is in private hands, still retains these multiple layers of wallpaper. In 2002, a two-year project to study and treat the MNAA screen was made possible through funding from the Operational Programme for Culture (POC).

Measuring 1.98 m in height by 5.20 m in width, this unusual screen was examined by Katshuhiko Masuda when passing through Lisbon in early 1994. He refers to it as the Chinese Screen, a nomenclature that has been commonly used to describe it. In his observation report he states that the front panels have a western handmade support paper adhered to a thin textile on the bias. He also observes that the support paper on the back panels is a Chinese paper (Masuda, unpublished report 1994). It was then suggested by Pinto that this combination of materials might be the result of its having been produced in the former Portuguese territory of Macau (Pinto 1996).

The intention of the 2002 project was to consolidate the obvious structural fragility of the screen, as well as to examine its pictorial and structural characteristics with respect to the materials and construction techniques, together with historical, archival research. This involved the collaboration of art historians, material scientists and conservators. The discussion
on conservation strategies involved Eastern and Western intervention philosophies and a consensus was reached based on the expertise of Far East Asian methodologies, without going so far as a complete removal and replacement of the inner layers and internal structure. Expertise that could meet these requirements was sought. Visual observation, complemented by instrumental analysis and documentary research was then undertaken.

The results of this project – conservation intervention, material characterization and historic contextualization – were published in an in-house project book (Curvelo 2004).

**VISUAL AND ANALYTICAL IDENTIFICATION**

Chinese export screens produced in the 17th and 18th centuries were normally rigid structures of lacquered wooden panels, known as *Coromandel* screens. However, this screen was observed to have numerous structural, stylistical and technical anomalies in relation to this type, and was more similar to Japanese folding screens, or *byōbu* (Figure 1). Curvelo, the project’s East Asian art historian, has recently published that painters from the Jesuit school of Nagasaki in Japan, founded in 1602, had taken refuge in Macau after their persecution in 1614, following the anti-Christian edict and the closure of the school (Curvelo 2001). This migration of the Nagasaki Jesuit school artists to Macau could explain the screen’s similarity to Japanese screens.

![Figure 1](image.png)

Recto of screen, before conservation intervention

The fact that this screen was manufactured a century after this occurrence, and that materials available in Macau were not the same as in Japan, may account for its various deviations from the traditional Japanese *byōbu* format.

**Visual identification of structure**

This pair of screens consists of two six-panelled laminated paper screens, with flexible hinges, a format which is common to Japanese screens.
The screens are taller than traditional Japanese examples and have seven hinges (one more than Japanese screens), in the following proportions: $\frac{1}{2}$, 1, 1, 1, 1, 1, $\frac{1}{2}$. The reason for this is probably the fact that Chinese and European ceilings are higher than those of Japan. Masuda notes this difference in his condition report: “The inside structure is a lattice work, but the grid is bigger than the usual Japanese one. The vertical members of the lattice work are three” (Masuda 1994).

A sample of the wood from the lattice core was examined under the microscope and identified as belonging to the species Cunninghamia lanceolata Hook, corroborating an earlier identification by the Jodrell Laboratory at the Royal Botanic Gardens at Kew. It is a native tree of China whose wood is strongly resistant to rot and insects (Orwa 2009). Japanese cores, shitaji, are normally made of white cedar sapwood, Cryptomeria japonica (Meredith 2002).

The lattice core paper laminate has five layers, not the usual eight layers of bast-fibre paper seen on Japanese screens. These are pasted completely onto the next, forming a solid laminate, instead of the ‘floating’ or pocket layers that are used in the traditional Japanese laminate construction.

A European watermark used on Portuguese documents in the early 18th century (Melo 1926) is visible on the support paper for the painting on the recto (Figure 2). This is the only known Asian screen of this period using western rag paper for this layer. The paper seems to be from a notebook, with the pages inscribed by a Portuguese owner, Lemos (Figure 3). It may be that western rag paper was considered better for this purpose than other locally available papers. In Japanese screens, used ledger book pages are often used for the sub-linings of the panels.

The twill-like surface texture seen on the paper has been created by its lining of paper combed with thick animal glue, a technique that has not been observed before. The glue identification method is described later in this paper. This unusual technique could have been chosen to ensure the adhesion of a thicker western paper firmly to the bast-fibre layer underneath (Figure 4).

This screen has textile hinges instead of the strong kōzo paper hinges that are common to Japan. This could be explained by the fact that Japanese paper would not have been easy to acquire and that locally available Chinese paper might not have been strong enough to endure the continued mechanical stress of opening and closing the screen panels.

The overlapping sheets of the outer support layer were pasted down from top to bottom. In the traditional Japanese mounting system the sheets are pasted from bottom to top, to prevent a dust deposit on the edge of the overlap.

Again, most Japanese screens of this type have one, usually two outer borders of decorative textile on the front panels. This screen’s front panels have an outer border which is an extension of the gilded embossed decoration.
that ornaments the entire panel surface surrounding the battle scenes and portraits.

Japanese screens usually have a repeat-pattern block printed paper on the backs of the panels known as karakami. However, this type of paper is not present on this screen, but instead a hand-painted Chinese paper, somewhat similar to Chinese export wallpapers, depicting sinuous fruit trees (prunus sp), birds and peonies. This reflects an early period style of decorative compositions, bringing together varied influences, namely Persian, Indian and Chinese (Bruignac-La Hougue 2003).

**Stylistic observation**

The screens bear depictions of battle scenes within large medallion forms, with one medallion covering two panels. Above these are portraits of Portuguese kings in four smaller ovals - a total of 12 per screen (24 kings and six battles being the total on the pair of commemorative screens).

The Asian depiction of the western figures on the front panels is similar to the Japanese Namban style of the Jesuit school of Nagasaki. As mentioned above, this Namban pictorial technique was probably passed on and continued by the painters who took refuge in Macau.

However, the embossed gilded surface that surrounds the paintings, creating a brocade-like pattern (a gesso relief technique called moriage in Japanese), is not common to the Namban screens produced by this school but rather contemporary to it, and is seen in screens of the Japanese Momoyama period (1573-1615) (Grantham 1999). One possible reason for this unusual mixed decoration could be a request from the commissioner, inspired by the contemporary Dutch embossed gilded leathered screens (Pinto 1996).

**Analytical identification**

The µXRF elemental characterization on 58 points was difficult to interpret as pigments were present in two layers, both front and back. To complement this, 32 pigment samples were then taken and 12 from those were mounted stratigraphically for optical microscopy observation. Binders and glues were detected using µS-FTIR instrumental analysis. Paper fibres were stained with Herzberg solution and observed under transmitted optical microscope.

Most pigments found on this screen were used both in China and Japan, except for lead white (PbCO\(_3\))\(_2\)·Pb(OH)\(_2\)), which is used extensively in this screen and was predominantly used in China during this period. Shell white (CaCO\(_3\)) was the most commonly used white pigment at this time in Japan. Shell white was found only on the underlying layers of the gilded relief and on a few small flowers in the front panels.

Animal glue, which was determined as the pigment binder, is characteristic to both countries.
The chrome green pigment, a mixture of Prussian blue (Fe₄[Fe(CN)₆]₃) and Chrome yellow (PbCrO₄) +, found on the two outer back panels is contemporary to the 19th Century, which leads us to conclude that these two panels underwent a western restoration treatment that included overall overpainting (Figure 5).

The front paper laminate was found to be made up of several different types of papers. The support layer is composed of rag fibres, which is in accordance with our visual observation of a western laid, watermarked rag paper; the second layer, a twill-like textured paper is composed of bast fibres; samples taken from the folding edges gave different results, with fibres identified as *Broussonetia papyrifera* and *Boehmeria*. The verso paper laminate was also found to contain different types of papers. The first, uppermost layer of the back laminate is composed of a mixture of *Pteroceltis tatarinowii* and *Oryza sativa*, which corresponds to *xuan* paper, a Chinese paper (Chen 2003). The fibres of the second layer were *Bambusa* and the fibres of the third and fourth paper layers were from *Broussonetia* and *Edgeworthia papyrifera*. The samples of the back laminate had been removed from a tear found on the outer folding panel. The results for these last two paper layers may be explained by the conservation report of 1985, which records that the back laminate from these panels was removed from its lattice frame and was partially debacked and relined with Japanese paper (Milheirão 1985).

**DESCRIPTION OF CONDITION**

Many earlier Western repair treatments and conservation interventions of different periods are noticeable in the screen. Numerous small conservation problems were apparent throughout the front and back panels. This paper will focus only on three major problems.

**Hinges**

The present structure of the screen is basically sound, there being no serious deformation of the cores or active insect infestation.

The most significant structural intervention it underwent was the addition of one-way metal hinges to the original textile hinges, which had begun to split. This prevented the characteristic back and forth flexible movement characteristic of Japanese screens and restricted the proper closing of the screen panels, pushing them apart and putting extra strain on the original canvas hinges. Some of the canvas hinges remained functional.

**Bursts**

Large bursts were extensively present in the outer back panels. Bearing in mind that these panels had been relined in 1985, and that the screen had been on permanent exhibition from 1986 to 1994, when it arrived at our conservation department it was obvious that this screen was an extremely fragile object to be handled with care, since the largest tears were on the recently relined panels.
These outer back panels must always have been the most vulnerable, having been completely overpainted in a previous historic intervention of unknown date, before being subsequently covered with wallpapers, as has been reported in the 1985 intervention.

Relief decoration

The embossed gold leafed decoration on the front panels had undergone numerous conservation treatments at different times, as seen by the variety of discolourations produced when it was repainted with ‘bronze’ or imitation gold pigment that subsequently discoloured. Parts of the relief decoration and their surrounding red painted areas were treated with a glossy consolidant. The 1985 intervention used Paraloid B72 and Primal as consolidants. The more intense glossy zones are a result of the use of Primal, which when applied to the relief areas sometimes ran over the adjacent red painted background.

TREATMENT

A major conservation treatment, involving the disassembly of the screen and replacement of the paper laminates, was considered unnecessary. It was decided to give priority to the consolidation of the hinges in order to enhance the future structural stabilization of the screen.

Hinges

The first step in this procedure was to remove the outer papers that covering margins placed over the hinges. Each pair of hinged panels was opened wide to determine the condition of the remaining textile hinges and to record which hinges needed total substitution and which needed only local reinforcement. The metal hinges were removed and losses and damaged areas in the core were plugged with chestnut wood. Linen canvas was chosen for the replaced hinges because it is less hygroscopic than cotton canvas, is more dimensionally stable to humidity fluctuations and was the fabric used for the original hinging. The canvas was stiffened with a funori, gloioptelis furcata seaweed gel so that it acquired more rigidity and could be applied more easily. The canvas was cut to the length and width of the original hinge size.

In order to facilitate the insertion of the hinge it was necessary to separate the paper laminate along the edges of the panel using bamboo spatula.

When inserting the new canvas hinge between the wooden lattice and the paper laminate, two polyester strips on either side of the canvas were inserted to facilitate application of an adhesive on each side of the textile (Figure 6). Sanzenbon Japanese hoof and hide animal glue was the selected adhesive for adhering the linen hinge onto the wooden core. It was heated in a hot water bath and diluted to a concentration that would not be liquid enough for it to run down inside the lattice wood or paper laminate, nor so thick as to impede a homogeneous distribution. Animal glue hardens
quickly so a rapid application was important. After application of the first side of the canvas onto the verso of one panel it had to dry completely before attaching the remaining canvas strip onto the front side of the adjacent panel. The two adjacent panels had to be placed at an angle of 270° in order to guarantee maximum mobility when the hinges would dry. It was also important to create a straight line indentation on the folding junction between the adjacent panels, using a bamboo spatula, in order to facilitate the folding movement.

The linen canvas was pasted over with two layers of sekishu paper and wheat starch paste, drying one layer before applying the second. Then the paper laminate that had been lifted was pasted back into place. The same process followed on the reverse side of the hinge.

The remaining damaged hinges were consolidated with two water cut strips of sekishu paper cut horizontally across the chain line for maximum fibre strength and of different dimensions so that the overlapping would not coincide. These strips were pasted with thick wheat starch paste. The same consolidation technique was carried out on the reverse side of the hinge.

A toned xuan paper strip was used as a finishing paper choosing an overall tone corresponding to the front and back panels.

**Bursts**

The consolidation of bursts, both big and small in size, was carried out according to their size, with an insert of one- or two-ply matboard patches covered with Japanese papers of lighter or heavier weights, respectively closer to the top layer of the paper laminate or closer to the wooden core. These different weights and positioning were chosen bearing in mind the size and extent of the burst and the importance of avoiding a surface distortion that would be visible in raking light. The Japanese paper that covers the one- or two-ply board patches is attached by wrapping it around and pasting the margins to the back of the board. This way, the free floating layer of paper at the front of the patch can be pasted at the back of the burst, within the laminate, with the board holding the paper in tension. Before inserting these consolidating patches their centre is marked with a pencil and the patch manipulated with a needle to place it correctly within the paper laminate.

An area some 5 cm around the burst must be humidified by lightly spraying with water from a dahlia spray previous to the insertion of the patch. The paper laminate may also have to be opened more to facilitate its correct positioning. The humidification process allows for a good repositioning of the tear edges as they are more relaxed and offer less resistance to pasting, as well as equalizing surrounding tension while the consolidation patch and paper laminate dry together.

Wheat starch paste, diluted to the consistency of thick mayonnaise was applied to the interior edges of the tears (Figure 7).

![Figure 7](image_url)

*Figure 7*

Sequence details of burst consolidation
Relief decoration

The gilded relief *moriage* and red background decoration of the front panels had been consolidated in 1985 with *Paraloid* and *Primal*. The removal of these synthetic glazed surface protections was initially thought to be important. However the present conservation condition of the glazed areas seemed stable and it was decided to remove only the excess glossy areas from the leaked Primal application, because it altered the refractive index of the red pigment used as the background of this gilded decoration.

The very discoloured ‘bronze’ pigments on the gilded *moriage* decoration in the front panels were tested for removal with different solvents, but could not be removed without endangering the original gold leaf. Due to the complexity of this treatment process, the extensive areas to be removed, the lack of knowledge on the amount of gold to be found underneath and also the lack of knowledge of a suitable removal agent, a discussion forum decided on postponing this action for possible future interventions.

Following discussions with the Collections curator, gold mica powder was applied as a lightener to these darker, discoloured areas.

**CONCLUSION**

The aims of the treatment of this hybrid screen project were to resolve the screen’s structural problems and give it lasting resistance and stability. Parallel to this, there was the need to study the materials and techniques that went into its construction, in order to know more about its unique properties and characteristics. Both of these points were successfully achieved as a result of the project.

The conservation treatment on the hinges brought back the original kinetic mobility of the screen. This, together with the consolidation of torn hinges and large tears, allowed for the reinforcement of the structure, meaning that it could be handled more safely. The application of gold mica powder over the discoloured bronze pigment areas contributed to an overall improvement in aesthetic appearance.

Although formerly known as the Chinese Screen, the observation of its technical structure, pictorial depictions and ornamental styles indicate that it can be attributed to a school of production closely related to the Japanese school of Nagasaki but located in Chinese territory, i.e. in the Portuguese colony of Macau. This combination of factors has resulted in a pair of screens that may be described as truly unique objects.

**REFERENCES**
