Decorative and Functional Uses of Paper on Furniture

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In this article we will give an introduction to the wide variety of papers used on wooden surfaces and examples of examination and treatments which were undertaken at the Museum of Fine Arts, Boston. It is important to address the treatment of paper on wood surfaces because of the significant information, context and value that paper components add.

The presence of paper on wooden surfaces can pose unique challenges because of both its fragile nature and the relative infrequency with which it appears on furniture. The delicacy of paper requires conservators to take special care when treating a wooden object that includes a paper component. It is important to emphasize that any treatment of the object must consider the effect upon the paper portions in order to avoid exacerbating problems and to ensure the future stability of the paper. Solutions that improve the structural stability of the furniture but neglect to consider the paper components are incomplete. Careful consideration of the survival of paper components is an important aspect of furniture treatments.

Over the past few months we were able to study and treat several wooden objects with attached paper in the extensive collection of the Museum of Fine Arts, Boston. Once this project started we continued to investigate examples available in other museums and private collections. The opportunity to work on a large group of such objects has given us an understanding of the techniques of paper manufacture, decoration and typical types of damage.

Paper can be severely damaged when it is adhered directly to wood. Exposure to light and dust, unstable relative humidity, and wood acidity all contribute to the deterioration of the paper structure. The movement of wood in variable relative humidity can tear or distort paper. The considerations in handling delicate paper surfaces require an interdisciplinary approach involving knowledge and techniques used in both paper and furniture conservation.

We will discuss some different types of paper and their applications on furniture. In the second part we will present an overview of methods for examining papers, typical types of damage and treatment solutions, using a range of objects in the Museum of Fine Arts, Boston and private collections.

We will make a general distinction in the use of paper on furniture as being functional—such as labels, dustcovers or backing materials—or decorative, in which the paper is colored or decorated using techniques like printing, painting, pressing or covering with metal leaf.

Functional Use of Paper on Furniture

Labels, dust covers and linings

Original labels provide us with information about the manufacturer as well as the geographic area and the date of manufacture for a piece of furniture. Labels can be handwritten or printed, or both.

Dust covers or backing papers like those on mirror backs or on the tops of clocks are often made from

reused newspaper or stationery. These papers are sometimes overpainted to complement the wood color.

Linings of drawers or whole interiors are often not intended to be decorative. Plain, cheap papers, such as cartridge paper, were used. Even lining and backing papers that have been replaced or later additions can provide valuable information.

Straw marquetry

Paper is also used as a backing material for objects decorated with straw marquetry to support the individual straw pieces. The art of straw marquetry appears to have originated in the Far East in the 13th century. The technique developed in Europe in the 17th century and formed a highly fashionable trend in France, Netherlands, Italy and Russia in the 18th century, with makers including professional and religious workshops.

The technique was mostly applied to small cases, caskets or boxes, but in the 18th century several cabinetmakers created large-scale furniture beautifully decorated with straw.

Making the marquetry involved a number of techniques: pieces of straw were prepared with alum, placed in dye solutions, cut open, pressed apart and scraped out with a quill knife.[1] The dyed straw was then straightened and glued onto the paper backing. The paper backing holds the straw pieces together and increases the strength of the marquetry layer. Re-used writing paper was sometimes used as the backing paper.[2]

Wheat starch paste was usually used to attach the straw to the paper. The straw surface was generally unfinished. Varnished surfaces have been found but this is not mentioned in any of the historical descriptions of the technique.

Decorative Use of Paper on Furniture

For our purposes, the decorative use of paper can be divided into the following categories:

- Backing material for translucent materials
- Printed paper
- Paste paper
- Metal paper/pressed paper
- Lacca povera

Backing material for translucent materials

Paper was used as a colored background underneath translucent materials like tortoiseshell, parchment or thin horn or bone slices. This technique is frequently used on Boulle marquetry.

The paper backing for tortoise shell was most often painted red using pigments such as cinnabar or red lead to give the material a richer appearance. Plain, white paper, black-painted paper or even gilded paper was also used. The paper was usually adhered to the tortoiseshell using hide glue and both materials were cut together.

Colored papers

Furniture and wooden objects were often covered with multi-colored papers for decoration or to imitate precious materials.[3] This technique was most prominent during the 18th century when a variety of new manufacturing processes made the papers readily available. The decline of this technique's popularity coincided with the increasing industrialization of the 19th century.

The lining of interiors was very common, especially of drawers and boxes, but paper was also used to cover the show surfaces of smaller objects like boxes or chests. There was a wide variety of colored paper ranging from relatively inexpensive papers like the well-known marbled paper to more valuable papers like brocade paper. One can find signatures (as a kind of copyright and advertisement) indicating the maker's name and provenance on valuable types of paper, like brocade and bronze-varnish papers.

Colored or printed paper and wallpaper are related due to their parallel development. Prints on paper quires for wallpaper and stained paper were both made of rag in the same technique. They can be distinguished by the size of continuous length with repeated pattern—wallpaper gets its pattern

after assembling several quires—colored papers have smaller patterns, often with an accentuated central motif.

Many colored papers were used for stationery, bookbinding, the reverse sides of game cards, small box coverings, and chests or suitcases. The decoration of cabinets and commodes with paper began around 1600 and becomes common with the end of 17th century.

Techniques

The manufacture of printed papers developed in conjunction with printed textiles; the same type of wooden print models or stencils were used for applying color or varnish to paper. This technique has been known since at least the 1470s.

So-called paste papers were usually cheap patterned papers especially common in Europe since 1600. Paste papers faded from popularity around 1830.

The technique was originally based on a ground of gum tragacanth paste or starch paste. For additional decoration, watercolors with an addition of ox gall were used. The expense of tragacanth encouraged the transition to starch pastes as the binding medium. The paste was mixed with pigments or natural dyes and was applied to the sized paper surface. This provided a flexible medium for artistic expression, for example, the "fantasy papers" of the Herrnhuter fraternity in Saxonia, which contained lattice and cross decoration made with combs, rolling stamps with small carved wheels and cloudy shapes made by turning the thumb on the surface.

The manufacture of marbleized papers is common in Europe since the end of the 16th century. Marbleized papers are still widely used for the lining of boxes and small chests and as endpapers in books.

Colors are dropped onto a paste bath, they float and spread out, but don't intermingle. It is then possible to manipulate the colors using different tools to create a variety of patterns like floral, comb, wave and zigzag designs. The pattern is then picked up by laying the paper on top on the past bath. Every single sheet is unique. The design created cannot be fully controlled thus causing the inability to duplicate identical pieces of marbleized paper.

The process of bronze-varnish paper was also developed from techniques in the fabric industry. Wooden print models were used with white, monochrome or polychrome patterned paper. Instead of using the usual printing colors, a gold or silver varnish was used. The painted sub-surfaces were often streaky.

The peak of this technique was between 1695 and 1735; afterwards brocade papers, which allowed even more elaborate design in the time of high baroque, replaced this technique.

Pressed and brocade papers are considered the highest artistic level of paper production. The technique has been known since the early 16th century and reached its peak during the first decades of the 18th century. It developed from the embossed printing of leathers and parchments using gold leaf and brass punching tools. Engraved copper plates were used for the manufacture of brocade papers.

The paper was covered with metal leaf (usually brass or tin) and pressed with the engraved plate on a rolling press. The paper and metal leaf bonded under the high pressure, the metal leaf on unpressed areas was brushed off.

In a slightly different technique the paper was completely covered with metal leaf. The metal leaf was adhered to the paper with a weak adhesive such as animal glue size or egg white and pressed. The paper is then embossed evoking the effect of gold leather.

An excellent example of this kind of decorative paper can be found in the collection of the Museum of Fine Arts, Boston: a magnificient Herter Brothers cabinet, dated about 1880. Here additional flowers in a reddish-brown paint have been applied to the gilded paper surface, possibly with stencils.

During the Art Nouveau period, pressed papers again became popular. Often designers created whole room interiors, matching floral motifs of wallpaper, fabric and furniture paper, fabric or leather linings.

Lacca Povera or Decoupage

Lacca povera was intended to imitate Asian lacquer. A very high quality example of this technique is a Venetian secretary dated around 1730 in the collection of the Metropolitan Museum of Art in New York.[4] Lacca povera consists simply of prints that were cut out and adhered to a prepared and painted surface and varnished many times over. The many layers of applied varnish can make it difficult to distinguish between a lacquered surface and a lacca povera technique.

Lacca povera was probably first practiced toward the end of the 17th century and became especially popular during the 1720s in France, Italy and in other European countries, where it was used continuously throughout the 18th century. It was especially popular during the Rococo period with its fondness for chinoiserie.

Nearly everything was decorated: screens, folding screens, wall hangings, ceilings, the tops of coaches and sedan chairs. Printed design sheets were produced and published specifically for decoupage. Amateurs may have decorated smaller objects, but larger pieces of furniture were mostly the work of skilled craftsmen. Historical manuals contain accurate instructions of this art form with exact lists of materials and how to use them. The instructions differ slightly in their preference for glue or varnish. The most common technique is probably the following: the wood surface was carefully prepared by smoothing and painting. The cut-out motifs were glued onto the paint layer with a fish-glue animal-sizing solution followed by an application of varnish. A minimum of eight to ten varnish layers were recommended.[5]

Examination

The identification of paper fibres and paper-making techniques can provide information about the origin and history of the furniture it decorates.

The technical examination of paper on furniture can be carried out using a variety of different tech-

Figure 1. Band box with paper covering.

niques. The use of low energy x-rays, beta radiography, and transmitted light are not particularly useful when paper is applied over wood. The density of any wood substrate presents a barrier of material that is more radio-opaque than the paper layer. The transmission of the low-energy radiation that has traditionally been used to gather information about the structure of paper is ineffective in these circumstances. These imaging techniques have been used to identify water marks and paper making processes.[6] Without the removal of paper from the object, these techniques cannot be used when wood is the substrate.

Microscopic fiber identification is a useful technique for the identification of paper on furniture. Transmitted, polarized light microscopy can distinguish between many different fiber types. While there are limits to the ability of the technique to distinguish between fibers, it can provide valuable information. The identification of cotton, bast, and certain Asian fibers can help confirm the identification of paper origins and may offer insight into when and how the paper was applied.[7]

Other common techniques such as ultraviolet fluorescence and infrared photography can aid in the detection of compounds and designs not visible to the human eye. Although ultraviolet fluorescence is not a quantitative technique, it can provide information to direct more thorough testing by highlighting areas of discontinuity that could hold information about production processes or previous treatments. It has proven useful in our examinations of several objects. The use of infrared photography allows us to capture images of printed text and designs that might otherwise be unavailable due to dirt accumulation or overpainting.

More advanced techniques such as infrared spectroscopy and gas chromatography/mass spectrometry can provide much more detailed information about pigments, binders, and other compounds present in the paper. These techniques require a significant amount of expertise to carry out and interpret. The results from these tests can provide invaluable information about paper, its components, and later treatments.

To illustrate the conservation of paper on wood objects, we have outlined the examination and treatment of several objects undertaken at the Museum of Fine Arts, Boston. These examples can provide an idea of the issues involved and how we chose to carry out the treatments.

Band Box

The treatment of a 19th-century band box covered with wallpaper (fig. 1) illustrates the damage frequently encountered in wood/paper systems. The object is a Shaker-style bentwood oval box and lid. The interior is lined with newspaper and the exterior is covered with a block-printed wallpaper. The wood substrate is an unidentified softwood.

The box suffered from widespread paper detachment, buckling and lifting due to wood shrinkage, and instability due to structural problems. Analysis of the paper and residues using infrared microspectroscopy suggested that a starch adhesive was originally used to attach it. This adhesive had failed at the edges of the sheets, allowing the paper to lift and exposing it to potential damage from poor handling.

The shrinkage of wooden elements caused buckling and detachment of the paper as the surface area of the wood decreased. The relative dimensional stability of the paper coupled with the tendency of wood to shrink as it loses moisture often leads to buckling and detachment of the paper in waves parallel to the grain of the wood.

This type of damage cannot be permanently corrected without removal of the paper to accommodate the dimensional changes. However, removal of the paper is an extremely drastic measure and should be avoided. Often the buckling, although unsightly, is stable. The problem can promote loss when detachment occurs at the paper edges. As fingers and clothing brush the partially-detached edges, they may snag, tearing the paper, detaching larger areas, or snapping off brittle edges.
In addition to the detaching paper, several of the bent wooden bands had breaks that resulted in lifting wood as the tension of the structure was released. These breaks left areas of tangentially

Figure 2. Lifting paper with a small Mylar barrier.

projecting wood splinters that could easily be detached in handling.

The stabilization of the box required addressing the breaks in the wood structure as well as the detaching paper. Cold-setting fish glue and clamps were used to secure the areas of lifting wood. Special care was taken to avoid applying the fish glue to areas that might transmit any water from the fish glue to the paper, potentially staining it.

The re-attachment of the paper required an adhesive that would secure the paper without allowing the migration of inks, dyes, or other soluble components. The greatest concern was the formation of tide lines within the paper or exposed wood areas as well as the possibility of changing the morphology of the paper surface. After consultation with paper conservators it was decided to use a very dry wheat starch paste adhesive.

We have found over the course of several object treatments that wheat starch paste provided the best adhesive to attach paper to a wooden substrate. We also noticed that the type of wheat starch used and the way it is prepared has a noticeable effect on how it behaves during treatment.

The staff of the Asian conservation lab makes a wide variety of wheat starch pastes for different applications. They provided us with the paste and the technique for producing the driest, most adhesive paste possible. This is the paste that the Asian lab uses to attach paper to wood in their own conservation treatments. They use precipitated wheat starch paste mixed in the ratio of four parts water to one part dry powder. This mixture can later be thinned with water to produce an appropriate adhesive. The result should be a smooth, thick paste.

One of the dangers of using any adhesive on paper is the tendency of the solvent to wick into the paper structure and saturate the surface, effectively consolidating any surface dirt and significantly changing the appearance of the treated area. We found that despite making the driest possible paste there was still the problem of saturating the paper surface. In order to remove additional water we first spread the paste on a cotton blotter.

We used Mylar strips as barriers between the paper and wood to avoid accidentally applying the paste to nearby surfaces (note the Mylar strip in figure 2). We then allowed the paste to dry further, wait-

Figure 3. Applying weight.

Figure 4. Box with straw marquetry in visible light (above) and ultraviolet light (below).

ing a minute or two before applying weights. (fig. 3) We used a piece of blotter paper with a Hollytex barrier to weight the area. Because the paste is so adhesive, very little was needed to adhere the paper to the wood. Any tiny amounts of paste that were pushed out by the weights did not stick well to the Hollytex.

Numerous areas over the surface of the box had lifting and detached paper. The extremely dry paste allowed us to lay down the paper without saturating it or causing changes in the surface color, texture or overall appearance.

Casket with straw marquetry

Another object which offered interesting results during examination was a 16th-century Italian straw marquetry chest (fig. 4, top). Its long and rectangular carcass with a domed, hinged cover is made of pine and covered on the show surface with a colored paper layer and straw marquetry. The straw marquetry shows a symmetrical, floral decoration with small birds in it. The main motif of the lid is a crowned eagle with wings outspread, escorted by two lions and two peacocks.

On this casket the straw doesn't cover the whole surface. The underlaying paper is colored red and is part of the decoration. Additional paper pieces were glued underneath the main straw motifs to raise them from the ground. This is an infrequent technique in straw decoration and gives the impression of a *pastiglia*. There are small paper squares colored in a light blue applied directly underneath the cutouts of the straw flower leaves, providing a nice decorative effect. Infrared analysis (FTIR) of the blue paint layer indicates it contained polyvinyl acetate, ultramarine blue and lead white. (Note: The object was apparently treated with polyvinyl acetate. The absorption bands for this polymer appeared in nearly every spectrum.)

Additionally we examined the front and the rear side of the carcass using X-rays. (kV20, mA2.7 to 3, t1.5min). The presence of the lead white is clearly visible as the darker, radio-opaque areas

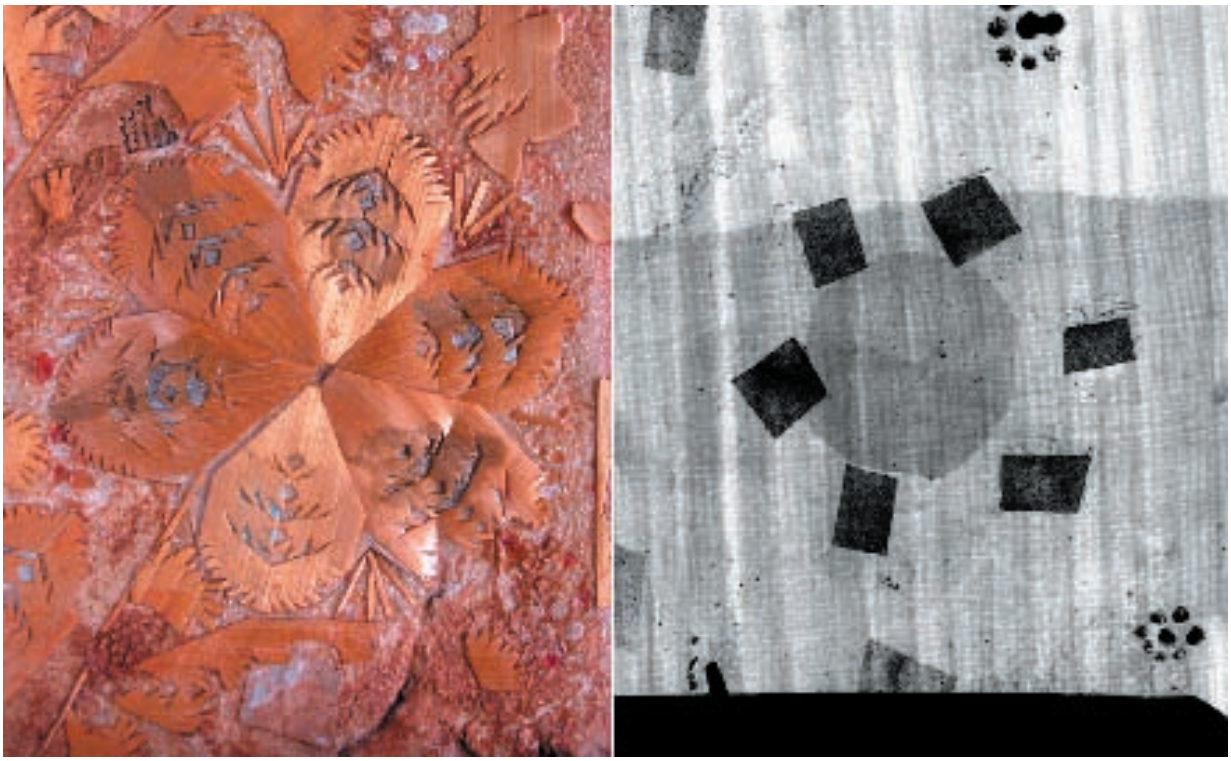

Figure 5. Detail from the front panel of the straw marquetry chest with a visible image on the left and X-ray image on the right.

of the X-ray (fig. 5). Finely painted dots applied using the same light blue color complete the floral pattern. Analysing the X-rays, we also discovered a doubled fabric lining at the front side behind the lock. We can also see the wood grain, but the most interesting part for us was to see the position of the paper squares underneath the straw. There were also paper shapes which were barely visible —like the round one on the right—that are actually unpainted paper squares glued on top of each other to raise the flowers.

The overall surface was examined using UV light (fig. 4, bottom). The red-sized paper had a very strong white fluorescence, suggesting the use of a proteineous adhesive. Wheat starch paste doesn't have a strong fluorescence, a sign that an animal glue was used to glue the straw marquetry onto the paper layer. This identification as a protein was confirmed by infrared microspectroscopy.

The interior of the casket is lined with a red painted paper. The paper itself is dark cream in color and of medium thickness. Identification of the structure and fibers using microscopic analysis can also be used by a paper conservator to help identify the date and origins of paper. This paper appears to consist of rag fibers. Laid and wove lines are visible on its surface, a sign that it has been made in a laid mold, typically referred to as laid rag paper. Laid rag paper is considered one of the earliest paper types produced in Europe. It was made as early as the eleventh century and has been continuously produced to this day. For this reason, it is not possible to assign a specific date to the paper based solely on the paper type. Wood pulp was not detected, which would have confirmed a later date—after 1841—as this is the earliest recorded date for the use of wood pulp in paper production. An extraneous, non-fibrous material found in the sample and identified using infrared microspectroscopy was most likely a protein-based adhesive, possibly hide glue used to attach the red-painted paper to the wood.

Watermarks on applied paper are often not visible without transmitted light. However, in this case a close visual examination revealed a circular

watermark on the interior paper. Watermarks are impressions on paper created by wires attached to the papermaking mold. The combination of watermark shape, positioning on the sheet and sewing dot pattern can be used to identify the manufacturer of the paper, the geographic area where it was produced, and the approximate date of manufacture. Because of considerable uncertainty inherent in this identification, watermark evidence can only provide clues, not precise facts. In this case the watermark could not be correlated to known examples collected in the most common catalogs.

Clock Hood

A final example is an interesting hood from a tall case clock from a private collection (fig. 6). The clock dates from the middle to late 18th century and has a brass leaf paper attached to the front decorative areas and a paper dust cover on top. The brass leaf paper was corroded in spots and detaching from a white, calcium carbonate gesso layer. The paper itself was coated with an orange bole layer bound with an oil/protein mixture over which was applied the metal leaf. The brass paper had corroded unevenly to produce a pattern of corroded dots.

X-ray examination revealed that these corroded dots corresponded to holes in the wood structure. (fig. 7) These holes were probably originally intended to be sound holes for clock bells, filled with a calcium carbonate gesso and the brass leaf paper applied over it.

The brass leaf paper on the face of the clock was very delicate. There were losses to the gesso and paper in areas where the wood substrate had moved. The remainder of the metal leaf surface had areas of flaking and tenting. To consolidate the surface we used a 0.25% solution of gelatin in a 9:1 mixture of water:ethanol. The alcohol helped the gelatin wick into the fine metal cracks and the surface could then be weighted using the Hollytex and cotton blotter technique used on the band box.

The dust cover on the top of the clock was extremely discolored and detaching from the wood of the clock hood. (fig. 8) The paper had been

Figure 6. Clock hood, showing the gilded paper in the pediment and the arch above the door.

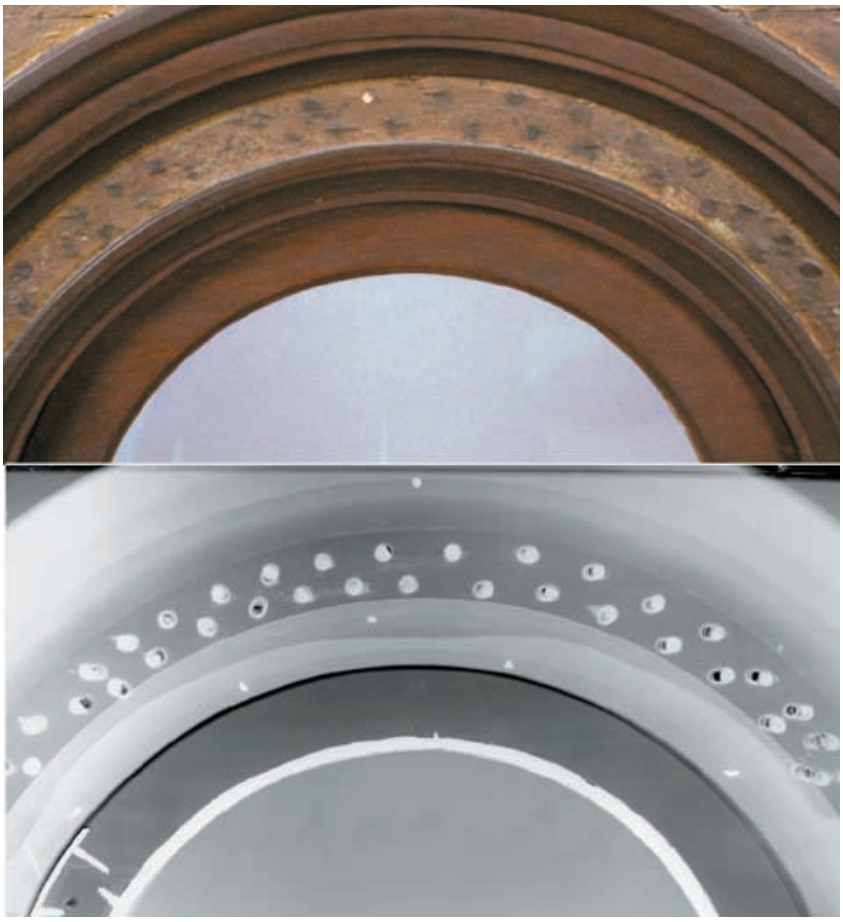

Figure 7. X-ray of front panel, revealing the presence of old sound holes beneath a layer of calcium carbonate gesso and brass leaf paper.

printed but was legible only in a few areas. The use of an infrared camera was able to greatly clarify the text. (fig. 9) The paper refers to the town of Newport and mentions, "the moderation and wisdom of the Count de Vergennee," possibly referring to the Count de Vergennes, the French minister of foreign affairs who strongly supported the American Revolution and who died in 1787.

We used wheat starch paste in a manner similar to that used on both the straw marquetry and band box. The use of an extremely dry wheat starch paste effectively secured the lifting edges of the paper, reducing the potential for loss without noticeably changing the appearance.

These treatments illustrate how the skills and materials of paper conservation can be effectively used in the treatment of paper on wooden objects. There are a wide variety of techniques for applying paper to furniture, only a few of which we have addressed. The application of a much broader knowledge of conservation and materials is needed to fully appreciate and adequately treat the wide variety of furniture with applied paper.

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Figure 8. Clock hood showing the paper dust cover.

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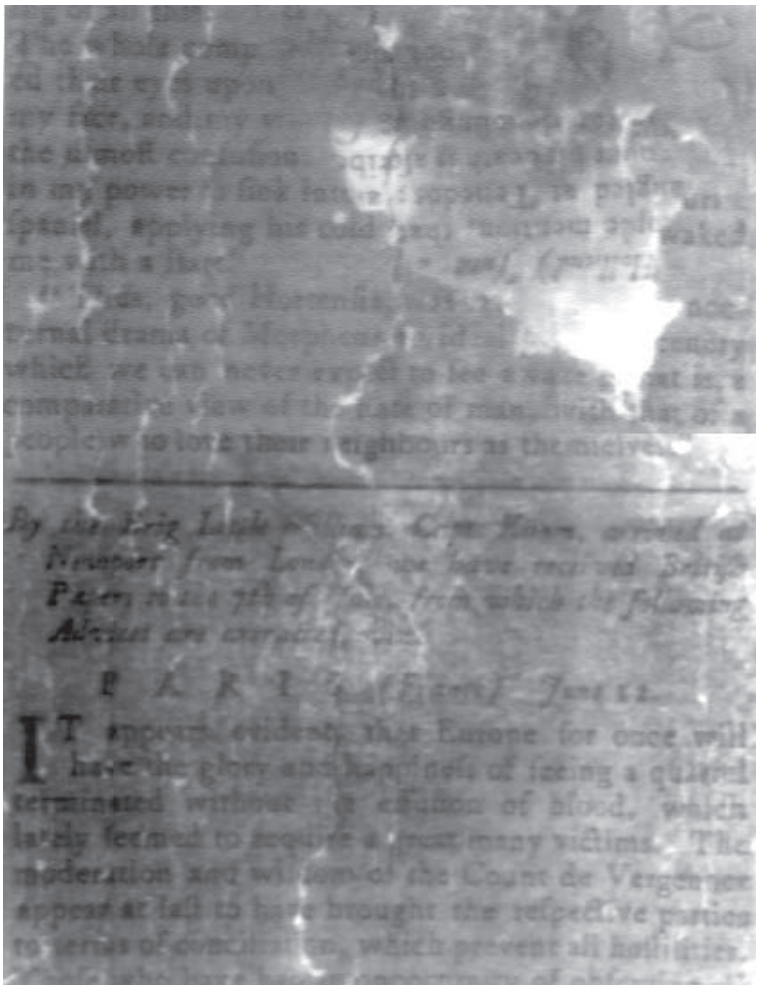

Figure 9. Infrared image of the paper dust cover on the top of the clock hood.

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