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# Digital imaging to unveil traditional craft methods

## A case study of a Renaissance Flemish panel

### **ABSTRACT**

*To understand the creation and the function of a Flemish oil on panel, non-invasive technical investigations including UV, IRR, X-ray and  $\mu$ -XRF have been used as a method to unveil its specific material features. The undated and unsigned panel has been attributed to The Master of the Female Half-Lengths possibly active during the early 16<sup>th</sup> Century, due to its stereotype motif, materials and dimensions. The analysis reveals that the panel has several damages due to natural and forced interventions. The painting process shows various inconsistencies, interpreted with the aid of literary sources as a product of a workshop adapted to producing art as a response to the great demand of Flemish panels from the blooming Early Dutch art market.*

### *Keywords:*

Art as craft, technical investigation, digital imaging, Master of the Female Half-Lengths, Flemish.

### **INTRODUCTION**

The global demand for Flemish panels stimulated the establishment of artist workshops during the 15<sup>th</sup> century in cities like Antwerp, on a scale never before seen. A shift from an established tradition of commissioned artworks to the production of art to be displayed and sold on an open market for a much broader clientele is believed to have had an impact on the materials and painting techniques, in addition to the more obvious choices of motifs. The materials and painting techniques are highlighted through technical analysis and digital imaging. When it comes to the creation and the function of a Flemish oil on panel, these material characteristics are part of the puzzle for interpreting the painting's aesthetics, context and hopefully in the long run its relation to other panels with the same attribution. Within the

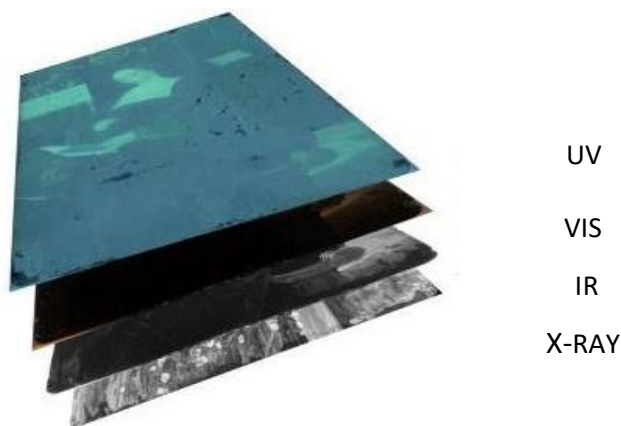
field of Technical Art History, technical investigations are used as methods to analyse artwork (Bomford, 2010).

### The case-study and its materials

The analysis of a Flemish oil on panel was conducted in cooperation with Swedish National Heritage Board using its mobile laboratory. This technical investigation was carried out as part of a broader analysis to be presented in a Master thesis at the Department of Art History at Uppsala University. The investigation revealed information that was interpreted within a material and painting technique perspective, in regarding the early Dutch context. The painting, *Seated Lady Writing*, is not dated and has been attributed to the Master of the Female Half-Lengths (Hahr, 1905). The designated master is believed to have produced somewhere between 50-100 similar motifs depicting young women playing music, reading or writing in sombre interiors dressed in an expensive early 16<sup>th</sup> century courtly fashion. Further, the panels share an allusion to the Magdalene with her attribute of the ointment container. The reason for the choice of painting to be analyzed was its attribution, a panel seemingly alike the others, and therefore hopefully significant as a typical workshop production.

### Technical instruments

To reveal the different painting layers displaying the panel's materials and painting technique, a number of non-invasive analytical techniques as infrared and ultraviolet photography, radiographic imaging and x-ray fluorescence spectrometry have been used. As different wavelengths have various penetration capacities they have been used to uncover the different layers and stages in the painting process (Figure 1.).



**FIGURE 1.** The paint layers are made visible by digital imaging by photos taken in different wavelengths.

The figure above displays how the X-ray penetrate all the way down and through the support, how IR reveals the underdrawing and how UV diffracts at the surface layer, in this case the varnish. X-ray spectrometry both as micro point analysis and area mappings of two selected areas has been used to facilitate pigment identification through elemental analysis. Starting from the bottom to the top of the artwork several interesting technical features were identified and will be described in the following.

X-ray imaging was carried out using a General Electric (GE) 42MF4 portable X-ray unit with a 46X38 cm IPC2 phosphor imaging plate, running with an exposure time of 10 seconds at 60 kV and 4.5 mA. Photographic imaging was done with a modified full spectrum Nikon D810 camera, equipped with an AF Nikkor 50 mm lens, using UV pass (325-375 nm), UV/IR cut (400-550 nm) and IR pass (350-800 nm) filters from the CHSOS Robertina series. X-ray fluorescence spectrometry was carried out with a Bruker Artax 800, equipped with a Mo X-ray tube and a polycapillary lens, with spot analysis at 10 seconds, 50 kV and 600  $\mu$ A.

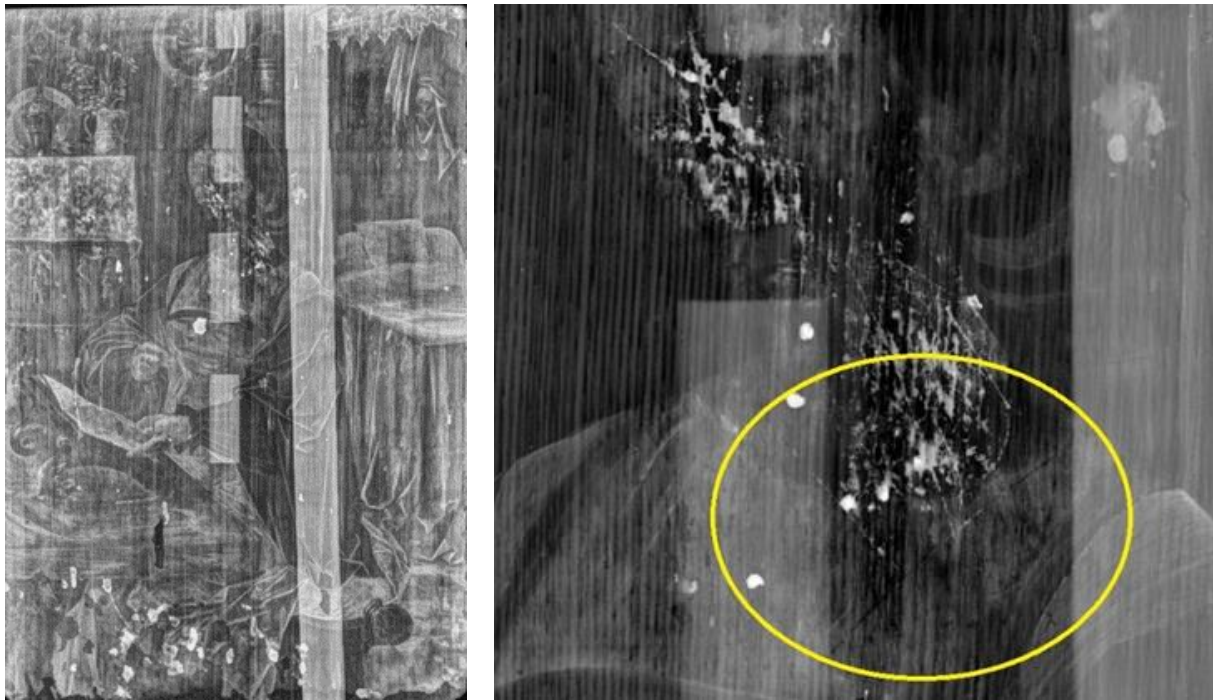
### THE PANEL AND THE GROUND LAYER

The painting consists of a four millimeters oak panel (43 x 29 cm) slightly thinned out along its borders. The back of the painting show traces of a now removed cradling (Figure 3). Cradling is a traditional technique used for stabilizing the natural movements of the board, although in modern conservation practice often removed as the risk of causing cracks increases when forcing the panel in a rigid position (Nicolaus, 2001).



**FIGURES 2 AND 3.** The painting *Seated lady writing* in white light from the front and the back. The back of the panel show traces of a removed cradle and later added stabilization wooden blocks. Photo: Magnus Mårtensson, Swedish National Heritage Board.

The panel appears to have been reduced in size along its upper end. This is evident both from the motif, given the cutoff appearance of the candle and sconce, and the board itself, given that it shows comparatively little signs of damage along the edge. Calcium was detected in all points over the panel, which substantiate the interpretation of a thin ground layer made of chalk, probably with a binder made of an organic glue (Vergara, 2007).



**FIGURES 4 AND 5.** The wood fibers are visible as traces in the dense ground layer with X-ray imaging. Dense agglomerations of lead clearly visible as white areas, localized particularly to areas of damage in the face and to areas in the painting's lower part. Photo: Magnus Mårtensson, Swedish National Heritage Board.

Several features indicative of damage or later alterations to the structure of the painting are visible through X-ray imaging (Figures 4 and 5). The white areas with distinctive borders are believed to be representative of filled in insect galleries. Some insect damage is also visible from the back of the panel with possible wax infillings. The denser infillings have been grounded up, the less white ones consists of bare color without ground layers. These infillings mostly contain lead, some minor infillings zinc. These results indicate both older and more recent infillings as indicated by the use of lead white and zinc. Lead is detected all over the panel with a small exception, to be discussed later. There might therefore be a preparatory layer of lead white together with an earth pigment such as umber, given the presence of manganese, as detected in  $\mu$ -XRF. The lead white may likely be associated to subsequent paint layers (Billinge, Campbell, Dunkerton, Foister, Kirby, Pilc, Roy, Spring, and White, 1997). There is a large area of damage concentrated to the central part of the face of the woman and extending down over the throat, a damage visible as both losses and thin etchings, likely caused by a sharp tool. When in time this damage has occurred is not possible to explain by the investigations done, given that only non-invasive analysis was carried out. The mapping of the face area with  $\mu$ -XRF detected mainly lead in the fillings. The damage is believed to extend down to the panel through the ground, and, if there is a paint layer based on lead, it has been scraped off in the immediate areas around the fillings, as no lead was detected there.

### THE UNDERDRAWING

Grey strokes are visible with the naked eye in the face area and on the fingers of the woman. As these strokes are not attributable to any suggested shadowing or a conscious visible final expression, they are believed to have been rendered visible through time. Research has shown that metal soaps may form in the presence of metal pigments, in particularly in the presence of additives, such as in the use of a siccativ, or as here, with a high amount of lead present as infill; these additives tend to increase the colors transparency (Izzo, Kratter, Nevin and Zendri, 2021). These strokes, more visible in IRR, can be related to the underdrawing (Figures 6 and 7).



**FIGURES 6 AND 7.** The underdrawing is slightly visible along the temples, both in visible light through the thin incarnation color and more clearly in IRR. A more characteristically sketched nose and mouth made legible by IRR. Photo: Magnus Mårtensson, Swedish National Heritage Board.

Thin strokes are probably made with a dry medium, as the strokes are evenly thick and well distinguished. A thicker contour line has in contrast been used to define the composition for the garments and textiles. It is only when the underdrawing is not accurate in relation to the covering strokes that they can be legible. Thus, when examining the textiles it is difficult to distinguish the paint layers from a possible underdrawing, although the underdrawing can be assumed as the meticulously layer by layer-method is applied, thoroughly following the same composition profiles. This accurate underdrawing with its paint application showing a meticulous exactness and lack of hesitations is deduced to indicate the use of a tracing method. Tracing as an underdrawing method is based on an already existing composition that is being copied (Curry and Ghys, 2006).

### ***A free-hand underdrawing?***

Whereas the rendering of the woman and the textiles on the bed show signs of a transfer for the underdrawing, there is another quality to the underdrawing defining the cupboard behind the woman. In IRR, the ornamented wood paneling connected to the cupboard is suggested in a more sketchy handed underdrawing defining the arabesques and some shadowing. Several of these strokes have not been accurately followed and completed by later paint layers, and the shadow from the plate does not logically correspond to the intended light sources. This shadowing seems to take part of the underdrawing process when constituting the composition's construction, modelling up the depth, as presented in Figure 8.



**FIGURE 8.** In IRR a dry medium underdrawing is visible trying out the niches' placement and some shadowing. More prominent is the wet medium underdrawing visible above the flowers, in the plate's shadow and in the arabesques. Photo: Magnus Mårtensson, Swedish National Heritage Board.

The exemplified underdrawing has the characteristics of brushstrokes, alternating between thicker and thinner strokes. Traditionally, pigment in water has been used to enhance some of the dry underdrawing, (Kammerer, Lettner, Zolda, Sablatnig, 2006), here in a painterly manner. This underdrawing differs from the accurately defined profiles present on other parts of the painting. An additional type of underdrawing might be definable when regarding the damages in the face. In particular, the etchings in the lower part of the damage, might arguably be considered as part of conscious compositional markers, as they are not in-filled with lead white (area marked in yellow in Figure 5). Hypothetically, if the panel has been cut at its upper part, these crossed etchings might constitute the composition's central point.

The various forms of underdrawing visible in this panel seems to associate to the different parts of the composition and when in the painting process they take place. For the important main

compositional elements, including the woman and the textiles, a tracing might be possible, followed by a wet medium applied with a brush. As for the minor details, exemplified by the flowers and the panel behind the cupboard, a sketchy dry medium underdrawing is used. This underdrawing is only partly followed in the painting process by a wet medium brush underdrawing. A further example of underdrawing or rather a lack of it, is seen in parts of the painting which shows no indication of an underdrawing, to be discussed in the paint layer section.

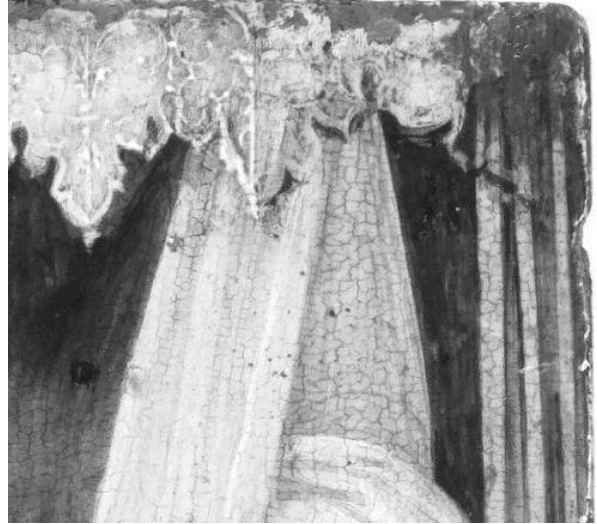
### ***Pentimenti or inaccuracy?***

It might be that some areas of the motif are of greater relative importance, inviting the notion that some areas have been completed in a consciously less accurate manner to save time. When it comes to the deviation between what's visible and what is revealed in IRR, the question of consciousness is relevant. Regarding the fingers holding the diary, the tip of the forefinger with a visible fingernail has been abandoned in the paint layer. In addition, the page of the book has been extended in an unrefined grey tone hiding the tip of the thumb (Figure 9). Another minor pentimento or mistake is visible in IRR, here exemplified in figure 10, is in the way that the textile differs from the underdrawing, visible by its dark contour at the tip.



**FIGURES 9 AND 10.** In figure 9 the tip of the forefinger is distinguishable in the underdrawing phase, extending the finger. In figure 10 the linear contours of the underdrawing, visible in IRR have been slightly changed and extended in the painting phase. Photo: Magnus Mårtensson, Swedish National Heritage Board.

A detail difficult to miss, and only explained by a hasty painting process, is the baldachin. What seems to be the outlining of the baldachin has not been filled in with paint and therefore exposes the underlying folds of the textile (Figures 11 and 12). Although this is a seemingly minor mistake in a peripheral area, it is an example of an unfinished final appearance.



**FIGURES 11 AND 12.** The gold embroidered outline of the baldachin covers the left textile both in visible light and in IRR. Therefore the vertical plies of the textile are visible through the baldachin. Photo: Magnus Mårtensson, Swedish National Heritage Board.

These deviations between the end result and the underdrawing calls into question the attribution of the painting to one single artist. The evidence points rather to a final result where different hands are contributing to different parts of the process.

### THE PAINT LAYER

Various types of brushwork build up the paint layers according to compositional or aesthetical considerations. The viscous oil medium shows traces of broad sweeping brushstrokes to cover the lighter ground layers, especially visible in the dark areas. They are deviating along the table ignoring the minor items such as the feather and the knife (Figure 13). In IRR the compositional regards are even more legible, considering the cupboard with its horizontal broad strokes, and how they in contrast with the table's brushstrokes deviate for the set outline of the woman's garment (Figure 14).



**FIGURES 13 AND 14.** Broad viscous brushstrokes cover the tablecloth and follow its outlines without regard for the minor items on the table. The minor items are clearly painted on top perhaps without an underdrawing. In figure 14, the painterly manner of the details in the cupboard's niches and their transparency indicates a paint layer without an underdrawing on top of the horizontally broad-brush painted cupboard, only deviating for the set outline of the woman's garment. Photo: Magnus Mårtensson, Swedish National Heritage Board.

Figures 13 and 14 further show some of the details added in the upper viscous paint layers without a visible underdrawing, with regards particularly given to the painterly manner in which the details in the cupboards niches are expressed, and in their transparency. Another



example of the glaze technique being used is in the red textiles where the thin layers accurately follow the composition and therefore build up barriers in which the viscous paint creates puddles (Figure 15). These thin brushstrokes add both texture and color nuances. As opposed to the viscous texture used for the textiles, another mean to achieve a plasticity is exemplified in the white cloth on the cupboard. The vivacity in the floral embroidery has here been accomplished by the use of the dense pigment, lead white.



**FIGURE 15.** By successively and strictly following the underdrawing contours, the viscous glaze applied with a fine brush gives a plasticity to the textiles many plies. Photo: (Own source)

To achieve the effect of a painting process where each layer is methodically added on the next, several techniques have been employed to make the process more efficient. This can be seen when it comes to the tassel and the ointment container, here dark areas have been blocked in and the later completed with decorative painting, applied with thin gentle brushwork (visible in figure 16).



**FIGURE 16.** The tassel on the cushion has been outlined and painted dark, to create a contrast to the decorative pattern added on top, creating the illusion of highlighted golden threads. Photo: Magnus Mårtensson, Swedish National Heritage Board.

### ***Pigments***

The various pigments used are all efficient to work with when mixed with a viscous medium such as oil. Metal pigments have the added function of acting as a siccative, speeding up the drying process, exemplified by action of the copper component in copper acetate, copper resinate and malachite used for the greens (Spring, 2017). They are only distinguishable in UV false color due to the fact that copper resinate and malachite appear browner in contrast to the greyish appearance of copper acetate (Figures 17 and 18).



**FIGURES 17 AND 18.** Different kinds of copper greens can be distinguished by comparing the colors in visible light (figure 17, with UV False color (figure 18). In figure 18 the green on the vase and the green for the flowers differs and indicating the use of different kinds of green pigments. Photo: Magnus Mårtensson, Swedish National Heritage Board.

An abundance of lead, associated with the use of lead white, was detected by  $\mu$ -XRF over practically all areas of the painting. The bright red color was identified as vermillion, indicated by mercury. The yellow color was found to consist of tin and lead, indicating the pigment lead tin yellow. Different earth pigments, commonly used for shading are indicated by iron and manganese. Analysis for the presence of lakes can be deduced given the technical evidence for the use of glazing. These elements indicates common pigments in use during the North European Renaissance, presumably manufactured in cities like Antwerp, according to local recipes (Vermeulen, 2010).

### **NATURAL OR FORCED INTERVENTIONS**

The painting shows marks of time, where some of the painting's alterations might be natural and some caused by intentional interventions. The lead white fillings covering the face might have been caused by an intentional change. What is evidently a loss of superficial glaze layers has deprived the head of the woman of its plasticity, shades and nuances. These alterations might be the cause of conservation interventions such as cleanings, often occurring on central light areas where the results appear more evident. The chemical process of soaping is a possible cause, which may additionally apply to the dense pigment covering the bust (visible in Figure 5). As interpreted from the X-ray image, the illusion of a fabric is close at hand, but is now only visible as two thin white strokes in visible light. A further garment issue is a larger overpaint in black with a turquoise highlight, likely to deceive the eye from noticing that the garment is more violet or burgundy, as visible along the silhouette (Figure 19).



**FIGURE 19.** A large black over paint highlighted in turquoise is covering the breast. At a quick glance, this overpaint might give the impression that the dress is not violet or burgundy, as visible along the silhouette. Photo: Magnus Mårtensson, Swedish National Heritage Board.

The minor and major alterations need to be considered and analyzed when trying to attribute and date the painting, they obviously make an impact on its aesthetics, and play a role in the understanding of the original appearance, and constitute a part of the paintings history.

## **CONCLUSION**

Several of the technical features supports the hypotheses that *Seated lady writing* is the product of a cooperative workshop. The different underdrawings mirror the extent to which the parts of the composition that have been prioritized, indicating that the female figure and the textiles are likely to have been copied, whereas minor details like the cupboard with its items are rendered from a free hand underdrawing. The material characteristics indicates that the painting was made for the open market without a certain destination. This conclusion is supported by the use of common as opposed to precious pigments, and to the varying care and accuracy in the finishing of details relating to their importance to the composition and aesthetic impression. The technical investigation has provided keys to the understanding of the painting's creation and function. The complete technical investigation was performed as a part of a Master Thesis which further discuss the painting's context and attribution.

#### ACKNOWLEDGEMENTS

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