4b

Conservation and Restoration Treatment
The Frames: In Search of Lost Unity

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The exterior of the *Ghent Altarpiece*'s eight wing panels have frames that are original, but which no longer possess their original format or appearance. Over time, and due to their tumultuous material history, they have undergone numerous transformations in terms of both their structure and polychromy. We know that in the work of the Flemish Primitives and especially that of the Van Eycks, frame and painted image formed an inseparable ensemble, from conception to display.[1] This unity was broken as a result of the various campaigns of restoration and transformation. Before treatment commenced in 2013,[2] no one suspected the richness of the polychromy, which was hidden at that point beneath thick overpaint that was dull and uneven, considerably diminishing the role of the frames even though this is essential to the reading of the work (fig. 4b.2a-b).

The treatment initially planned for the frames focused solely on conservation and on the basic harmonization of their visual appearance. A new approach became necessary, however, when the polychromy was studied in the light of the polyptych's material history and the discovery in the panels of overpaints concealing the Van Eyck brothers' original painting.[3] Once the decision had been taken to uncover those original paint layers,[4] the panels could hardly be reinstalled in frames which had not had their overpainting removed too.

Confirmation of the presence of a refined underlying polychromy, imitating dressed stonework on silver leaf prompted us to seek the lost unity of the altarpiece and to re-establish the relationship between frame and painting that was so important to Van Eyck.

Fig. 4b.1. (facing page) Detail of the frame of the *Interior View* before the uncovering ; detail of the frame of the *City View* after the uncovering

Fig. 4b.2a. The closed altarpiece before treatment (next page)

Fig. 4b.2b. The closed altarpiece after treatment (next page)

Hidden polychromy

From the supposed date of its completion, 6 May 1432,[5] through to our own time, the *Ghent Altarpiece* has been moved, confiscated, hidden, sold or stolen on numerous occasions, resulting in damage followed by restoration or transformation of varying significance of both the support and the polychromy.[6] Changes to the frame supports were not only prompted by wear and tear over time, but were also and primarily caused by the replacement of the hinges.[7] While the supports of the frames for the

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eight wing panels are in a relatively good condition, the polychromy was not unaffected by all these transformations.

Not only was the polychromy covered by a significant layer of dirt and thick overpaint prior to treatment (fig. 4b.2a), but a difference in appearance between certain frames meant that the exterior of the polyptych could not be appreciated in their overall effect as an ensemble. Comparison of the frames of the *City View* and the *Interior View* with those of the other six wing panels showed that the polychromy did indeed look different. The polychromy of the frames of the six wing panels, intended to imitate dressed stonework was quite darkened and greenish, while the frames of the two views was more unified, with a brown-black appearance and gilding of the interior chamfers.

A study of the polychromy was performed on the frames as a whole. Stratigraphic examination revealed the presence of twenty layers resulting from seven interventions. To obtain a better understanding of this colour evolution and succession of layers, we need to revisit the principal interventions that occurred during the life of the altarpiece.[8]

The earliest of these – the original polychrome decoration seen in the frames of the exterior of the wing panels – is a refined polychromy composed of a ground layer, an oily orange mordant and silver leaf covered with coloured glazes, modulating from yellow to red. It mimics dressed stonework by means of joints painted in black and white, placed every 12 to 17 centimetres and a speckling of black dots heightened with a light colour (fig. 4b.3).[9] The inscriptions and the quatrain were then applied in black and red paint.[10] The modulations in the tones and intensity of the coloured glazes could no longer be evaluated with any precision, however, due to their degradation.[11]

Local intervention[12] was only detected in the right stile of *St John the Baptist*'s frame (fig. 4b.4), which displays a vertically aligned series of losses down to the wood. The wood is pitted and black in appearance, suggesting burn marks. The remnants of silver leaf covered with a yellow glaze are present in these losses. The silver leaf was applied over a grey underlayer and covers the original polychromy. This intervention shows that areas of damage were concealed by retouching, imitating the original technique (silver leaf plus glaze).

A third major intervention comprised the greenish overpainting of the entirety of the frames of the exterior. The date when this occurred is not known, but it must have occurred before the paintings were dismantled and separated, that is, prior to the beginning of the nineteenth century.[13] Photographs taken before the restoration in Berlin in 1894[14] show a monochrome coating of the frames and the fittings that can be identified as the greenish overpaint. The presence on certain frames of a bulge in the residual overpaint (barb) at the location of the hinges indicates that it was applied after the hinges were installed. These hinges were the third set to be fitted to the frames, which might have occurred when the altarpiece was remounted in the Baroque altar around 1662–63.[15] This would mean that the greenish overpaint covering the hinges postdated 1662–63 (fig. 4b.5).

Six of the eight wing panels were sold in 1816. Only those of the *City View* and *Interior View* remained in Ghent.[16] The material history of the frames of these two wing panels differs therefore from that of the other six between 1816 and 1919, when

Fig. 4b.3. Details of the original polychromy imitating dressed stonework on the frames of the *Archangel* and the *City View,* and of *St John the Evangelist* and *Elisabeth Borluut* after treatment

Fig. 4b.4. Frame of *St John the Baptist* during treatment: details of the second intervention on the right stile

4b.5

4b.6

Fig. 4b.5. Frame of the *Interior View* before treatment: local uncovering of the green overpainting (third intervention)

Fig. 4b.6 Frame of the *City View* before treatment: uncovering of the brownish layer and coat of bronze paint that constituted the fourth intervention

the panels were reunited. During that period, the frames of the six wing panels were overpainted in a dark tone on the flat parts and gilded using bronze paint on the chamfers (fig. 4b.6).

An intervention was performed in Berlin in 1823[17] on the six wing panels, which had been sold to King Frederick William III of Prussia in 1821.[18] The greenish overpaint must have been partially removed there on the order of Gustav Waagen,[19] allowing the rediscovery of the quatrain and the inscriptions on the cross-members. These inscriptions were visible through little shutters incorporated in the double-sided, gilded frames that covered the original frames in the Gemäldegalerie between 1830 and 1880.[20]

The most significant intervention performed on the frames of the six wing panels occurred in Berlin in 1894. In addition to the complete removal of the greenish overpaint, the six frames of the wing panel frames were subjected to major structural transformation, resulting in damage to and/or alteration of the polychromy. It was during this fifth intervention that the wing panels, as well as the frames, were sawn apart through their thickness.[21] All the fittings, including the hinges, whether original or not, plus later reinforcements, were removed.

Following this drastic sawing operation, the positions of the original hinges, an old latch, the bolt-holes for the metal hinges, seals and other losses in the support were plugged with lime wood inlays, then filled and retouched. Retouching in the area of these inlays consisted of an orange underlayer applied over a white ground and a layer of bronze paint, topped with black speckling, touches of colour and black-and-white joints mimicking the dressed stonework of the original polychromy (fig. 4b.7). However, this retouching covered substantial areas and spilled over significantly into the underlying polychromy, while still sparing the inscriptions, with the exception of localized reworking of certain letters.

The layer of bronze paint applied to the frames of the six wing panels in Berlin is likely to have oxidized fairly quickly. As this occurred, the bronze paint will have browned – a shift in tonality that probably no longer accorded with that of the original polychromy. A brownish layer was then applied to the entirety of the six frames, to mitigate the difference in tone between the original polychromy and the oxidized bronze paint.

The frames underwent a seventh intervention during restoration at the Laboratoire central des Musées de Belgique (the precursor of the KIK-IRPA) under Paul Coremans in 1951. This entailed impregnation with wax and the planing of the edges of certain frames, the fitting of brass reinforcing brackets, flush and screwed on the reverse, as well as the construction of a *'solide charpente métallique'* – a solid metal framework.[22] To adapt the format of the frames to this new metal display structure, two oak slats were added to the uprights on either side of the *John the Baptist* frame and another to the right stile of the *City View*. The slats were filled, given a coat of minium and then retouched in greenish brown. The only two frames to have retained their original grooved fitting[23] were dismantled on this occasion. During reassembly, some of the pegs that held the assemblies together were replaced with new wooden pegs or by large metal screws. These pegs or screws were then filled and retouched in the same way as the added slats.[24]

Fig. 4b.7
Demonstration of the interventions on the frame of *St John the Evangelist* in Berlin, 1894: the bronze paint heightened with black and coloured touches with which the wooden inserts filling the notches of the original hinges were retouched spilled onto the original polychromy, as can be seen in UV light

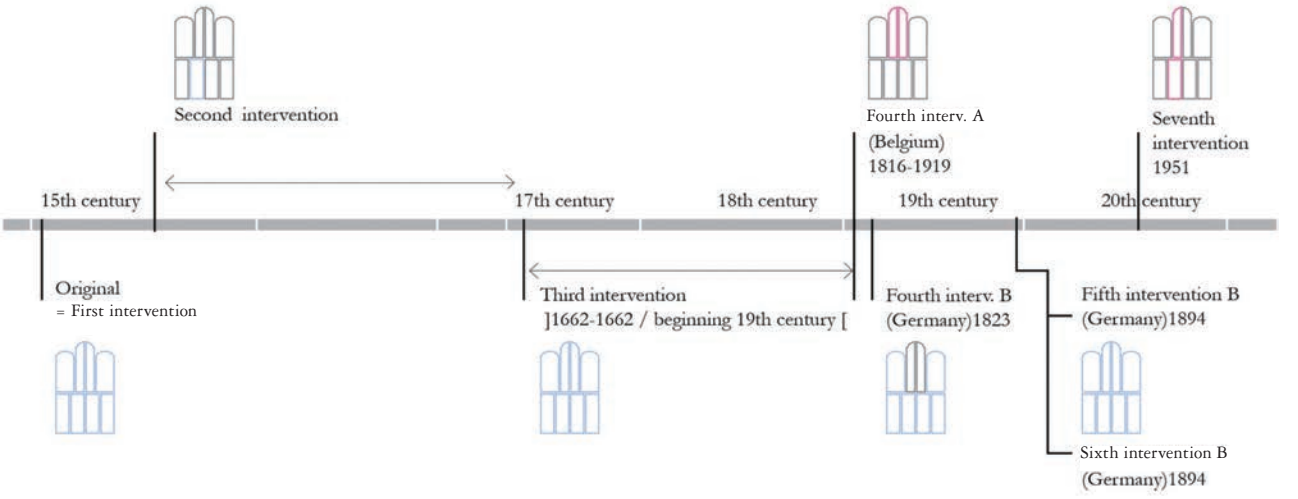

Fig. 4b.8. Timeline showing the different interventions on the frames. Diagram Jochen Ketels

This review, summarized in a timeline (fig. 4b.8), enabled us to sort out the problem of the difference in appearance between the frames that was visible at the outset of our intervention: on the one hand the group of six wing panels 'restored' in Berlin in 1894, when they were sawn through their thickness and overpainted with imitation dressed stone; and on the other the two frames of the *City View* and the *Interior View*, which had remained in Belgium and were overpainted in a greenish colour that was then hidden below a brown-black layer applied sometime between 1816 and 1919.

Necessary treatment

Despite the scale of the transformations to the frame supports and the extent of the reintegration, the uncovering of the original polychromy was justified by the difference in appearance between the frames and by the presence of very heavy layers of overpaint. The polychromy had been covered by a succession of non-original layers consisting not only of surface dirt, local retouching, a brownish layer and a coat of bronze paint, but also a thick greenish overpaint for the frames of the *City View* and the *Interior View*. However, the sequence of layers was not identical everywhere or on all the frames. Following a thorough survey of the damage observed on the frames and an evaluation of the extent of the overpainting, retouching and losses, test removals were performed – dry at first, using a scalpel under the stereo microscope, and then with solvents. A cleaning protocol was established, taking account of the issues specific to each zone to be treated: the layers covering the original one, those covering old fills at the location of the old hinges, and those covering the inscriptions – a particularly delicate area. It was also necessary to consider the solubility of each layer.

The first, swiftly performed cleaning tests revealed that the layer of surface dirt could be removed at the same time as the brownish layer, which thus avoided the need for prior surface cleaning. The results of dry removal, by contrast, proved inconclusive.

To select the most appropriate solvents with which to dissolve the dirt and the brownish layer, different mixtures of high-quality organic solvents were tested, specifically two large families of blends – a ketone with an aliphatic hydrocarbon and an alcohol with an aliphatic hydrocarbon in different proportions, according to a method drawn up by Paolo Cremonesi.[25]

The selection was based on several factors, including the capacity to solubilize the existing layers, miscibility to obtain homogeneous mixtures of different polarities, low retention in the paint layer, variable evaporation rate to avoid mixtures that could damage the remains of original glazes and/or the silver leaf, and minimal toxicity in the context of the work to be performed.

The removal of successive layers of dirt and overpaint was thus carried out in several stages:

— using a solvent gel comprising an alcohol and an aliphatic hydrocarbon, according to the formulation proposed by Richard Wolbers[26] to eliminate the brownish layer present on the six frames restored in Berlin in 1894. Gelling allowed the effective solubilization of the non-original layers and a homogeneous result, while preventing excessive diffusion of the solvent within the layers and reducing friction on a fragile surface (fig. 4b.9).

— using a solvent gel comprising a ketone and an alcohol to eliminate the greenish overpaint present primarily on the frames of the *City View* and the *Interior View* and as residues on the other frames. This solvent mixture proved more effective in compresses when removing the bronze paint from the expanses of filling applied in Berlin in 1894 at the location of the old hinges, that is, where there was no original polychromy. It was possible in this way to remove the bronze paint while retaining the orange underlayer, which seemed at first to provide a useful base for future retouching.

Fig. 4b.9. Removal of the brownish layer obscuring the original polychromy of the frame of the *Archangel* by means of a solvent gel. The gel is applied in a thick layer using a cotton swab. Excessive gel is removed when dry and the uncovered area washed with solvent in order to eliminate any residual material.

— combining the action of the solvents and the scalpel, monitored under the stereo microscope, to eliminate the residual overpaint around the inscriptions, given the fragility and importance of these zones.

For most of the time, therefore, the action of the solvents was combined with use of the scalpel. In particularly fragile zones, however, such as the inscriptions, mechanical removal under the stereo microscope proved indispensable (fig. 4b.10).

This prolonged and painstaking removal work revealed an original polychromy of high quality but in an altered and abraded condition with numerous losses (fig. 4b.11). Having been uncovered, therefore, the polychromy displayed not only alterations reflecting its material history, such as the presence of expanses of filler, wood inlays and numerous losses, but also specific alterations inherent to its structure, such as the degradation of the silver leaf or the original glazes.

The propensity of silver leaf to degrade was well known to artists in the Middle Ages, as evidenced by the warnings set out in guild rules or in early treatises,[27] notably Cennino Cennini's: '*Note above all: do it with as much silver as possible, because it does not last and turns black on walls, on woods, but it fails more immediately on walls*';[28] (although Cennini fails to recommend the application of a specific protective layer to delay this alteration[29]). Artists were in the habit of placing coloured glazes over silver leaf, a practice that played a significant role in the latter's preservation.[30] These protective layers too degrade over time, exposing the silver leaf to contamination. Depending on the environment, a variety of corrosion products form on it, the ones detected most commonly being silver chlorides, AgCl (white) and silver sulphides, Ag_2S (black).[31] Samples were therefore taken from two locations on the frame of the *Interior View*, at the position of one of the first micro-windows, to measure the oxidation and its possible evolution. The two compounds (AgCl and Ag_2S) were detected in the samples by SEM-EDX and TOF-SIMS. Macroscopic observation did not reveal any blackening during the uncovering of the frames. The distribution of chlorine in the micro-samples containing fragments of silver leaf was determined using SEM-EDX. Chlorine was detected alongside silver at all the analysed points of all the samples, even those presenting a metallic character. In some cases, the chlorides seem to have developed where the silver leaf meets the mordant layer rather than the glaze layers protecting the leaf, suggesting that one of the sources of the chlorine might be the adhesive layer.

Before proceeding with the treatment, it was therefore essential to protect the exposed silver leaf from oxidation. The different ways of achieving this were considered alongside a series of tests performed by the paintings workshop at KIK-IRPA[32] and in collaboration with Ghent University. Bearing in mind that most of the studies carried out in this regard related more to the protection of solid silver objects than that of silver leaf incorporated in polychromy,[33] the research performed at Ghent University by Anastasia Rousaki and Peter Vandenabeele in collaboration with Hélène Dubois[34] focused on the effectiveness with which silver leaf was protected against exposure to high concentrations of corrosive gases. The synthetic resins to be tested were chosen from among the ones most frequently used in conservation and restoration.[35]

A purely visual evaluation of the corrosion was made by Anastasia Rousaki, following which Laropal A81 and Regalrez 1094 were selected as the most effective protective coatings. Paraloid B72 proved less convincing in the context of this

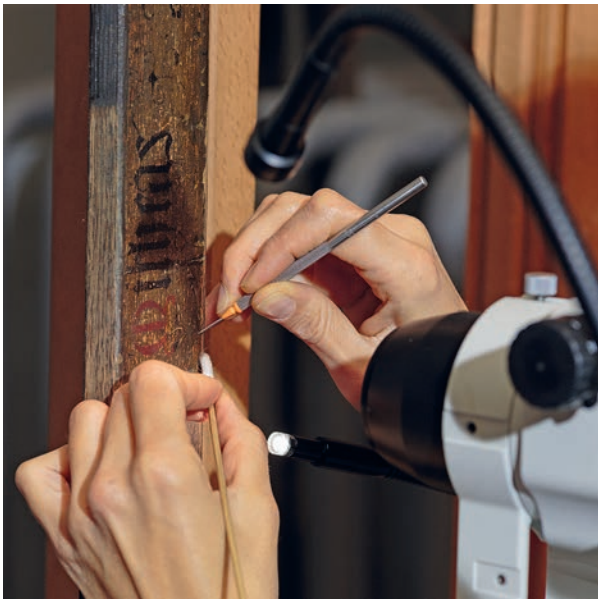

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Fig. 4b.10. Mechanical removal of green overpaint, under the microscope: inscription on the frame of the *Virgin Annunciate* and on the quatrain, frame of *St John the Baptist*

Fig. 4b.11. Frames of the *Archangel* before and the *Virgin Annunciate* during the uncovering

experiment,[36] although research by Lyndsie Selwyn into the protection of silver and copper gilt[37] does not exclude this resin. At the same time, test-samples reconstructing the original polychromy and topped with the different varnishes were produced at the KIK-IRPA paintings studio and subjected to ageing in natural and UV light, or by adding a coating of Cosmoloid 80H wax. Visual evaluation of these results[38] showed that the combination of Paraloid B72 and Cosmoloid 80H wax offered the best protection to the silver and the polychromy; Laropal A81 and Regalrez 1094 also delivered good results. Given the results of the tests performed by KIK-IRPA and Ghent University, but also taking account of compatibility with the retouching materials, their solubility in the varnishes used and control of the desired degree of gloss in the final appearance, we opted for three-stage protection.

Following the uncovering of the original polychromy, a layer of Paraloid B72 varnish (dissolved 10% in xylene) was applied with a thin varnish brush. Next, following retouching, the frames were sprayed with a thin coating of Paraloid B72 varnish with three vertical and horizontal passes, to isolate the retouching while simultaneously reinforcing the protection of the silver leaf. Lastly, the application by brush of a layer of microcrystalline wax completed the protection of the polychromy and the silver leaf.

The first stage in the treatment of the frames therefore enabled the original polychromy to be revealed by removing the various layers of overpaint (fig. 4b.12) and other interventions that had concealed it (compare figs 4b.12 and 13).[39] The retouching done in Berlin was removed, for instance, revealing the orange underlayer covering the filling applied to the wooden inlays. We initially considered using this as the base for retouching, but realized that it would be preferable to remove it to allow correction of the filling, which spilled over into the original layers and was not level. These fills with conspicuous outlines and rectangular forms situated at the position of the hinges and the other fittings were very significant, especially in the arched frames of the *Archangel* and the *Virgin Annunciate*. The orange layer as well as the filling overspill were therefore removed. In most cases, the old filling was preserved and levelled by applying a new, finely sanded chalk and glue-based filling. The fillings covering smaller losses were also preserved and reworked with a slight texture to integrate them more effectively with the remains of the polychromy. Not all the losses had been filled, however. In addition, certain historical traces concealed during earlier restoration treatments were uncovered. This was the case of the historical burn marks in the wood of the frame of *John the Baptist*[40] and of the two wooden slats added to the lateral edges in 1951. Depending on the condition of the polychromy and the extent of the losses to be filled (fig. 4b.12), each frame therefore required an individual, staged approach, which was then set against an overall view of the ensemble.

At this stage of treatment, the frames presented numerous expanses of fillings, which had to be reintegrated (fig. 4b.14). It was important to keep in mind, however, that these were not losses in the strict sense, but traces of the lost hinges. Van Eyck himself originally disguised the hinges by painting them, as may still be seen on the frames of the *City View* and the *Interior View* (see fig. 4b.1). How then to re-establish the lost unity and aesthetic value of the ensemble, while simultaneously respecting this eventful history? How might these large rectangular zones be integrated without eradicating the material traces, but actually highlighting them?

Fig. 4b.12. Frames of the lower register after the uncovering of the polychromy. (1) position of the original hinges; (2) position of the notch for the pin of the second hinge; (3) position of an old latch; (4) screwholes of the metal hinges; (5) position of seals and lacunae

The status of these frames and the intrinsic nature of the polychromy necessitated further reflection, from both an ethical and a technical point of view.[41] The frames form a unified ensemble with the painted panels and contribute fully to the coherence of the polyptych; what's more, the highly distinctive *trompe l'œil* stone also provided the physical link with the original architectural setting of the Vijd Chapel. Consequently, these *lacunae* should not just be approached in the same manner as losses in the paint layer, but care should be taken to re-establish unity and balance on several levels.

The reintegration of losses in a metal leaf is not straightforward, due in part to its colour, but above all to its sheen and the light it reflects.[42] Even if the original silver leaf and glazes were oxidized and had lost their gleam and intensity over time, the question of restoring the lost lustre and the illusion of the stone facing was crucial.[43] Several treatment approaches were therefore possible, ranging from minimally interventionist retouching to illusionistic retouching.[44] However, since the aim of the retouching was to serve the *trompe l'œil* intended by Van Eyck and to achieve a complete vision of the altarpiece, it was necessary to avoid any confusion between the original parts and the retouches. In order to respect the authenticity of the work it was therefore decided to privilege a 'suggestive differentiated retouching',[45] which would evoke the loss through variations in colour and form, but without recreating details and while remaining perceptible from a certain distance. Further-reaching retouching of the illusionistic type would have meant inventing the location of irregularities in the

Fig. 4b.13. Wings of the lower register before the 1894 restoration

stones and coloured highlights and hence a risk of returning to the appearance of the removed overpainting. With this in mind, only the black lines were replaced so as not to lose the rhythm of the dressed stone.

Retouching – like the filling – was carried out in stages. To allow the potential of each frame to be evaluated, it was vital to start the retouching process with the areas of abrasion in the polychromy before commencing on the expanses of filler. Watercolours would not deliver satisfactory results because of the impermeable surface of the polychromy's protective coating,[46] and so the abrasions were retouched using industrially ground pigments in Paraloid B72[47] – a set created at our request especially for this project by the Kremer company.[48]

The visibility requirement was particularly necessary in the area of the inscriptions and the quatrain. Special attention was therefore paid to these zones: only the abrasions around the letters were retouched and not the letters themselves, to avoid interfering with the interpretation of the quatrain, which has been the subject of so much debate (fig. 4b.16).[49]

Once the abrasions had been retouched, a start could be made on reintegrating the fillings. Use of watercolour as a base tone (fig. 4b.17a) allowed light and thin retouching. A fairly fluid base tone was applied by paintbrush (fig. 4b.17b); retouching then occurred progressively, using fine vertical and parallel lines, modulating the tone while taking care to preserve transparency (figs 4b.17c-d). The frames were not all in the same condition, so re-establishing the balance of the ensemble had to undergo several stages: a first stage of retouching with watercolour allowed the original

4b.14

Fig. 4b.14. Frame of the *Archangel*: the fillings are large and geometric in shape, in particular those covering the notches of the old hinges.

Fig. 4b.15. Detail of the reintegration on the frame of the *Archangel*: (a) filling, (b) retouching

4b.15 a

4b.15 b

4b.16 a

4b.16 b

Fig. 4b.16. Example of the reintegration of losses around the inscriptions on the frame of *Joos Vijd*: filling (a) and retouching (b) of abrasions and losses

polychromy of each frame to be highlighted in isolation, before then being compared with its immediate neighbour and lastly with all the frames placed side by side. Following this overall view, a second stage of retouching was carried out using ground pigments in Paraloid B72.[50]

The temporary reframing of the paintings was essential for the finalization of the retouching and for harmonizing the ensemble. The final wax-based protection allowed certain remaining matte/gloss issues to be dealt with while lending a satin and homogeneous appearance to the frames, contrasting with the appearance of the varnished painted panels. In this way, the connection between the painting and its frame, as well as the relationship that each frame maintains with its neighbouring frame within the overall exterior of the polyptych, has been restored within the limits determined by their specific condition and their material history.

Conclusion

Prior to the conservation and restoration treatment, the frames had been entirely overpainted: six of them had been polychromed in imitation stone, brownish and dull; two others, the *City View* and the *Interior View*, were painted black. This difference in appearance, reflecting their respective material histories, as well as the numerous overpaints, made it difficult to view the closed polyptych as an ensemble.

Uncovering the frames was not initially planned. However, the study carried out in parallel with that of the painted panels resulted in a proposal to fully conserve and restore them (fig. 4b.19), which would allow the original polychromy to be rediscovered. The latter consists of a refined imitation of dressed stonework, rendered using silver leaf covered with coloured glazes (now substantially darkened), ranging from yellow to red and heightened with small touches of colour and articulated by joints painted in black and white.

4b.17 a

4b.17 b

4b.17 c

Fig. 4b.17. Successive stages of retouching: (a) retouching small losses using watercolour; (b) progressive retouching of large fillings through the application of a fluid base tone using a medium-sized paintbrush first, then thin parallel strokes

4b.18

Fig. 4b.18. Frames, during the final retouching.

Once the additions and numerous overpaints had been removed, the polychromy displayed a considerable degree of alteration, abrasion and losses. The meticulous and phased process of filling and retouching was intended to serve the illusion created by Van Eyck's *trompe l'œil*, while refraining from an overly interventionist reintegration. Reconditioning the imitation dressed stone in this way has re-established the connection between the paintings and their frames which, despite its vital importance in Van Eyck's work, has been hidden for so many years. The scenes are more spatially coherent as a result, while the shadow cast by the frames on the tiled floor of the scene in the upper registers now takes on its full meaning. The uncovering of the original polychromy has also contributed to a rereading of the quatrain and the inscriptions (fig. 4b.2b).[51]

The irreversible degradation of the glazes prevents a full appreciation today of the original appearance of the polychromy and the brilliance it once possessed. Be that as it may, thanks to some well-preserved zones we can understand the sophistication of the polychromy and the attention that Van Eyck bestowed on this element of the work. Revealing the original polychromy of the frames, even in its darkened state, means that the closed polyptych can now be appreciated in a condition that, while altered, is nevertheless closer to the original, and which had not been visible for several centuries.

Fig. 4b.19. Successive stages in the restoration treatment of the frames illustrated from the *Archangel* and *Joos Vijd* (next page)

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Notes

1 See the many publications on this subject by Verougstraete, Van Schoute 1987, 1989, 2000.

2 Treatment of the frames began in May 2013, while that of the painted panels had begun in 2012.

3 The research and restoration treatment was headed by Livia Depuydt-Elbaum. We are grateful to everyone who contributed to this work from both near and afar.

4 See contribution 4a by Depuydt, Rosier, Devolder and Laquière in this volume.

5 The 1432 date is mentioned in the quatrain painted on the frames of the lower register. See contribution 6 by Jones, Augustyniak and Dubois in this volume.

6 For the material history of the altarpiece, see contribution 1 by Dubois and contribution 2 by Ketels, Glatigny and Augustyniak in this volume.

7 The five interventions to replace hinges resulted in the damage described in the contribution 2 by Ketels, Glatigny and Augustyniak in this volume.

8 See contribution 1 by Dubois in this volume.

9 See contribution 5b by Augustyniak, Mortiaux and Sanyova in this volume.

10 For the inscriptions, see contribution 6 by Jones, Augustyniak and Dubois in this volume.

11 For the exhibition *Van boomstam tot altaarstuk* at the Provinciaal Cultuurcentrum Caermersklooster in Ghent, Marie Postec reconstructed the original polychromy of the frames. She did so by reproducing the technique and materials used by Van Eyck as faithfully as possible. The difference in appearance between this luminous reconstruction and the polychromy that is sufficiently visible at present is striking. However, the reconstructions altered in appearance, dulling considerably, within just three months. Comparing this appearance with laboratory analysis alerted us to the fact that the alteration of the original polychromy might also have resulted from the glazes covering the silver leaf. Augustyniak, Postec, Sanyova 2015, pp. 111–13.

12 Viewed as the second intervention.

13 In 1816, six of the eight wing panels were sold to the art dealer L.J. Nieuwenhuys, who sold them in turn to the British collector Edward Solly; the Adam and Eve panels remained in Ghent; Kemperdick 2014, p. 63.

14 See contribution 2 by Ketels, Glatigny and Augustyniak and contribution 1 by Dubois in this volume.

15 For the Baroque altar, see Dhanens 1976, pp. 33–36; Kemperdick 2014, p. 60.

16 Kemperdick 2014, p. 63.

17 Waagen 1824a; 1830; Waagen, Rassman, De Bast 1825.

18 Prussia legally acquired the six wing panels of the *Ghent Altarpiece* from Edward Solly in 1821; Kemperdick, Rößler 2014, pp. 70–99.

19 Waagen, Rassmann, De Bast 1825.

20 These frames were created by Karl Friedrich Schinkel. See Von Roenne 2017; Stehr, Dubois 2014.

21 In 1894, Wilhelm von Bode, the director of the Gemäldegalerie where the paintings were kept, wanted to be able to present the paintings side by side, which prompted him to order the splitting of the panels and the frames. The grooved frame assemblies were dismantled so that each element could be cut in half through its thickness. Following the splitting of the frames, softwood pieces were glued to the reverse to create deep members that had been sufficiently enlarged to receive the cradled panel (thickness 2.2 cm); Coremans 1953, pp. 59–60 and 86–87; Glatigny et al. 2010, pp. 253–57; 276–78; 288–89; 299–300; 311–13; 325–27; 332–34; Stehr, Dubois 2014. See also contribution 2 by Ketels, Glatigny and Augustyniak and contribution 1 by Dubois in this volume.

22 Coremans 1953, p. 93.

23 The *City View* and the *Interior View.*

24 I.e. white filler, orange underlayer, ochre-khaki layer, brown layer.

25 Cremonesi 1997; 2004; Cremonesi, Signorini 2004.

26 The solvent mixture was thickened using a polyacrylic acid and a weak base. Use of gel necessitated dry cleaning to remove the excess and rinsing by application of a blend of solvents of weaker polarity; Wolbers 1992; Phenix, Wolbers 2012.

27 Historical treatises contain numerous recipes and application techniques for

solid silver objects and/or metal leaf, with a preponderance of gold leaf, but also silver and tin leaf, which were used in illuminations, in decorative techniques for polychrome sculptures and in paintings. The texts often mention its use to mimic gold by covering it with yellow glazes. The principal historical texts referring to gilding and silvering techniques are: *Mappae Clavicula* (9th–10th century): Smith, Hawthorne 1974; *Schedula diversatum artium* [On Diverse Arts] by Theophilus Presbyter (twelfth century), see Hawthorne, Smith 1979, particularly Book 3: *The Art of the Metalworker*; *Il libro dell'Arte* by Cennino Cennini (1390–1435): see Broecke 2015; *Manuscript of Strasbourg* (1400–1570): see Neven 2016; *Experimenta de coloribus, Manuscripts of Jehan Le Begue* (1431) and *De coloribus et artibus romanorum*, Heraclius, Eraclius (XIII): see Merrifield 1999. For more details, see contribution 5b by Augustyniak, Mortiaux and Sanyova in this volume.

28 Chapter 95: 'The way to decorate walls with gold or with tin', Broecke 2015, p. 130.

29 There is little reference in the literature to coatings used by artists to protect silver, which does not necessarily mean they did not exist. Protein coatings, based on albumen are often mentioned in the Middle Ages, but so too are animal glues, oils and resins; see Bergeon-Langle, Curie 2009, II, p. 1058. For the purposes of this study, the ageing of test-samples reconstructing the stratigraphy of the frames showed that those in which the silver leaf was covered with a coating of albumen displayed less oxidation on the part of the silver leaf and the coloured glazes than the test-samples that were not coated with protein. See *Tests de vieillissement de plaquettes-test en vue d'étudier l'altération des glacis des cadres de l'Agneau Mystique et l'efficacité de divers vernis protecteurs de la feuille d'argent*; study performed by Charlotte Sevrin, Marie Postec and Alexandra Louis in collaboration with Jana Sanyova and Hélène Dubois, KIK-IRPA, April 2014 – September 2016; unpublished.

30 Martin, Eveno, Ressort 1998, p. 106.

31 Martin, Eveno 1994; Salvado et al. 2011.

32 *Les couches protectrices pour les feuilles d'argent: cadres de l'Agneau Mystique*; study performed by Charlotte Sevrin, Marie Postec and Alexandra Louis in collaboration with Hélène Dubois and Marie Postec; KIK-IRPA, July 2015; unpublished.

33 Including notably the recent study: Grissom et al. 2013.

34 Hélène Dubois provided the selection of varnishes based on the conservation literature.

35 Namely Regalrez 1094, Laropal A81, Paraloid B72, PVA 20 Kremer and PVA 30 Kremer.

36 Rousaki et al. 2016a; Rousaki et al. 2016b.

37 Selwyn 2000.

38 Evaluation by Charlotte Sevrin and Alexandra Louis, report dd. 12 April 2016, KIK-IRPA, unpublished.

39 The work to uncover the entirety of the frames was performed between 24 March 2014 and 22 January 2016.

40 At the time of the 1894 intervention in Berlin.

41 Brandi 1963; Philippot 1959; Philippot 1990.

42 The problem of reintegrating metal leaf arises most frequently with respect to gilding and particularly to the retouching of the gilded backgrounds of early Italian or Spanish paintings, in icons, or on frames. Various reintegration techniques have been developed to deal as effectively as possible with gilded backgrounds. They include the *tratteggio* technique (by Paolo and Laura Mora) and selective retouching and chromatic abstraction (by Umberto Baldini). These interventions, even when executed brilliantly, often remain perceptible. No retouching, no matter how illusionistic, can capture the highly distinctive gleam of gold leaf. Tests have also been carried out using gold leaf or powder, which give a better result in terms of sheen. There are few examples, by contrast, of the reintegration of silver leaf. See in particular the articles on this subject by Dunkerton 2001 and Klaar Walker 2011.

43 Rolland-Villemot 2014.

44 Nadolny 2012; Muir 2011.

45 'Suggestive differentiated retouching = an approach in which the retouching provides a general indication of lost form using variation in either or both colour and shape, but no detail. The goal is to provide as coherent an image as possible for the viewer by completing forms without resorting to speculation. The retouching is perceptible at all viewing

distances. It may be built up with a different manner of paint application from the original – often a series of fine lines, tiny dots, etc.'; in Nadolny, 2012, p. 576.

46 To recapitulate, after the polychromy had been uncovered, the frames were given a protective coating composed of Paraloid B72 dissolved 10% in xylene, applied by brush.

47 Lowry, 2010.

48 The Van Eyck set supplied by the Kremer company consisted of twenty-four colours and the solvent used for dilution was 1-Methoxy-2-propanol.

49 See in this regard Van der Velden 2011b and contribution 6 by Jones, Augustyniak and Dubois in this volume.

50 Kremer set.

51 See the contribution 6 by Jones, Augustyniak and Dubois in this volume.