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Setting the Stage, Framing the Picture; the Gilding and Polychromy of Late Medieval Altarpiece Structures in the North

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Abstract. The gilding and polychromy of the structural parts of altarpieces have largely been overlooked in art historical studies. However, these specific designs were important elements in the framing of the sculptural and painted content of the altarpiece complex. This article provides a detailed art technological overview of the gilding and polychromy of the supporting elements of the whole corpus of Northern German altarpieces in Norway. It highlights the medieval craftsman's use of sophisticated materials and techniques, and proves that, in addition to being secondary props, the shrine decorations bore important meanings in their own right, containing intrinsic material and aesthetical values. Furthermore, the study found both change and continuity in the specific craftsmanship throughout the late medieval period. Changes in the layering and three-dimensional effects have been especially useful tools in the correction of previously assumed dates of origin of several of the altarpieces. It is hoped that the results presented in this study, together with a new perspective, encourages further close analyses of the 'backdrop' of medieval altarpieces in future studies.

The religious function of all things 'to stand on an altar'¹ subjected the medieval craftsmen to the doctrinal use of specific materials and methods. In the making of altarpieces, transforming plain wooden boxes into heavenly spheres for objects of worship was a medieval craft often referred to as 'preparation', performed by preparers.² These terms might appear somewhat misleading, because in addition to the preliminary steps such as applying the ground layers and a temporary 'pre-gilding' fitting of the sculptures in the shrines, the

¹ The phrase is taken from the Hamburg guild ordinances of painters and glaziers from c. 1458 (Rüdinger 1874: 90-96), from a region with particularly strong regulations regarding the gilding materials of objects of worship.

² 'Preparer' is the literal translation to English of the German medieval terms used in written medieval sources: *bereder*, *bereiter* and *zubereiter*. See Nadolny 2008 and Heydenrich 207, 279-280, for the role of the preparer, and the meaning of the term 'preparation' in medieval times.

craftsmanship included modelling reliefs and executing gilding, punching, painting and decorative applications. Thus, the work of the preparer had its own powerful aesthetical effect, framing the sculptural scene that would transcend the spectator to the divine.³

In pre-World-War-II scholarship, there has been a lack of attention given to the polychrome expression of late medieval art in the Nordic countries, following a broader art historical tendency in European research.⁴ In the case of large altarpiece complexes, the shrines have received even less attention than the sculptures, a consequence of the secondary importance placed on the colouristic expression of these constituents compared to the sculptures and painted wings. This focus shifted with Tångeberg's seminal book *Mittelalterliche Holzskulpturen und Altarschreine in Schweden: Studien zu Form, Material und Technik* from 1986, which included a large-scale study of gilding and decorative elements of altarpieces, demonstrating a high degree of technical sophistication of these layers and how their identification can act as pivotal criteria in questions of dating and geographical attribution.⁵ This article will expand on these studies, by adding systematic descriptions of the gilding, polychromy and decorative details of the shrines and frames of the wings, as found on 22 Northern German altarpieces exported to Norway in the period 1460 to 1530, with a comparative line drawn to Northern Germany itself.

Since frames in particular have had a high risk of being fully or partially subjected to campaigns of repainting, gathering information on original polychromy could only be achieved by close-up examination with head loupe and different types of lights, enabling the differentiation of original elements from overpaint, and deducing a large amount of information from small fragments. Two altarpieces, *Veien* and *Kvåfjord I*, at the Museum of Cultural History (MCH) in Oslo, were analysed in-depth, with measurements of the polychromy made on the surface using a handheld x-ray fluorescence analyser (pXRF).⁶ Furthermore, paint samples were selected for stratigraphic analysis using scanning electron microscopy (SEM) coupled with energy-dispersive x-ray (EDX) analysis.⁷

³ For further reading on the role of paint and polychromy as mediators of spiritual understanding, see Kollandsrud 2017.

⁴ 'Although great art historians like Lindblom and Roosval, especially the latter, went all over the country and examined and described the objects of medieval art, and German scholars like Paatz, Struck and Heise wrote in the 1920s and -30s about the many objects of Lübeck art in Sweden, nowhere were polychromies described, or even mentioned' (Tångeberg 1970, 318). Gilding and polychromy are not mentioned in Eivind Engelstad's overview of late medieval art in Norway, *Senmiddelalderens kunst i Norge ca. 1400-1535* (Engelstad 1936).

⁵ Data from around 140 Northern German altarpieces (in addition to altarpieces produced in Sweden and the State of the Teutonic Order) provide a foundation for the late medieval material in the book. Similar overviews of material in Northern Germany itself (or other Northern European regions) do not exist, apart from Early Netherlandish production (Verougstraete 2015, 83–102).

⁶ Model Niton XL3t 950-He GOLDD + pXRF. Each scan lasted two minutes, with 30 seconds for each range.

⁷ Instrument specifications: JEOL JSM-840 scanning electron microscope; Software: INCA suite 4.06 Oxford Instruments Analytical Ltd. 2005; Samples were carbon coated. Accelerating voltage 20 KeV.



Fig. 1. *Kvæfjord I Altarpiece*. 130 x 113 x 16 cm. Inv. 3215, Museum of Cultural History, Oslo (MCH). Photo © MCH.

The collected data, gained from minute fragments or pristine surfaces, will not only serve as a valuable source of information on medieval gilding, decorative painting and application practices on an important portion of the altarpieces which often get overlooked. It will also be a prism to explore aspects such as polychromy as an agent of symbolic hierarchies and the relation between form and colour, as well as questions of dating.

The golden interior and frame of the corpus

Twenty-two of the Hanseatic exports of altarpieces from the Northern German region survive today in university museums and churches along the coast of Norway. Their origins were recently explored as part of the author's PhD research.⁸ The Northern German altarpieces have a rectangular form comprising a central shallow, open-fronted box (*the corpus*) and movable wings. The corpus is reminiscent of a theatre stage adorned with an intricately carved baldachin and platform, and a sculptural programme which was unveiled on feast days and hidden by the painted exteriors of the wings on fast days (Fig. 1). The holy sphere of the central shrine was held in the highest esteem in the *Gesamtkunstwerk* (total work of art), and thus worthy of only the finest materials. In the eyes and rules of the Northern German craftsman, this meant that only real gold leaf should be used on the large surfaces of the corpus, while other metals (part gold and silver)

⁸ Kausland 2016.

could be used on the painted wings, in less visible areas and on certain parts of the sculptures. The gold requirement was regulated, as can be seen in the surviving Northern German guild statutes for painters and glaziers in Hamburg (c. 1458) and Lüneburg (1497).⁹ In Hamburg, if the altarpiece was not destined for a humid climate, part gold could be used for the baldachins.¹⁰ Dishonest use of other metals was subject to fines.

On all but two of the Northern German altarpieces in this study real gold leaf was used as the main type of metal, applied on the most visible parts of the altarpiece-shrines, such as the back panels and the baldachins.¹¹ The thickness of the gold in samples from the altarpiece of *Kvæfjord I* is around 2 µm (0.002 mm). After application, the gold was burnished with a suitable tool, such as hematite for the flat parts and agate stone for the mouldings, to create a shiny surface.

While the use of real gold leaf stayed constant on the altarpieces in this study, the build-up of the burnished gilding – the poliments and the ways the layers were manipulated to create three-dimensional effects – differed. Upon analysing these layers, three categories of technical characteristics appeared. Interestingly, these types largely coincided with the previous dating of the altarpieces, as determined through stylistic studies.¹² However, exceptions were observed, where the technological traits of the polychromy and gilding did not fit earlier given dates, resulting in a possible revision of the age of the altarpieces. In the following, the technical specifications of the three categories will be discussed.

Early period, c. 1460–1480

The title of this section does not refer to the early part of the Late Middle Ages, which is usually regarded as initiated with the Black Death around 1350, over hundred years earlier than the altarpieces enlisted here. Rather, the material represents, with one exception,¹³ the oldest material in Norway, given approximate dates: *Trondenes II* (1460), *Vardo* (1460), *Nesna* (1470), *Holmedal* (1480), *Lurøy* (1480), *Bergen St Mary's* (1480), *Fosnes* (1480), *Trondenes IV* (1480).¹⁴

⁹ For the Hamburg statues, see Rüdinger 1874, 90–96. For the Lüneburg statues, see Nadolny 2001, 511.

¹⁰ A dry climate would not put the part gold at risk of tarnishing to the same degree as a humid atmosphere.

¹¹ The two altarpieces without gold are *Uggdal* (consisting of part gold) and *Stranda*. *Stranda* is covered with silver (unoriginal) and might originally have been gilded using real gold leaf. *Holmedal*, *Norddal*, *Hillesøy* and *Fjell* are re-gilded or overpainted but original gilding is documented in reports. Instances where materials other than real gold leaf were used on late medieval altarpieces could be explained by several factors. The guild rules might not have been respected. Alternatively, the altarpiece came from a more peripheral town in Northern Germany, lacking the type of guild regulation as mentioned above.

¹² Engelstad 1936.

¹³ The *Sande altarpiece* (Møre and Romsdal) is dated to the first half of the fifteenth century and not included in this study.

¹⁴ The altarpiece from *Hillesøy* (1460) is not included in this section due to several campaigns of overpaint that obscures the original surface.

The shrines of the early altarpieces have poliments of a specific character. It consists of a thin wash, applied in one layer with streaky brush work. The colours range from bright pink, as seen in *Vardo*, *Nesna*, *Luroy* and *Bergen St Mary's* to dark red, visible on *Holmedal*, *Tronden IV* and *Fosnes* (Fig. 2). The thin wash is more reminiscent of an intermediate layer than a conventional poliment, the main purpose of which was to give colour and secondarily to act as a 'cushion' during the burnishing of the metal layer. However, burnishing – and burnished gilding – does not necessarily require cushioning and colouring poliments: in the twelfth- to the fourteenth centuries so-called ground-gilding was used in Northern Europe, where the gold was applied directly



Fig. 2. Detail back panel shrine, *Nesna Altarpiece*. A thin wash of poliment is visible through the burnished gilding. The gold is decorated with punch work consisting of dot, circle and star punches, and incised lines in the saints' names. Photo © Kristin Kausland.

on the chalk ground wetted with a thin application of glue or egg.¹⁵ Thus, the thin washes found on the earliest altarpieces in this study might reflect a technical transition period between ground-gilding and the more conventional burnished gold gilding on orange to dark red poliments that became the most common gilding technique in late medieval Germany.

After the gold leaf was applied and burnished with a suitable tool, the gilded surface of the shrines was manipulated further with punching and incisions, a technique frequently used in the Northern German altarpieces from the first quarter of the fifteenth century.¹⁶ Punching and scoring in the polished gold would make patterns emerge in the small indentations and incisions when the light reflected upon the surface. The patterns on the eight early altarpieces imitate haloes surrounding the heads of the sculptures (Figs 2–4). First the circle or disc of the halo was traced onto the gold using a compass and a pointed tool, a technique called '*trassieren*' in German, leaving a shallow indentation in the metal surface.¹⁷

¹⁵ The terminology applied to gilding techniques is taken from Nadolny 2001, 124.

¹⁶ Tångeberg 1986, 231.

¹⁷ Indentation refers to a form of marking where the material is compressed by simultaneous pressing and stretching, and in which the metal leaf is usually not torn, though it might be buckled.



Fig. 3. Detail of back panel of shrine, *St Mary's Bergen*. The punch work displays the common design of simple dot-stamps forming rosettes and lines. The incised rays appear three-dimensional: an effect created by rolling the cogwheel in increasingly closer lines towards the edge of the ray. Photo © Kristin Kausland.

and rosette punches (*Vardø, Trondenenes II*) (Fig. 2 and 4). These types of stamps and their frequencies are very similar to Northern German decorations found elsewhere.¹⁸

In addition to punching, the haloes of the altarpieces have incised lines imitating rays, or as in the case of *Nesna*, the saints' names (Figs 2–3). In Northern German shrines, ray-imitation could be made with the aid of a ruler or with a cogwheel (serrated wheels)

Usually several circles were indented, forming narrow bands along the edges of the haloes. These outlines served as a base for punching. Punching was the process of placing a metal stamp perpendicular to the object's surface and tapping with a hammer in order to imprint a small pattern or design onto the surface. The skill of punching lies within achieving a consistent depth and placement of the indentation, without puncturing the metal. Providing that the chalk ground was still flexible, the punch should compress it without breaking the gold leaf. This skill was not always easily achieved: the patterns in Norway often display uneven repetitions and depths of the punches, frequently breaking the thin metal leaves.

The punching was mostly done in a simple manner using only one type of 'dot'-punch to form a larger pattern. A common design is the evenly spaced dots inside the narrow bands of the halo, with rosettes formed by individual dots in the middle (Fig. 3). Further dotted lines divide the rosettes. Variations of this arrangement are found in the haloes of *Fosnes, Trondenenes II, Trondenenes IV, Bergen St Mary's and Lurøy*. In addition to the dot punch, other types are also found, such as different star punches (*Nesna*)

¹⁸ Such as the vast Northern German material in Sweden (Tångeberg 1986, 231–233) as well as altarpieces located in Northern Germany itself (illustrated in the three volumes by Albrecht 2009, 2013 and 2016).



Fig. 4 a-b. Different stamps on the gilded back panels: a) *Trondenes II (high) Altarpiece*: Various rosette-stamps. b) *Vardo Altarpiece*: Small rosette punch. Photo © Kristin Kausland.

creating straight pointed lines.¹⁹ Cogwheels were normal from the second half of the fifteenth century, in Sweden specifically from examples after 1468. Thus, the Norwegian material represents early examples of this technique, where all the early shrines except *Fosnes* display use of a cogwheel to imitate rays, evident from the repetitive pattern and the square form of the single points. *Bergen St Mary's* and *Luroy* show a special use of the cogwheel (Fig. 3). The rays appear three-dimensional: an effect created by rolling the cogwheel back and forth in increasingly closer lines towards the edge of the ray. In addition to this rare pattern, the two shrines also have an identical decorative punching and gilding poliments, indicating a workshop connection. All the decorative aspects discussed in this section, from ground to ornamentation, indicates that this workshop was active 1470–1480, twenty years earlier than the stylistic dating of *Bergen St Mary's* given by Engelstad in 1936.²⁰

¹⁹ Tångeberg 1986, 232.

²⁰ Engelstad 1936, 238. Technical features of sculpture, painting and gilding, elements which will form part of an upcoming publication by the author, supports an earlier date.

Transition period, c. 1490–1510

Some altarpieces are difficult to place within a definite timeframe; for example, *Andenes* displays structural features consistent with fifteenth-century practices, such as a gothic baldachin and simplistic dovetail joinery, combined with post-1500 elements such as pillars and a lower inclined sill (*wasserschlag*). Therefore, care should be given in placing too much weight on isolated pieces of technical ‘evidence’ in the dating, since these developments were not completely linear and the altarpieces in the current study are dated relatively close together. Based on mixed features such as those mentioned above, there are five altarpieces that I have placed in a so-called ‘transition period’ from the fifteenth- to the sixteenth century, displaying both ‘old and new’ features. These are *Horg* (1490), *Andenes* (1500), *Trondenes I* (1500), *Stranda* (1500) and *Hamre* (1510).²¹

All of the altarpieces in this category have dark red poliments, applied in several layers, covering the ground completely. The appearance of the poliments indicates that the material used is bole, a ‘fatty’ sub-species of red ochre, and the most widespread material used as gilding ground beneath burnished gilding. The polished gold leaf background behind the sculptures has received incisions and punching to imitate haloes.²² In the case of *Andenes* and *Horg*, these are similar to the previous group, displaying six-dotted flowers. *Trondenes I* has further decorations in the form of a semi-circle of small dots as well as star-punches, while *Hamre* is decorated in a simple way with few circular punches.

In this group, a new feature has been introduced in creating an illusionary chapel for the standing sculptures. Before starting the gilding, the craftsman reserved an approximately 20–30-centimeter horizontal band in the lower part of the back panel, which after gilding covered with opaque paint, imitated the fringe of a hanging tapestry (Fig. 5). The colours and method of achieving this illusion are consistent on all the altarpieces: it consists of bands of three opaque monochrome colours: white, blue and red. On top, black outlines imitate the swaying threads and the transition from the gold surface to the fringe. With this new, rather simple, element, the materiality of the gilded back panel was transformed from being a solid wall to becoming a textile imitation, a feature that continued with increasingly realistic textures into the last part of the Middle Ages, as we shall see in the next section.

Late period, c. 1520–1540

Altarpieces made in this phase are *Norddal* (1520), *Kvernes* (1520), *Kvæfjord I* (1520), *Hjørundfjord II* (1520), *Uggdal* (1520), *Vevring* (1530) and *Veien* (1530). Engelstad dated

²¹ In addition, the altarpiece from *Fjell* (1500) is part of this group. A modern canvas painting is attached to the back panel of the corpus, obscuring the original surface. Thus, it will not form part of the further discussion.

²² The altarpiece of *Stranda* has an unoriginal silver surface with an unusual grid punch work which is hard to place both in time and stylistically. Since the original appearance is uncertain, the altarpiece will not be discussed further.



Fig. 5. *Hamre altarpiece*. 57 x 57 x 11. Located in Hamre church, Askøy. Photo © Kristin Kausland.

Hjørundfjord II to 1505–1506, which is around twenty years earlier than the date suggested here. Engelstad was certain that the altarpiece was produced by the master craftsman Claus Berg in his Lübeck period, and therefore dated the altarpiece to the last possible year of Berg's presence in that specific town, namely 1505–1506.²³ However, this date clashes significantly with both stylistic and technical features in the shrine, sculptures and paintings. Engelstad's attribution must be seen in the context of a pre-World War II art historical

²³ Engelstad 1936, 247.

tendency to attribute altarpieces to a limited number of known (or fictive) master names, all of whom were supposedly active in Lübeck. Today, upon examination of the sculptures of *Hjørundfjord II*, both carving and polychromy bear little resemblance to Claus Berg's associated works. Rather, the format and features in sculpture, paintings and the shrine (the baldachins, socles) relate it to Hamburg production almost two decades later. A very close relation can be found between the sculptures of *Hjørundfjord II* and the *Petri-Altar des Fischeramtes* in St Jacobi church in Hamburg, dendrochronologically dated to c. 1524.²⁴ A similar case of incongruence between previous date and both material and formal qualities is the altarpiece of *Uggdal*, dated to around 1500 by Engelstad.²⁵ Again, technical features point to a date twenty years later.²⁶ Such features, as observed in the shrine's upper layers, will be discussed below.

The poliments beneath the burnished gold in these late altarpieces have a dark red brown colour, similar to the altarpieces in the 'transition-group', resembling the conventional material bole.²⁷ Indeed, analysis of *Kvæfjord I* identified the poliment as bole (containing iron, aluminum and silicon) mixed with chalk and some lead. Analysis shows that the poliments of *Kvæfjord I* and *Veien* are approximately 15 µm (0.015 mm) thick. On both, the poliment was applied with streaky broad brushstrokes. It seems to have been applied swiftly, in several thin superimposed layers, with two to three applications. The direction of the brushstrokes varies, mainly running vertically. It was applied over the incised lines in the ground that delineated the areas where metal leaf was to be applied.

The imitation of fringes, as first seen in the 'transition-period', stayed constant, employed on all the altarpieces in this late category, except behind scenes like the Crucifixion in *Vevring* and *Norddal*. In addition to fringes, the remaining back panel was further manipulated. To imitate tapestries of contemporary luxurious fabrics with decorative patterns, a texture in the form of a subtractive relief was carved into the ground (*Fig. 6*). The textures were achieved by first carving the outlines of the pattern with a pointed tool in the ground, followed by filling either the ornamental pattern or the background with zigzag lines carved into the ground.

Zigzagging was created by oscillating a chisel or gouge over the ground, imitating threads. The technique is usually referred to in German and Nordic literature as 'tremolierung' and 'trambulering' respectively, adapted from goldsmiths' terminology.²⁸ It has no precise English translation, but in frame terminology, the term 'zigzag hazzling' is used

²⁴ Klein 1994.

²⁵ Engelstad 1936, 225.

²⁶ In addition to the technical features discussed in this article, both sculptures and paintings can be related to specific workshops active in the 1520s. These workshop relations are the theme of an upcoming publication by the author and Dr Philos Peter Tångeberg.

²⁷ Bole is a natural mixture of hydrated ferruginous aluminium silicate clays, coloured with iron oxide, similar to ochre in composition.

²⁸ Oellermann 1978, 59.

for the same technique, and will also be employed here. After the relief with zigzag hazzling was engraved, the complete surface was poliment gilded and the even parts burnished, so that the textile pattern would stand out both through contrast in surface texture and gloss, imitating a real textile.

Carved relief with zigzag hazzling is claimed to have arisen in Lübeck at the end of the 1470s, in the workshop milieu around Bernt Notke.²⁹ However, the first known example of the technique is found in Ulm in South Germany, on the *Sterzinger Altarpiece* of Hans Multscher from 1456.³⁰ Although a few other early examples from Tyrol and Lübeck also employed this technique,³¹ it was not until the 1470s and 1480s that the technique became more frequently used in the whole of Germany.³² It quickly replaced other methods of producing textile patterns by manipulating the ground.³³ From the sixteenth century onwards, this ‘*Allerwelts-Strukturieretechnik*’ was employed in both northern and southern Germany to depict all kinds of textures, such as on the back panels in the shrines.³⁴ Before this period, this technique was mainly used on the clothing of the



Fig. 6 Detail, back panel shrine, Vevring altarpiece. To imitate luxurious textiles, a texture in the form of a subtractive relief was carved into the ground, such as this popular oak branch pattern. Photo © Kristin Kausland.

²⁹ Hasse 1970, 43.

³⁰ Koller 1981, 222.

³¹ Lienhart Scherhauff (‘Brixner master’) used the technique on his sculptures dated to the 1460s in Tyrol (Koller 1981, 222). Of Northern German altarpieces, Tångeberg mentions Stenrat’s *Birgitta Altarpiece* in Vadstena from 1459, where carved relief with zigzag hazzling appears in the back panel of the central shrine, as well as Stenrat’s *Bälinge Altarpiece*, dated 1471 (Tångeberg 1986, 215).

³² Tångeberg 1986, 215.

³³ These alternative methods include incising straight parallel and diagonal lines in the ground layer, in German called ‘*trassieren*’ (Oellermann 1978, 51). Carving and engraving are technically different from incising, due to greater depth achieved by removing more of the ground material, and the use of engraving tools which one pushes rather than draws with (Straub 1984, 168).

³⁴ Straub 1984, 170. Tångeberg 1986, 218.

sculpted figures, while the ground in the back panel was not treated in the same manner.³⁵ This fits the dating of the Norwegian material well: the technique is observed on pre-1500 sculptures, such as on the *Luroy* sculptures from 1480, and inside the mandorla of *Bergen St Mary's*, however not on the larger areas of the back panels.

On the late group of altarpiece shrines, carved relief with zigzag hazzling was employed consistently on the back panel behind the sculptures. The technique is occasionally combined with punch-work in the halo (*Hjørundfjord II*), however most commonly the punch work is now replaced by letters forming the saint's name standing raised on a background of zigzag lines.

A popular pattern for the textile backdrop imitation on shrines consists of oak leaves with cut branches and acorn twigs (*Fig. 6*). It reoccurs on thirteen altarpieces produced *c.* 1520–1530 in Scandinavia and Germany, including three in Norway.³⁶ The patterns have small variations, such as differing forms of zigzag hazzling, and are invariably used from both sides of a stencil or tracing, resulting in patterns which are similar but mirror-like. Another dissimilarity is the remarkable difference in thickness of the ground and the extent of modeling relief. In *Vevring*, the relief is created not only through carved outlines, but also through some further modelling of the pattern form, which created shadows and enhanced the three-dimensional effect. This stands in stark contrast to some of the other flat patterns. Rather than indicating a Lübeck-provenance, let alone a workshop connection, it rather seems that the specific oak branch pattern spread to workshops throughout the whole of Northern Germany and elsewhere in the late part of the late medieval period.³⁷

The symmetrical, rigid and continuous patterns attest to a mechanical – and not freehand – method for transferring the patterns. However, none of the Norwegian examples clearly indicate the specific transferal technique. It could have been pouncing a cartoon or using stencils; however, in such cases, the dotted or drawn outlines of the transferred design were likely removed upon engraving, and eventually covered with gold. Thus, exact methods of copying have so far only been suggested, but unfortunately not proven.³⁸ On the painted wings of both Northern and Southern German altarpieces, pouncing holes and dots of black are occasionally found under similar patterns, imitating brocaded textiles.³⁹ This method would have been an equally efficient way to provide the large areas of the gilded backgrounds with ornament.

³⁵ Tångeberg 1986, 218.

³⁶ On the back wall of shrines from Rostock, Riestedt and Wienhausen (Germany), Köping and Arboga (Sweden), Bjugn, Norddal and Vevring (Norway), as well as four Danish churches. Illustration of the traced pattern in Köping and Arboga can be found in Tångeberg 1986, 284.

³⁷ This topic is investigated further in an upcoming publication by the author together with Dr Philos Peter Tångeberg.

³⁸ Use of stencils, tracings and pouncing has been suggested in relation to both Northern German (Tångeberg 1986, 220) and South German altarpieces (Westhoff and Hahn 1996, 19).

³⁹ See for example Doose et al. 2001, 60 and Bachmann et al. 1970, 363.



Fig. 7a-b a) Trondenes IV Altarpiece. The frame mouldings of the wings in first sight: red front, blue cavetto and gilded ovolo. b) Uggdal Altarpiece. The frame mouldings of the wings in second sight: red front with yellow bevel. Photo: Kristin Kausland ©.

The polychromy of the wing frames

Contrary to the shrine discussed in the previous section, where clear technological developments could be discerned, the treatment of the frames of the wings, however, stayed largely consistent throughout the whole Late Medieval period. This system was based on colour order. The first sight of the wings was either gilded or red, while the colour of the second sight was dictated by the colour of the first sight: those with a gilded first sight are always red, while those with a red first sight have a red or a black frame on the second sight. In addition to a clear colour order, the system reveals a deliberate material hierarchy, ranging from the symbolically more important interior towards the exterior, where gold is reserved the interior. This material consideration was already practiced in the Marian tabernacle shrines which have survived in Norway, dating pre-1300.⁴⁰ In addition, the frame mouldings were painted using another system, this time

⁴⁰ Kollandsrud 2017, 229.

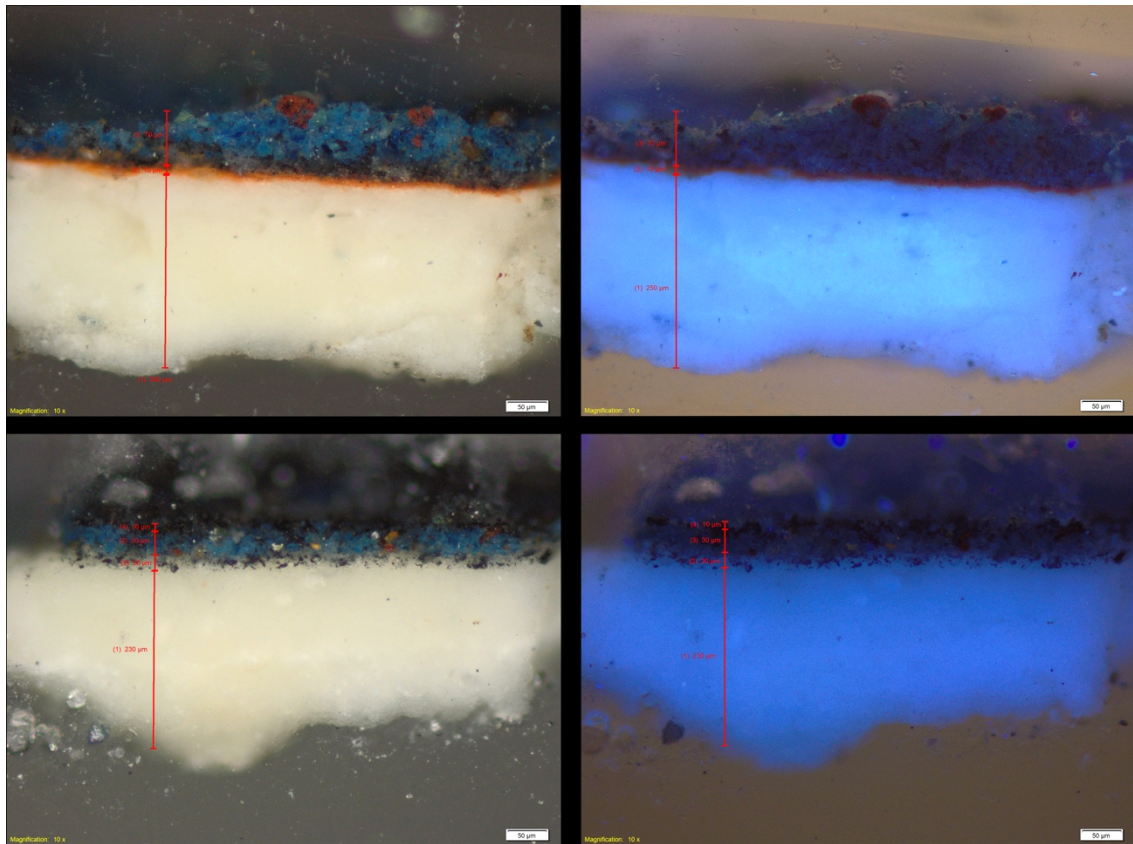


Fig. 8a-d Kvæfjord I Cross-sections (100X) of blue paint on central shrine. a) Cavetto on frame: 1) Chalk ground 250 μm . 2) bole 10 μm . 3) Black underlayer 20 μm . 4) Blue layer of azurite and ochre 50 μm . b) Interior of box frame: 1) Chalk ground 230 μm . 2) Grey underlayer 20 μm . 3) Blue layer mixed with ochre 30 μm . Photo: Kristin Kausland ©.

dictated by form: the hollow mouldings of the cavettos are blue, the convex shape of the ovolos are gilded, while the chamfers are yellow (*Fig. 7*). After the paint, stencilled gilding was applied to the frames, creating the final decorative patterns to adorn the structures. In the following, the specific materials and techniques of the polychromies of the wings will be presented.

Blue

It was a tradition of Northern German polychromy to paint the cavetto – the deep concave curve of the frames and architectural lists – with a blue matte colour, bound in a proteinaceous binding media. The properties of the matte blue colour reinforce the negative form of the hollow moulding, and increase the effect of the bright adjacent colours of either red or gold. This correlates to scholarly discussions on the symbolic use of blue, a

colour which neighbours black and the ‘absence of light’ in pre-Newton colour systems.⁴¹ Its symbolic meaning has been connected to ‘hidden light’, and to the pulsation between a ‘positive and negative theology’ when used to contrast bright colours.⁴²

Visual investigations, combined with sampling and analysis of *Kvæfjord I* and *Veien*, revealed that the blue colour is made up of azurite: basic copper carbonate, $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$. In *Kvæfjord I*, the blue layer (approximately 50 μm thick) contains coarse azurite particles mixed with some red ochre (*Fig. 8*). In addition, the layer contains other elements connected to the source mineral deposit, such as aluminum and silicates. The azurite is applied on top of a 20 μm thick dark underlayer, ranging in tones from light grey to black. Dark underlayers seem to be present beneath most of the blue frame details on Northern German altarpieces in Norway, made visible through losses and abraded upper layers.

In late medieval Northern European polychromy, use of a layered structure with azurite on a dark (grey or black) underlayer was a preferred technique when using the tempera medium to ensure that an intense blue tone was obtained.⁴³ Northern German altarpieces follow this practice, as exemplified here and in similar case studies from Denmark, Sweden and Hamburg.⁴⁴ The azurite blues are occasionally applied in a two-layer system with increasing degrees of particle sizes to make the colour more intense on the surface.⁴⁵

Red

A bright red was used on the flat front of the wing frames of seven of the altarpieces in this study.⁴⁶ It usually consists of two to three layers: a lean red lead underlayer overlaid with a brighter red and/or an oily red glaze. In *Veien*, the 15 μm thick red lead underlayer is mixed with some vermilion (*Fig. 9*). In *Kvæfjord I*, the 10 μm thick red lead underlayer is mixed with lead-tin yellow. On both, the organic red upper layer is approximately 5–10 μm thick. The transparent glaze added luminosity to the colour upon interaction with light, a property that revealed its ‘invisible qualities’, according to Aristotelian thinking.⁴⁷ The brightness of the red would increase in contrast with the dark matte blue of the adjacent hollow moulding, revealing how the concept of light in pre-Newtonian colour perception governed the making and perception of medieval polychromy.⁴⁸

⁴¹ Kollandsrud 2017, 110.

⁴² For a thorough discussion on the symbolism and use of blue in the East and in Western stained glass windows, see Kollandsrud 2017, 108-114.

⁴³ Tångeberg 1986, 240.

⁴⁴ Larsen 1970, 10-17; Tångeberg 1986, 240; Doose et al. 2007, 65; Doose et al. 2001, 64.

⁴⁵ Tångeberg 1986, 214, 40. This use is also seen in Netherlandish and Swedish altarpieces, as well as in other regions of Germany, such as in the *Herlin Altarpiece* (Bachmann et al. 1970, 353).

⁴⁶ The remaining altarpieces were either gilded (six) or have overpaint that obscures the original surface (eight).

⁴⁷ Kollandsrud 2017, 90.

⁴⁸ For a thorough explanation of such concepts, the reader is referred to Kollandsrud 2017. In her PhD thesis, Kollandsrud analyses and interprets pre-1300 polychrome sculpture in the light of early theo-

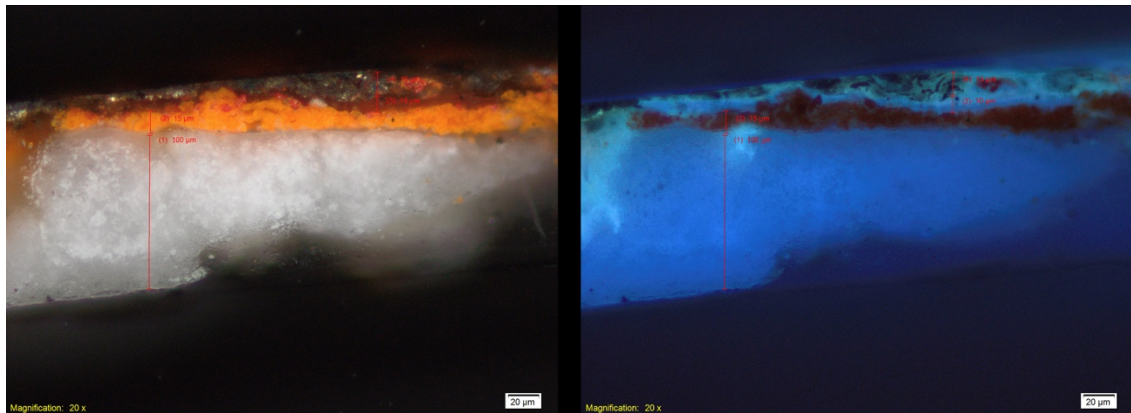


Fig. 9 Veien Altarpiece. Cross-section (200X) of red paint with corroded silver pattern interior box frame, in normal and UV light. 1) Chalk ground 100 µm. 2) Underlayer of red lead with some vermilion 15 µm. 3) Organic red glaze 10 µm. 4) Silver leaf 2-5 µm. Photo: Kristin Kausland ©.

The almost consequent use of a two-layer system is a continuation of a practice already common in twelfth century sculptural work, where the red was achieved through the use of an opaque and light base colour with a darker red glaze on top.⁴⁹ The same two-layered system of an orange red lead layer with a dark red glaze is present on the Northern German altarpieces in Sweden, and other places such as *St Mary's Altarpiece* from the high altar in Hamburg cathedral⁵⁰, and in numerous Lübeck altarpieces.

On the altarpieces in Norway, the thickness of the layers varies, and occasionally the upper red glaze seems to have been omitted or removed, revealing the yellowish red lead tempera-like colour. This type of matte tempera-like single layer of red lead was also applied to less visible areas of shrines, such as behind the baldachins. Often coarse brush application of the thin paint layer is visible on top of the white ground. Although analyses have not been taken, the brown tone of these areas indicates that some ochre was mixed with the red lead.

Yellow

The yellow bevel of the exterior frames consists of a light, opaque and monochrome paint (*Fig. 7*). This part of the frame is situated closest to the painted saints, and serves to cast a radiating line around the iconographical content. The choice of paint, and not gold leaf, to achieve such an effect can be interpreted in the context of the doctrinal absence of any gold on the symbolically less important closed state. The yellow 'substitute' consists of the pigment lead-tin yellow, which is a lead tin oxide compound. Lead-tin yellow type I, with composition Pb_2SnO_4 , was widely used in paintings throughout Europe until the first half

logical-scientific thinking, where colours are classified based on their inherent brightness and darkness.

⁴⁹ Tångeberg 1986, 240.

⁵⁰ Doose et al. 2001, 67.

of the eighteenth century.⁵¹ The same appearance of the yellow is observed on the late medieval altarpieces in Lübeck and elsewhere in Northern Germany, applied to the bevelled moulding on the exterior sides of the wings. Although there are few published case-studies with scientific data, the similar appearance of these surfaces attests to the use of the same type of pigment, lead tin yellow, as on the Northern German altarpieces in Norway.

Stencil gilding

All of the painted frames of the wings of the Northern German altarpieces have metal decorations, applied through stencils, as indicated by the similarity in type and form, and their appearance at regular intervals. Stencil gilding is a matte gilding technique frequently used for decoration in Northern Europe from the second half of the thirteenth century.⁵² The stencil was made by cutting a pattern out of stiff paper or parchment and positioning it on the painted surface, which in the case of the objects in this study, were not completely dry. A metal leaf was placed on top of this, which upon contact with the surface, attached to the sticky paint. Thus, the technique required no use of a mordant, glue or varnish between the paint and the metal to secure the attachment of metal, something which was confirmed by the absence of such intermediate layers upon examinations of the stratigraphy in samples from both *Kvæfjord I* and *Veien* (Fig. 10). After the stencil was removed and the adhesion between the metal and paint was sufficiently dry, superfluous foil was brushed away. Using this method, stencilled decorations in the shape of stars, rosettes and lilies were applied to the frames of the Northern German shrines and wings throughout the whole late medieval period.⁵³

There seems to have been a transition in type of stencils used on the Northern German altarpieces in Norway, from flower-stencils used on the early examples to meander patterns used on the latest ones. The meander pattern is made up of silver leaf (which has completely blackened), alternating with rosettes of part gold.⁵⁴ There is no hierarchical difference between the type of metal or stencil pattern applied to the symbolically more important first sight of the frame from the second sight. On both sides, silver leaf seems to have been applied with part gold rosettes in the corners and in between the pattern (Fig. 10). Also recurring are carnation stems. Lily motifs are less common, observed only on *Vevring*. *Vardo* has another rare type of floral decoration, which is combined with a meander pattern on first sight and rosettes on the second. Interestingly, in the current study it was found that similar stencils using the same variations were applied to the frames on both sights of the *Segeberga Altarpiece* in Sweden. Both altarpieces, dated to the 1470s, also had rosette stencils applied to the backgrounds of the paintings: a feature not seen in the newer altarpieces. In addition to the similar traits in the gilding of

⁵¹ Eastaugh 2004, 232.

⁵² Nadolny 2001, 142.

⁵³ Tångeberg 1986, 273.

⁵⁴ The metal used for rosettes was not analysed, however, it has a warm golden tone and occasionally small specks of silver sulphide oxidation, suggesting it is part gold.



Fig. 10. *Kvåfjord I Altarpiece*. The wing in first sight with stenciled gilding creating a meander pattern of silver and rosettes of part gold. Photo © Kristin Kausland.

the wings, the same painter must also have painted the wing panels of both altarpieces, as clearly revealed by similarities in style and technique. Thus, the use of similar stencil patterns in all likelihood relates to common workshops, and not a template that spread through influences and migration of craftsmen.

Concluding remarks

Like modern theatre, the scenic design of medieval altarpieces had the important aim to transform a stage to an illusionary sphere. Like the stage-crafts, the fashions and technological trends of altarpiece-sets evolved throughout the decades. However, there was one constant element throughout the late medieval 'heyday' of altarpieces, namely the glam and glitter of real gold. The continuity of gold must be seen in the context of the creation of a holy scenery in the symbolically important *corpus*, while the changing techniques of three-dimensionality are related to the increasing interest in portraying lush and luxurious brocades towards the end of late medieval times. This study is a proof of concept on how the technological analysis of the altarpiece backdrop unveils an atmosphere belonging to a specific decade, and thus can act as an investigative tool to complement or correct stylistic dating.

Contrary to the changing nature of the *corpus* interior, the frame polychromy stayed constant throughout the Late Medieval period. The colour system was based on broader

pre-Newtonian perceptions of light and colour, and of material hierarchies and properties. While regional adaptations occur, the general idea prevailed: specific forms required certain materials, and colours were applied to single parts depending on their placement in the altarpiece hierarchy. Thus, the medieval craftsman acted as part of a larger theological proto scientific system spanning the whole Catholic period and world.

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