
Oxford History of Art

Northern Renaissance Art

Susie Nash

OXFORD
UNIVERSITY PRESS

Physical Evidence and Technical Examination

Knowledge of materials and processes is part of the equipment for understanding why a painting is what it is and not otherwise

W.G. Constable, from *The Painter's Workshop*, 1954¹

5

Another way in which we can get, more literally, under the surface of the works of this period is with technical and physical examination of the objects themselves. In the last forty years increasingly sophisticated technical methods of examination, using techniques from radiography and infrared reflectography to dendrochronology and gas-chromatography-mass-spectrometry have presented us with a vast body of new material about how, when, and where paintings, and increasingly sculpture and other art forms, were made and how they may have originally looked. Like the documents, the results of these studies are an indispensable tool used throughout this book and some introductory remarks about their methods are pertinent here, focusing on Netherlandish panel painting, since within our period this area has received the most concentrated attention from these methods of study over recent years.² Although technical findings may be termed scientific, they are no less open to interpretation than documentary evidence, and their limitations as well as their potential must be understood. Physical evidence, not easily divided from technical evidence, relates to the information gleaned from a close study of every facet of an object: the frame of a painting, the bottom of a sculpture, the reverse of a print or drawing, the back of a tapestry, the

29

The Flémalle panels (35) being removed from the wall for reframing by curators and staff at the Städel, Frankfurt.

Detail of 32



30 Circle of the Master of Flémalle (Robert Campin?)
Reverse of the Seilern Triptych with wings open [31].

There is no trace now of paint or ground on the exterior wings (which have been scraped down), but these would have been painted, possibly with fictive marbling and coats of arms.



31 Circle of the Master of Flémalle (Robert Campin?)

The Entombment and Resurrection of Christ with a Kneeling Donor (the 'Seilern Triptych'), oil with some egg tempera on Baltic oak, c.1425.

The donor's scroll is blank. Our only clue to his identity is the purple flower set prominently against the tomb of Christ, which also reappears on either side of the donor in the wing, and may be his emblem. Although traditionally attributed to the Master of Flémalle, the paint handling and technique of this triptych are very different from the Flémalle panels [35] or the *Nativity* (cover).

32 Circle of the Master of Flémalle (Robert Campin?)
X-ray of 31.

The x-ray registers the paint surface, the ground, the support, and whatever is on the reverse all at the same time. Heavy elements like lead white or metals appear white. The dense, straight, vertical grain of the wood, characteristic of Baltic oak, is made visible where the white of the chalk ground sits in the grooves of the grain. X-rays will also reveal areas of loss and restoration.

hinges of a gold triptych, the gatherings of a manuscript, can each reveal much about original appearance and use, condition, place of production, and the artist or date.

The reverse of an object is often the best place to begin any investigation [29, 30]; the back of a carved work can reveal whether it was intended to be seen in the round, or if and how it was attached to something, or part of a larger ensemble, as well as how it was made [138]. Conversely, if a panel is painted on the back, with imagery, coats of arms, or fictive marbling or jasper (a technique found in many of van Eyck's smaller panels), then we can be fairly certain that the reverse was meant to be seen, and such panels cannot have been intended for a fixed position against a wall but were designed either to be handled or to be set in a manner which allowed the back to be visible.³

The reverse is also often the place where evidence concerning an object's earlier history or provenance is found. The back of the Seilern Triptych, attributed to the Master of Flémalle (identified by some as Robert Campin), a work with no external evidence to locate or date it, looks initially unpromising [30, 31, 32]: however, the nineteenth-century inscriptions written on it give us some indication as to its provenance, since they record two Neapolitan names, suggesting the work was at some point in that region, possibly an early export as were so many Netherlandish panels. The material evidence of the traces of a wooden baton running vertically down the back, clearly a later addition, and its treatment, supports this: this baton is made of poplar, and the coating is of gesso (calcium sulphate), both of which are Italian materials (the north more commonly used chalk, calcium carbonate), indicating these additions were done in Italy; however the panel proper, as with all paintings made in the Netherlands, is made of Baltic oak (for its supply and properties see p. 20).⁴ The type of wood used can thus be an important indicator in localizing an object. Baltic oak indicates a northern, usually Netherlandish place of manufacture; walnut is found mostly in France, but was also used for carving in the Netherlands; spruce is found in Germany, while pine was used in much of Spain, although both Spain and





33 Rogier van der Weyden
Triptych of the Virgin (the
'Miraflores Altarpiece'), oil
on Baltic oak, c.1442–5.

The fixed form of this triptych with three equal parts which did not fold was foreign to the Netherlands and must have been dictated by its Spanish patron. The decision to place the Virgin in red in the centre scene, which provides such a dramatic framing for the body of Christ, was the one element not followed in the copy made for Isabella of Castile [34], perhaps because in consequence St John the Evangelist, to whom she had a particular devotion, could not be dressed in his traditional red.

Portugal imported Baltic oak and used it on occasion for panels; in Italy, poplar was used universally for panel paintings.⁵

The huge advantage of Baltic oak for art historians is that its growth rings over a period of hundreds of years have been mapped using a body of reference material of known date to create a master chronology that can provide a sequence by which any piece (if the edge can be examined) may be compared and through statistical analysis dated by dendrochronology.⁶ Allowance has to be made firstly for rings removed with the sapwood when the wood was cut into planks, usually radially, which can be anything from 9 to 36 rings for Baltic oak, with a median of 15; secondly for seasoning time, which is generally thought to be around 10–15 years for fifteenth-century paintings; and thirdly, with narrow planks, for the possibility that they have been cut from the centre of the tree, the heartwood (suggesting a misleadingly early date). Dendrochronology cannot then tell us a precise year for the creation of a work, but it can give us an absolutely reliable point before which a work cannot have been painted or carved because the tree from which it was made was still growing. This has been most useful in distinguishing works which, once thought to be contemporary versions made in the same workshop as the original, are now shown to be replicas made at an often much later date, and not even, necessarily, in the same region or country as where the original was produced. This was most dramatically demonstrated for the two almost identical versions of a triptych associated with Rogier van der Weyden, one in Berlin, long thought to be a copy produced in his workshop, and one split between Granada and New York [33, 34], long thought to be the original given to the monastery of Miraflores near Burgos by Juan II of Castile, since it had a provenance to the collections of Isabella of Castile, his daughter. When the wood of these works was tree-ring dated, however, it was revealed not only that the Granada–New York one was in fact the copy, but that it was a copy made long after Rogier's death since the tree was still growing in 1473 (Rogier died in 1464). Moreover, because tree-ring dating can identify if the planks in



34 Spanish copy after
Rogier van der Weyden (Juan
de Flandes?)

Reduced copy of 33, oil on
Baltic oak, c.1490–1500.

one panel come from the same tree as those in another panel, it can give us fascinating evidence of origins and associations: in this case, it could also be determined that the Granada–New York copy was made in Spain, not the Netherlands (which makes sense), and that it was probably made by Juan de Flandes (c.1465–1519), Isabella of Castile's court painter there, since planks from the same tree were used to make another altarpiece painted by that artist for Miraflores around 1500.⁷

With both panel painting and wooden sculpture we should always look for their joins: these are often visible with the naked eye, however well constructed a work is, although for panel paintings in particular an examination of the back or an x-ray can confirm their composition, and reveal how the planks were fixed together [32]. It will be the areas along the joins where most restoration is likely to have taken place and so attention should be paid to them for this reason alone. Looking at panel joins in relation to the composition of the work painted on to them is also insightful: the better artists composed, wherever possible, with these points in mind, and avoided placing the faces of the key figures in their narratives over these areas, since they knew this was where the damage would occur over time as the wood expanded and contracted with varying weather conditions; in the Seilern Triptych [31], the joint in the centre panel is off-centre, running down between the Virgin and St John but avoiding both their faces.

The construction of panels and their frames can also be an important indicator of a work's original appearance, display, or use. Differences in construction across the same work require explanation: the three large panels of similar dimensions, showing the Trinity, the Virgin, and St Veronica, now in Frankfurt [35], which form the centre of the group given to the Master of Flémalle, were long thought to be part of a painted triptych. However, the methods by which each panel was constructed vary radically from one to another (see 36), and thus demand another explanation—either the panels are from three

**35 Master of Flémalle
(Robert Campin?)**

Virgin and Child, St Veronica, the Trinity (the 'Flémalle panels'), oil on Baltic oak, c.1440.

The panel of the Virgin has an unusually broad unpainted edge, indicating that it had a thicker frame than the Veronica and the Trinity, presumably because its reverse was set with sculpted reliefs which required extra support and fixings.

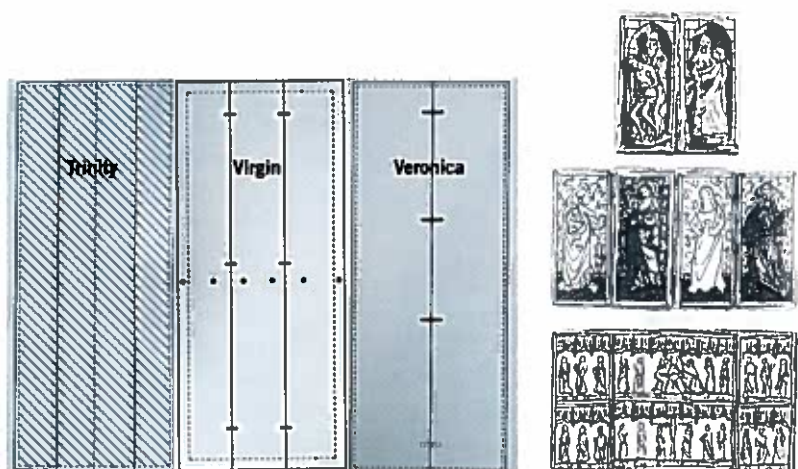


different works (which the visual evidence and that of provenance makes highly unlikely) or they formed a different type of object; the Trinity cannot be the reverse of the St Veronica, as had been assumed, but the Virgin and the St Veronica had to be visible together, given how carefully the visual plays between them have been thought out. The vital clue was in the series of dowel holes running in a horizontal line almost halfway up the Virgin and Child panel. These dowels, which do not hold the panels together, must have had a purpose, suggesting something was fixed along this point: the likely explanation is that the panels originally formed part of a double-winged folding triptych which had a sculpted interior (see 36 and 169 below). The Trinity would then be seen when the altarpiece was closed, the Virgin and Veronica would be seen together as part of the first opening, and on the reverse of the Virgin, as it, in turn, opened up to reveal the interior, would be two smaller

36

Diagram of construction of the three panels in 35 (by Joachim Sander) and hypothetical reconstruction (by Stefan Kemperdick).

This diagram of the construction of the Flémalle panels shows clearly that the Trinity cannot be the reverse of the Veronica, and that the Virgin and Child panel has a series of dowels across the centre which need to be explained. The reconstruction of these works into a double-winged, carved retable, would explain the structural differences and anomalies.



sculpted or painted scenes, the frame of which would have been held in place by the horizontal dowels.⁸ This double-winged form was particularly popular in Germany (see Part V), and might suggest that these panels were painted for a location in that region.

Close attention to the construction and condition of works can also give us evidence about possible ways they were kept, handled, and viewed: evidence of wear on parts of an image might suggest it was held frequently, touched, or kissed in a particular manner (the faces and feet of Christ and the Virgin or depictions of relics are particularly likely candidates for such wear, evident in 31). Original frames can reveal a surprising amount about display and viewing practices: Jan van Eyck's portrait of his wife, Margaret van Eyck [98], has a frame with a type of construction that suggests it was never intended to be hung from a chain or other form of suspension, but possibly set on a stand of some sort.⁹ The way the frames of diptychs are treated can reveal which was meant to be the primary side when shut, and thus indicate which way they were meant to be opened: Hans Memling's Diptych of Maarten van Nieuwenhove [208] has a more fully carved, complex frame on the reverse of the panel with his praying portrait on it, suggesting that this side was the 'top', which would be opened to reveal the other panel, showing the Virgin, below;¹⁰ Jan van Eyck's Annunciation Diptych [174] has reverses painted to resemble red marble, but finished to be smooth flat surfaces with no frame at all. This is an unusual form for panels painted on the reverse, chosen perhaps to enhance the illusion that, when closed, the object was a solid slab of stone.

For insights into the various possibilities for how painted works were designed and executed, two investigative methods have provided remarkably fruitful, although the images they produce are rarely straightforward to read or interpret. These methods are infrared reflectography and x-radiography, both of which reveal more than is visible to the naked eye. What an x-radiograph registers is the atomic weight of materials, so that any pigments or parts containing heavy elements, usually metals (iron hinges or nails, lead-based pigments like lead white, lead tin yellow or red lead), will show up very white on the image. They are therefore excellent tools for understanding the construction of a panel, revealing how and where planks are joined and traces of original hinges, which might indicate that a single panel originally formed part of a diptych or triptych, but also for considering the actual paint layers.¹¹ It is important to compare the x-radiograph to the panel itself, both its back and front faces, since x-rays pass right through the work, creating an image of the whole object simultaneously, so that back and front are superimposed, and what might appear to be on the surface in an x-radiograph may not be so at all. In the x-ray of the Seilern Triptych [33], the white band across the top is the added baton on the reverse, which is coated with a lead-rich white pigment or preparation, while the band across the centre which registers as darker than the rest in the x-ray is where the surface has no coating at all on the reverse, as the baton has been removed.

An x-ray will also show something of how paint was applied and manipulated: it can reveal the brushstrokes of a priming layer, and it can indicate

how heavily lead white was used to model forms (which can help date a work or distinguish copy from original—painters earlier in our period tended to use lead white relatively sparingly, while by c.1500 it is much more heavily applied). In the Seilern Triptych the x-ray reveals how the three areas of red drapery in the central panel (that of the robe worn by the Mary seen from behind, that of the angel in red above, and that of St John) are all modelled using very different distribution and application of lead white pigment (see detail heading this chapter). The reasons why such a variety of paint handling is to be found in this work are open for speculation—it may be that several different hands were involved, but it may also have been a deliberate choice on behalf of one artist to create varying effects, thereby suggesting the differences between the fabrics represented: the angels' robes appear to be shot silk, while that of the Mary seen from behind is clearly a heavy wool.

Most importantly, perhaps, x-rays can reveal changes made at a relatively late stage in the creative process, when something already established in the paint layer has been altered by another layer of paint, revised by the artist or by a later hand. This is evident in the x-ray of the Seilern Triptych, where we can see how the painter has adjusted the area around the heads of Christ and the Virgin to make less fussy conjunctions of form and colour, extending the hair of Christ in the final paint layer to cover much of Joseph of Arimathea's sleeve. This sleeve, as can be seen in the x-ray, is painted in full underneath Christ's hair: artists would normally leave a reserve, that is an unpainted area, for the whole of a figure, and would not paint in parts of a figure which were not to be visible.¹²

To see beneath the paint layers, that is to view the underdrawing on the white prepared surface of the panel before the painting stage began, a different method is needed—using infrared radiation.¹³ This does not penetrate all the layers of a painting as x-rays do, but instead the rays reflect off the white surface of the ground, while being absorbed by any carbon-based materials, as were routinely used for drawing, such as black chalk and inks. The contrast between reflecting areas and absorbing areas gives a black and white image; however, the image produced is a composite one of all the upper layers, and as such the visibility of any drawing on the ground of the panel will depend on the nature of these paint layers themselves: black and gold cannot be penetrated at all; the green pigment malachite and the blue pigment azurite absorb all but the longer wavelengths of infrared radiation, requiring equipment sensitive to these longer wavelengths to detect the signal,¹⁴ whilst red lake absorbs little of the infrared radiation, allowing exceedingly good penetration. As a result, the number of layers and their thickness will have an effect on how much is seen, as will the nature of the drawing material used: iron gall ink does not show up at all, while silverpoint can register very faintly, which leaves some works looking as if they have very little underdrawing, like Jan van Eyck's *Self-Portrait* [106], when this may not be the case at all, as close examination of the surface under the stereobinocular microscope can reveal.¹⁵

Interpreting reflectograms, like interpreting x-rays, is not always easy. Which lines are drawings under the surface, and which are painted lines in black on the top surface of the work, can be hard to distinguish. Our expectations of these types of images can be too high: we are tempted to imagine a reflectogram is of a similar validity as a picture of the surface. Moreover,

scholars have wanted to see this technique as the way forward in attributional issues, which it has, on the whole, proved not to be. The creative moment, the hand of the master, may not be this one: underdrawing could be a stage in the production process given to assistants who transferred up a model onto the panel for the master, and works documented as by the same painter may have completely different styles of underdrawing. Indeed, underdrawing may vary in style and form even within a single work: thus the exteriors of the Portinari Triptych by Hugo van der Goes [66] and the Dombild Altarpiece by Stefan Lochner [14] are underdrawn in a different manner to their interiors, less freely and with more detail, which may have several explanations: an assistant may have transferred the drawing up in this area, or the artist may have wanted a more extensive graphic plan for himself or for an assistant to follow in these areas in the paint layers.¹⁶

Infrared reflectograms can, however, provide dramatic insights into the creative processes of painters, which in turn, like x-rays, can have important implications for how we interpret works of art. The most rewarding example of this is probably the famous *Portrait of Giovanni (?) Arnolfini and his Wife* by Jan van Eyck, for which we have remarkably clear and informative reflectograms [37, 38]. These reveal how Jan's underdrawn design had no indication at all of many of the elements which are so arresting in the finished work: absent were the dog, the beads, the chair and the shoes, and possibly the chandelier; these he only developed, and apparently conceived, as he worked the picture up in paint. The reflectogram also shows how Jan altered, once he started painting, many elements of the design that he had established in the underdrawing: the mirror became smaller, the robe of Arnolfini longer, and shifts were made to the placement of hands and feet.¹⁷ This intense development of the composition on the panel itself, with the artist making significant changes to the drawing in the paint layers, and enriching and altering the composition visually and iconographically, is characteristic of other works by Jan van Eyck.¹⁸ It shows that there cannot have been a pre-conceived meaning established at the start, which every object in the picture helped to expound, which has been one deeply entrenched way of interpreting the works of Jan van Eyck and the Arnolfini painting in particular.¹⁹ It also shows how Jan was developing his image with the visual demands of picture making in mind—in many cases the primary motivation for the inclusion or alteration of objects and the poses of the figures was to balance or improve the way the picture worked visually. So the added shoes provide a vital light area necessary to balance the white of the woman's headdress; the changes in the position of Arnolfini's raised right hand, which turn it from a more open form in the underdrawing to one seen side on in the paint layer, probably relate to the need to minimize its surface area, and thus reduce the tendency for hands to compete for attention with the face, although it also allows for an impressive piece of foreshortening; while the dog, added only in the paint stage, presents both a virtuoso passage of fur painting as well as providing a direct link with the spectator by looking straight out of the picture.

While x-rays and reflectograms can reveal something about the pigments used and the way paint was applied (because of how different pigments react under these types of radiation), to get precise information on the chemical

37 Jan van Eyck

Portrait of Giovanni (?) Arnolfini and his Wife, oil on Baltic oak, 1434.

The figures stand in a reception room, not a bedchamber (beds were common features in such spaces). The woman is not pregnant; her large stomach is a fashionable norm (see Eve in 3b) exaggerated by the heavy train of her dress which she holds up in front of her. Sixteenth-century descriptions record a frame inscribed with verses from Ovid (which, if original, remain difficult to explain) and shutters. The identity of the woman, in particular, remains in doubt: her idealized features suggest van Eyck may never have seen her.



38 Jan van Eyck

Infra-red reflectogram of 37.

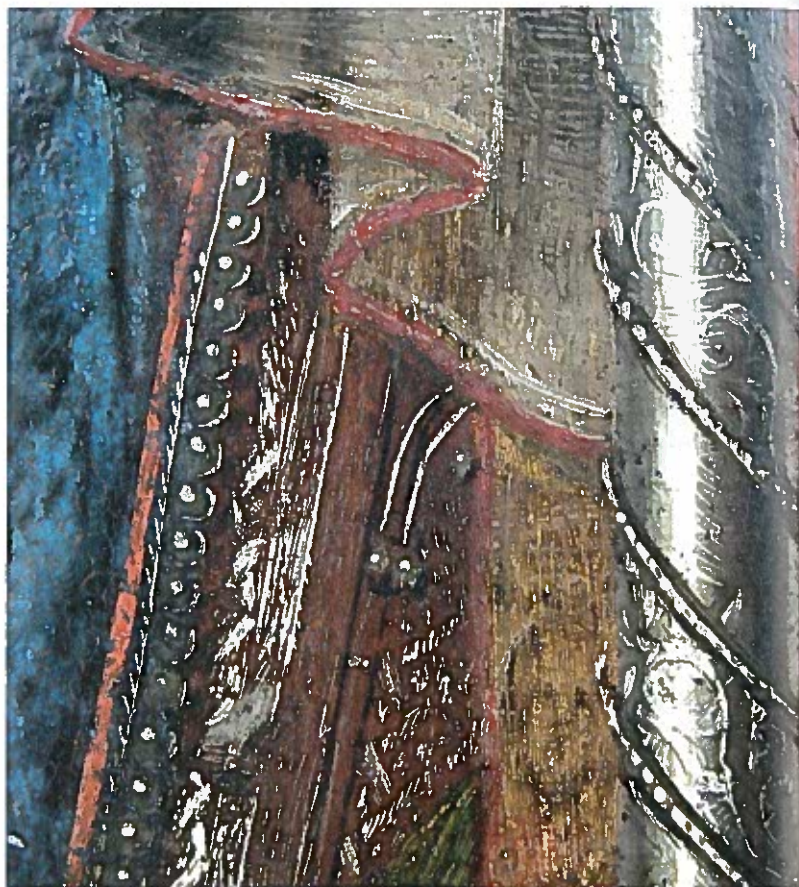
Technical examination has aided in establishing that this room is an imagined rather than actual setting. Jan's underdrawing concentrated on establishing the space and the fall of light and shade. In the underdrawing stage the mirror was larger; the feet, hands, and facial features of Arnolfini were differently placed; and the dog, shoes, beads, oranges, and probably the chandelier, were not included at all.

content of the paint layers and the ground, minute samples, often mounted as cross-sections for examination using microscopy [141], remain vital; these can also reveal the order, number and thickness in which the layers of paint were applied, and the way paint was prepared—for example, how coarsely or finely ultramarine was ground. For analysis of organic materials, gas-chromatography-mass-spectrometry (GCMS) can be used on samples, but even with such sophisticated methods, interpretation of the evidence where the nature of the paint medium is concerned is a very highly skilled task.²⁰ Complex layer structures which used varying organic materials present considerable challenges for analysis, and the subsequent history of the object, including conservation treatments, must also be considered, and further samples may be investigated at a later date with different conclusions being drawn. This is particularly the case in the history of the debate over whether artists at this period painted with a mixed media of oil and egg (now thought to be very





39 Master of Flémalle
(Robert Campin?)
Detail of the eyes of the
Christ Child and St Veronica
from 35.



40 Jan van Eyck
Detail of the cope of St
Donatian from 18.

unlikely, although egg tempera was used as an underpaint below oil layers).²¹ What GCMS and cross-sections techniques have increasingly revealed, as more and more data are collected, is the remarkably sophisticated understanding painters had of the nature and properties of their medium and the pigments they used. This is explored in Chapter 15 below.

However, it is in the examination of the paint surface itself, with the aid of magnification, and the reproduction of these magnifications in macro images, where perhaps the most enlightening perspective of all might be found: these images allow us to witness just how skilled painters and illuminators were in manipulating paint, and how that manipulation of paint might enrich effects and meaning.²² This is very clear in macro photographs of eyes of the figures of the Christ Child and Veronica [39] from the Flémalle panels discussed above. Those of the Christ Child display an astoundingly precise and detailed handling of paint—the iris has flecks of blue, red, white, and yellow in its brown base, each colour being applied separately and each thus requiring the painter to pick up a different brush; the lights on the eyes were made with six different flecks of white lead, while the eyelashes are individually defined, each being created with two strokes of different colour to mimic the way the light catches them. The contrast with how Veronica's eyes are painted is striking and immensely successful: here the iris is one colour, with no catchlights, lead white used instead to suggest a rheumy effect or imminent tears, while incredibly fine lines of white among the brown eyelashes indicate age and red around the upper and lower lid suggest she has been crying. These are the eyes of an old, sorrowing woman, and the difference in handling is clearly not the result of different hands at work but a deliberate choice, deployed to enhance meaning: the brightness of youth, and a joyous moment in the life of Christ and the Virgin, are contrasted with the dullness of age and the sorrowing caused by Christ's suffering which Veronica witnessed, and which she holds a record of.

By contrast, perhaps surprisingly, when we view van Eyck's paintings at high magnification, what is most apparent is the speed and relative economy with which he achieves his equally astounding effects. He worked in a free, fluid manner, sometimes using the end of the brush to scratch away the paint (particularly evident in 40) or manipulating the surface with his fingertips (a thumb print has been found in the area below the dog in the Arnolfini portrait), and evoking pearls, for example, with one or two strokes of the brush using lead tin yellow or lead white alone. The Master of Flémalle tended to paint the same type of object with many more individual strokes and by using several pigments, entailing several changes of the brush, a much more painstaking way of working.

The virtuosity revealed in these details is astonishing. Van Eyck's skill, in particular, was recognized by succeeding generations of painters, including Lancelot Blondeel and Jan van Scorel, who in 1550 began to 'wash' the Ghent Altarpiece (where we began), apparently undertaking their task 'with such love that they kissed that skilful work of art in many places'. Displays of extreme prowess were not just the preserve of painters, however: the technical facility of the best sculptors, metalworkers, embroiderers, weavers, and printmakers was equally astounding, if differently expressed, and was also recognized and lauded at the time. Some of their methods are explored in Parts III and IV.