

Chapter I

Painting technique : supports and frames

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1. INTRODUCTION

A great variety of materials has been adopted for use as supports in old easel painting¹⁻⁴. Most commonly used, however, were wood, canvas and copper. During the 18th century, mainly in France and England, ivory was appreciated as a support for miniatures. Easel painting on glass seems to have been practised since the Renaissance in Italy.

Canvas has been used at all times in all painting schools. Wood was used since the earliest practice of art. It was a favorite support in western painting from the 14th to the 16th century but less so in the 17th and 18th centuries, when it was supplanted by canvas. Wood gained new interest in the 19th century. Copper has been used to a lesser degree from the middle of the 16th century to the middle of the 17th century.

Frames and supports should be studied together as they often both depend upon the desires of the artist. At certain epochs, frames and supports were closely related. Frames can bear inscriptions relevant to art history.

2. CANVAS

The use of fabrics for painting can be traced back to ancient Egypt⁵. Its use in the Middle Ages is asserted by some famous examples as *The Diptych*

of the *Deposition* by H. Van der Goes (New York, Berlin-Dalhem). The fact that canvas was widely used since that time is confirmed by written sources, among them the inventories made of the Royal Spanish Collection of Isabel la Católica⁵. Some 16th century paintings in the Netherlands were originally mounted on an oak panel — either glued on, or maintained on the outer edges with the wooden pegs that fixed the frame to the panel. An example of a canvas glued on a panel is a *Danse of Vertues*, 1545 (Mechelen, OCMW) (Fig. 1). *The Adoration of the Magi* by Peter Bruegel the Elder (Musées royaux des Beaux-Arts, Brussels) also seems to have been originally mounted on a panel⁶.

These mounting techniques probably relate to a very old practice of gluing canvas on wood. It was much done in Italy from the 13th till the 15th century. It was described by Cennino Cennini (around 1390). Occasionally it was combined with paper⁷.

El Greco in 1586-88 still uses a wooden backing for his canvas representing *The Funeral of Count Orgaz* (S. Tomé, Toledo)⁷.



Fig. 1. Anonymous, *The dance of Virtues, Flanders, 1545. Mechelen, OCMW. (Copyright A.C.L.). The canvas is preserved in its original mounting on an oak support. Also original is the frame, that is pinned on the support, and was primitively adorned with a bright red color.*

However, it is legitimate to assume that it is the use of canvas independently of the wooden backings, along with the development of light-weight stretchers that lead to the extraordinary success of canvas from the middle of the 16th century on. Vasari (1550) stresses its light weight and easy transportation.

Although the cellulose that composes most fabrics is resistant, it is weakened a.o. by oil oxidation and attacked by mold and micro-organisms that develop in glues and pastes used as primings. As a consequence, many canvases have disappeared. A list of preserved 15th century Netherlandish paintings was given by W. Schöne in 1934⁸ and completed by P. Vandebroek in 1982 and by D. Wolfthal in 1985⁹.

2.1. *Fibers*

Linen was favored for its low sensitivity to humidity. The use of cotton is rarer because of its greater porosity. One of the best conserved canvases of the 15th century Netherlandish painting is *The Entombment* by T. Bouts (National Gallery, London) made out of a fine flax weave (twenty vertical threads per cm), lined with a modern fabric. Favorable conservation conditions probably played a role in this case¹⁰. Hemp is rarely used ; a few cases occur chiefly in the 19th and 20th centuries. In the 20th century, cotton has been made into a commercially prepared canvas.

2.2. *Weave*

The choice of the fibers and the way in which they are woven have an effect on the strength and the overall aspect of the work. For example the weave shows through the paint layers in many Venetian paintings of the 16th century. A study of ten canvases by Tintoretto showed that the artist used mainly linen and perhaps hemp in one case (*Last Judgement, Madonna dell'Orto, Venice*). A distinction between the two after the fibers have become aged and degraded is not always possible. In the ten paintings mentioned above, the weave is different in each case, even in those paintings which are a pair¹¹. Pieces of fabric of different strength and weave can even be sewn together into one support, as in Tintoretto's *Adoration of the golden Calf, 1570 (Santa Maria dell'Orto, Venice)*⁷. The most frequently adopted weave patterns have been described by M. Koller⁷. Mainly Italy uses a variety of weaves. In Netherlandish painting the use of the simple twill, in which the warp threads pass regularly under and over the weft threads is almost a general rule. Other weave patterns, as the chevron twill used by Martin De Vos (1532-1603) for his *Last Supper (Sint Waldetrudis, Herentals)*¹², are rarely described.

2.3. *Stretching*

Since the end of the 16th century a canvas is generally mounted on a stretcher, formed of wooden strips and — depending on size and necessity —



a



b

*Fig. 2. Anonymous, Christ appearing to the holy women, Flanders, end of the 16th, beginning of the 17th century Leuven, OCMW (Neg. Lab. Art, U.C.L.).
a. front ; b. reverse.*

The canvas is still preserved in its original setting : the stretcher on the reverse, and the frame at the face are securely pinned together, enclosing the canvas.

one or more cross bars, making a frame (Fig. 2). In 19th century painting, the stretcher is often beveledged to limit contact with the fabric. Originally, stretchers were fixed, generally with a mortise and tenon joint, reinforced with wooden pegs or nails (Fig. 3). The almost inevitable slackening of the tension of the canvas due to varying humidity in conservation led to the invention of hard wooden keys (oak or beech) sunk into the angles of the stretcher. Keys can be struck to loosen the joinery, thus permitting periodic restretching of the canvas and for a time at least, avoiding the inconvenience of changing the stretcher or relining (Fig. 4).

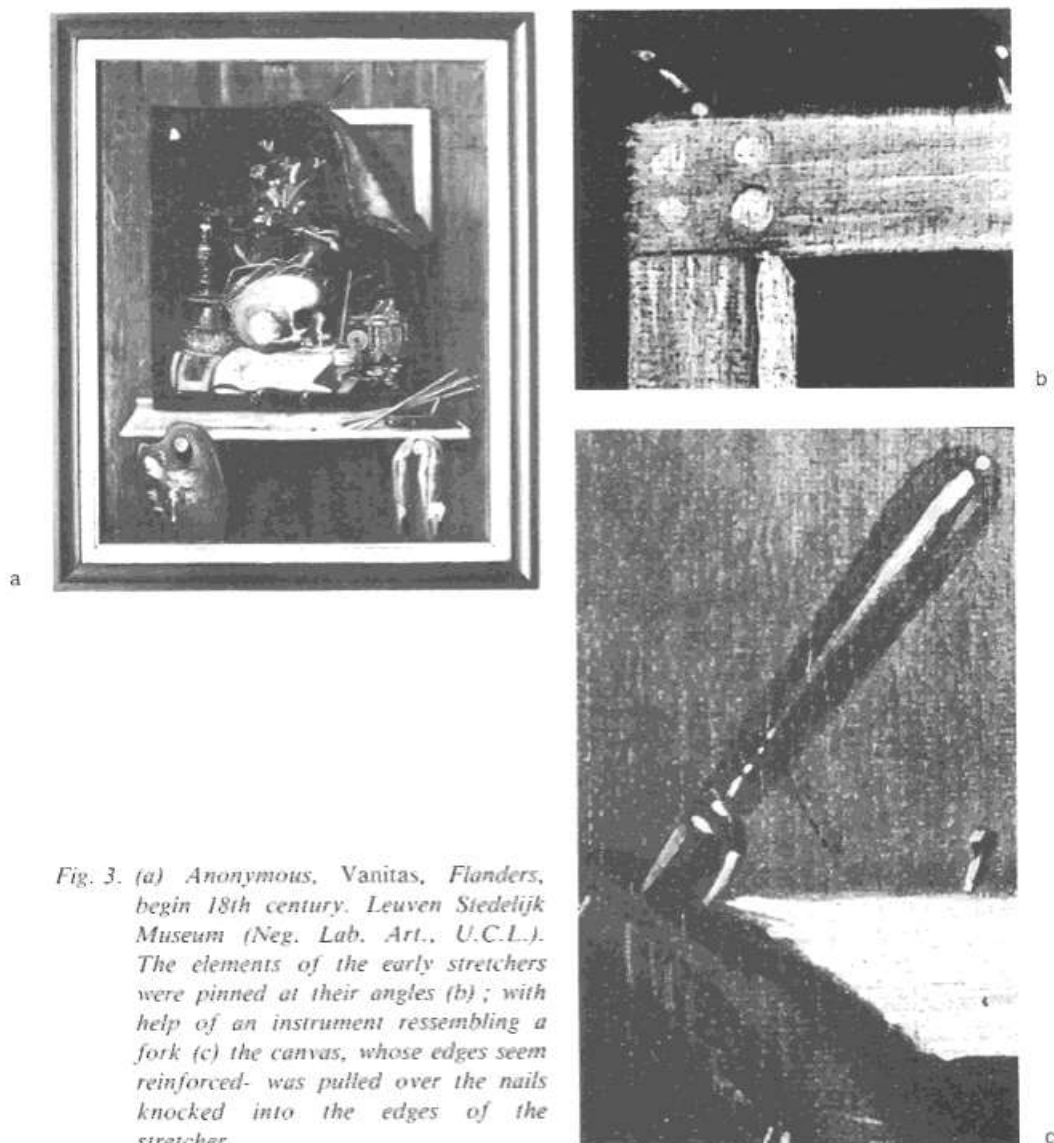


Fig. 3. (a) Anonymous, *Vanitas*, Flanders, begin 18th century. Leuven Stedelijk Museum (Neg. Lab. Art., U.C.L.). The elements of the early stretchers were pinned at their angles (b); with help of an instrument resembling a fork (c) the canvas, whose edges seem reinforced, was pulled over the nails knocked into the edges of the stretcher.

Keys seem to have been introduced sometime around 1755. They are mentioned as a novelty in 1757 by the benedictin monk Anton Pernety in his *Dictionnaire*³. The Leuven's artist P.J. Verhaghen (1728-1811), who studied painting in Antwerp, used stretchers with keys since 1760, but until the end of his production adopted the system for only part of his stretchers¹³.

Léon Cocherau in 1814 represented the *Atelier de David au Collège des quatre Nations*. The painting clearly shows that stretchers with keys were not yet adopted in David's atelier at that time. Early forms of stretchers with keys are reproduced by K. Nicolaus³.

The example by Verhaghens' stretcher for *The Coronation of the Virgin*, 1760 (Pastorij, Holsbeek) shows an early insertion method for the single key (Fig. 4a). This method left room for improvements such as the use of two keys at each angle (for better spreading of the tensions) and their insertion in a groove preventing them from falling out.

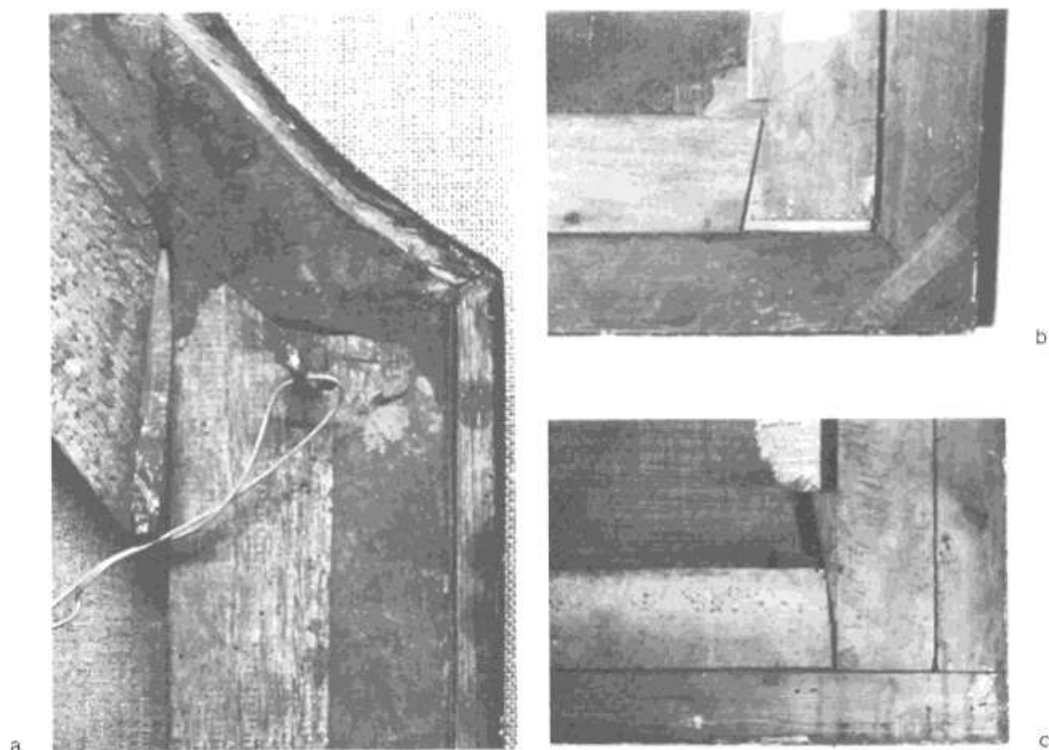


Fig. 4. Angles in stretchers dating from the second half of the 18th century (Neg. Lab. Art., U.C.L.). Some angles (a,b) were provided with a single key. When struck, the single key caused unsatisfying tension, leading to the use of two keys for a better repartition of the tensions. (c) Keys readily fell out of some early open notches. From the 19th century to nowadays, two keys are securely inserted into each angle of the stretcher.

At the end of the 16th century, the canvas was sometimes stretched during painting on a temporary frame, larger than the painting itself. The tension could be adjusted by pulling strings on the edges. A rare example of a 17th century painting on canvas in its original mounting shows a canvas stretched on the frame by pulling a string in holes practised in a groove of the frame itself¹⁴.

The existence of holes in the tacking edge of the canvas is thus not necessarily an indication that the original stretcher has been changed.

2.4. Seams

The fact that the woven fabrics were of limited width led to the practice of sewing them together into large size supports. M. Koller reports that around 1500 one single piece was generally not wider than 70 cm ; in Venetian 16th century painting one piece was not wider than 125 cm⁷. The width of the canvas reaches 94 cm in the *Adoration of the Magi*, P. Bruegel the Elder (Musée des Beaux-Arts, Brussels)⁶, 97 cm (*Last Supper*, A. Solario ?, Abbey, Tongerlo)¹⁵, 146,5 cm (*Last Supper*, Martin De Vos, Herentals)¹² ; in the second half of the 17th century canvases 210 cm wide occur in Netherlandish painting.

The weakness of old seams endangers the conservation of many old canvases.

2.5. Marouflage and relining

Deterioration of old canvases has caused them to be mounted on a rigid panel, i.e. marouflage. Most commonly, old canvases are relined either on the edges or usually completely with the old canvas being backed by a new one. Relining has been applied for almost 300 years. It was mentioned in France as early as 1698 in the *Inventaire des tableaux du Roy*³. Natural and synthetic glues, as well as wax (usually mixed with resin) are the principal adhesives for relining¹⁶.

3. WOOD

Wood has been constantly used as a support in all painting schools. Types may be distinguished by the species of the wood, the cut or the joinery. Variations exist according to epochs, countries and workshops.

3.1. Varieties

A variety of wood was used as a support depending on the country and the period. Most commonly used were oak, various conifers, poplar, walnut and more recently mahogany. As a rule, the use of a particular wood is constant at a certain place in a certain epoch and largely depends on local resources or on the possibilities of supply from local trading centers.

From the study of J. Marette a summary table (see table I) can be drawn up of the major species of woods used by the various schools of painting¹⁷.

Beginning in the 18th century and mainly in the 19th century, wood again becomes a fashionable support used by traditionalist painters. Mahogany is particularly appreciated for its strength and to a lesser degree oak and fruitwoods.

TABLE I. — MAJOR SPECIES OF WOODS USED BY THE VARIOUS SCHOOLS OF PAINTING (after J. MARETTE, *Connaissance des Primitifs par l'étude du bois du XII^e au XVI^e siècle*, Paris, 1961 ; mentioned are only those species used in more than 10 % of the cases)

Principal species used as support	Chest-nut	Oak	Norway spruce	Walnut	Poplar	Norway pine	Fir	Lime
Germany		20 %	21 %			11 %	21 %	21 %
Spain					35 %	42 %		
France		57 %		17 %	11 %			
Italy					90 %			
Portugal	12 %	82 %						
Low Countries		100 %						

3.2. Radial and tangential cuts

A board can be cut in two ways : radial cut or tangential cut. In the radial or quarter-sawn cut, the planks are sawn perpendicular to the growth rings. This was the best cut, little prone to shrinkage. Quarter-sawn planks were used in Flemish and Northern French painting in 15th and 16th centuries. As the back of the planks was often left irregular, their thickness is not easily determined. However, a thickness between 0.7 and 1.5 cm can generally be observed ; thicker planks (3.5 cm) have been used as in the *Descent from the cross* by P.P. Rubens (Cathedral, Antwerp)¹⁸. From the beginning of the 17th century on, the quality of the Flemish panel-making decreased, and tangential cuts, wood with knots and other defects occasionally occur. Routine X-ray examination of Flemish supports showed that the practice of re-using older supports was systematic in some workshops¹⁹. Tangential or plain-cut boards are cut through the whole width of the tree. This was the simplest and most widely used and produces planks that are highly susceptible to atmospheric conditions. It is often used with pine and soft woods for the production of planks that are 4 to 6 cm thick.

3.3. Joinery

Depending on the size of the painting, wooden supports are made up of one or more planks (Fig. 5). The types of assembly usually found are butt-

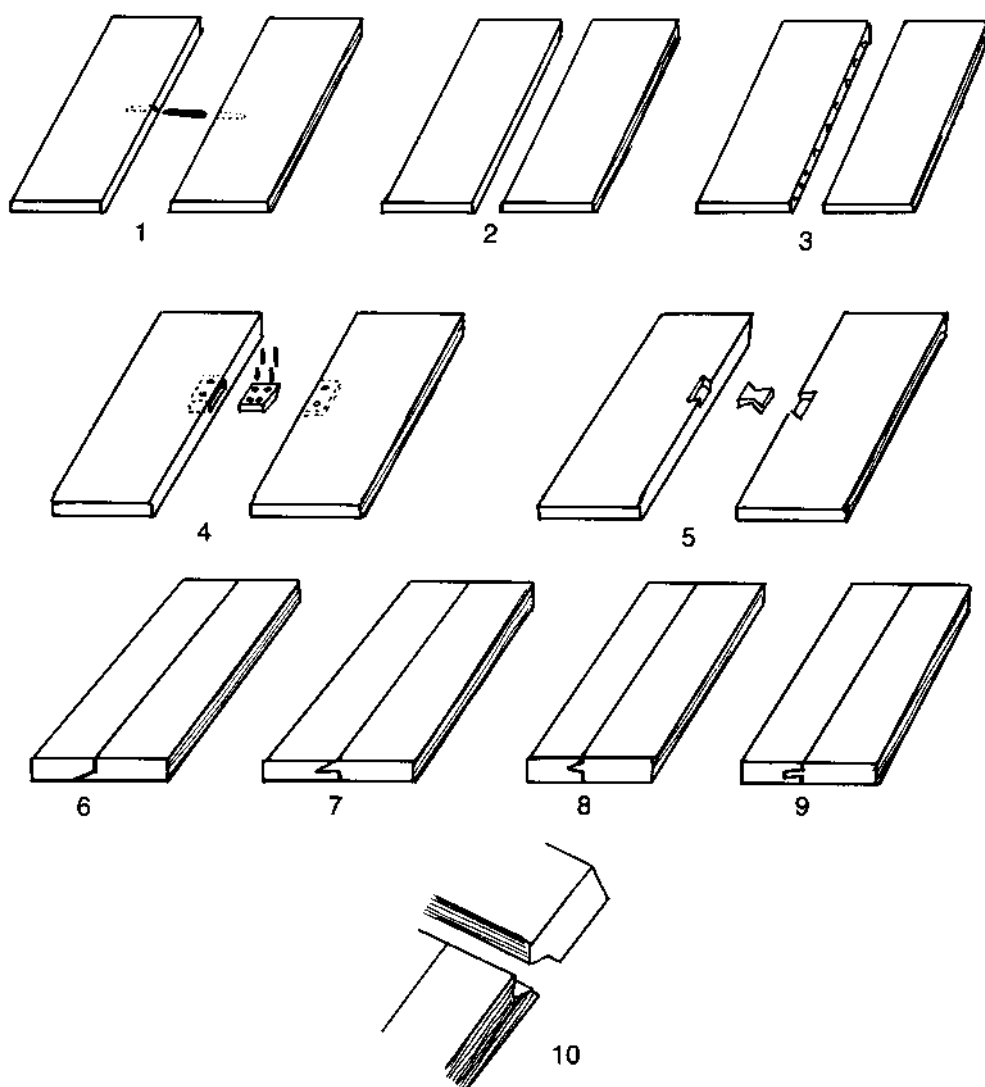


Fig. 5. Joinery techniques observed in flemish panels from the 15th to the 17th century. The glueing of butt joints, reinforced with dowels (1), without dowels (2), or, rarely, with punching marks intended to improve the glueing surface (3), accounts for the great majority of ancient panelmaking. Occasionally a tenon fixed with pins reinforces the joint (4). The pins then either surface on both sides (as in Hugo Van der Goes, *The Adoration of the Shepherds in Berlin*) or they surface only in the reverse of the panel (as in J. Bosch, *The Adoration of the Magi, in the Prado in Madrid*). The reinforcement of the joint with dovetail occurs very seldom (5). Joints as represented in numbers 6, 7 and 8 appear in the beginning of the 16th century. The earliest painting with a groove and tongue joinery we found, was dated 1588 (9). P.P. Rubens superimposed horizontal planks above vertical ones in the wings of the *Descent from the Cross (Antwerp, Cathedral)*, profiling the unglued joints as shown in n° 10.

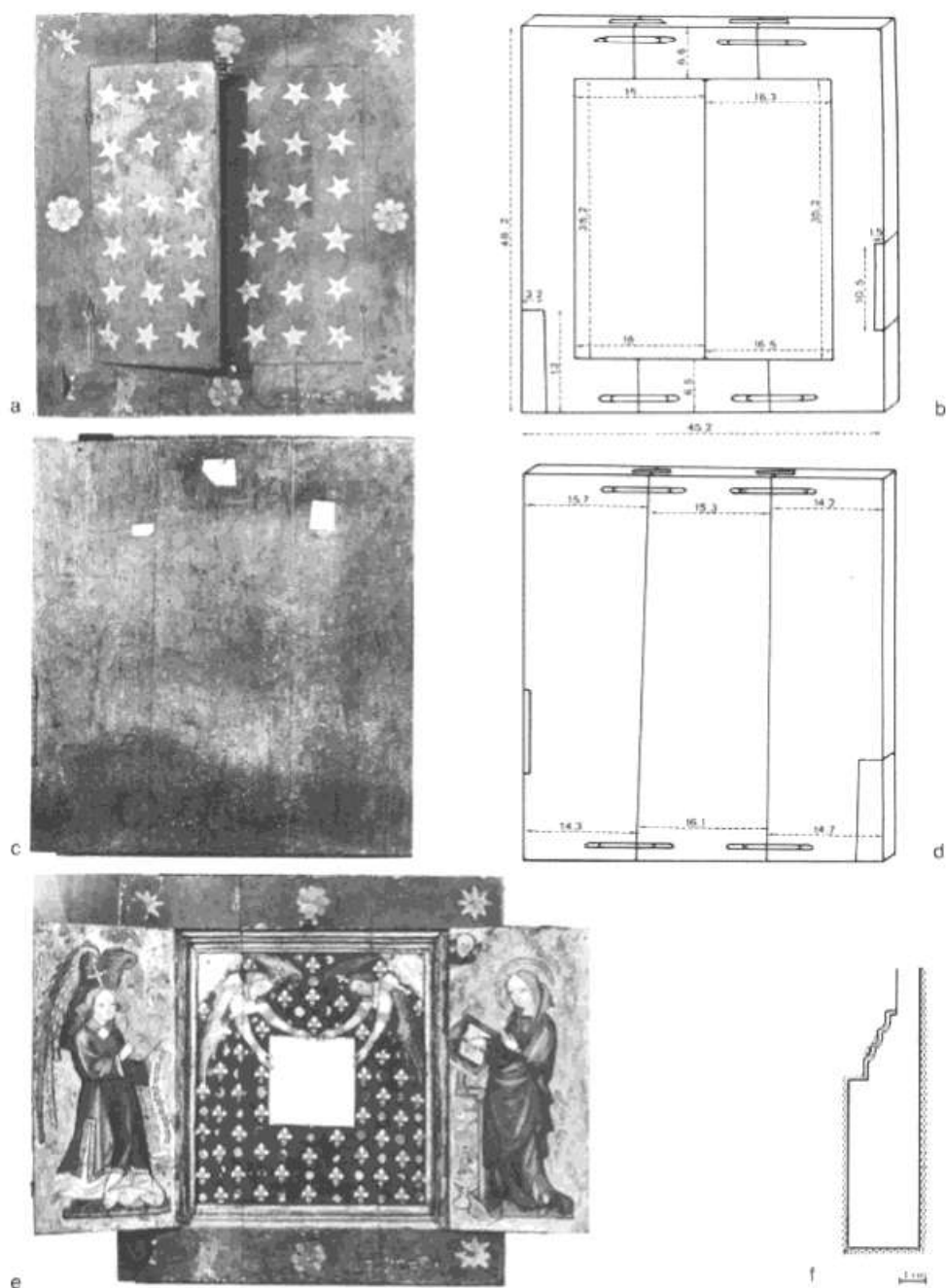


Fig. 6. Anonymous, Triptych with Annunciation, Pre-Eyckian ± 1400 Tongeren, Onze-Lieve-Vrouwkerk. (Neg. Lab. Art, U.C.L.).

a. Triptych closed and b. corresponding diagram of the support ; c. reverse and d. corresponding diagram of the support ; e. triptych open ; f. section of the frame. The butt-joints are reinforced with dowels. The frame is carved into the support itself ; the wings are simple planks, still hanged with the original hinges.

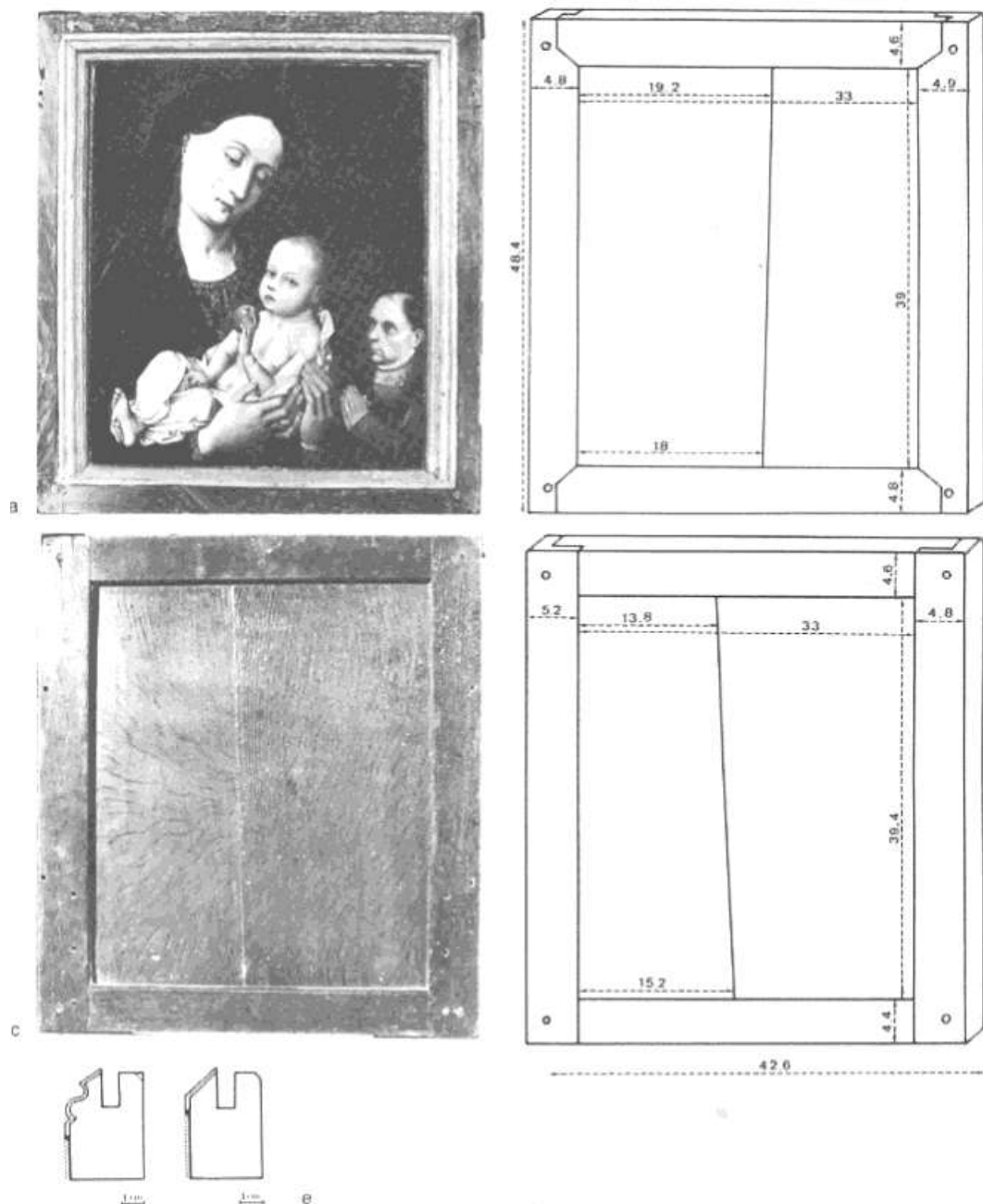


Fig. 7. Anonymous, *Virgin and Child*, Flanders, 2nd half of the 15th century. Tongeren, Stedelijk Museum. (Neg. Lab. Art, U.C.L.)

a. Front of the panel ; b. corresponding diagram of the support ; c. reverse of the panel ; d. corresponding diagram of the support ; e. sections of the frame. Carefully selected quarter sawn oak planks are glued along a butt joint without the help of dowels. The panel is inserted in a groove of the frame. Elements of the frame are joined with tenon and mortise, secured with a pin.

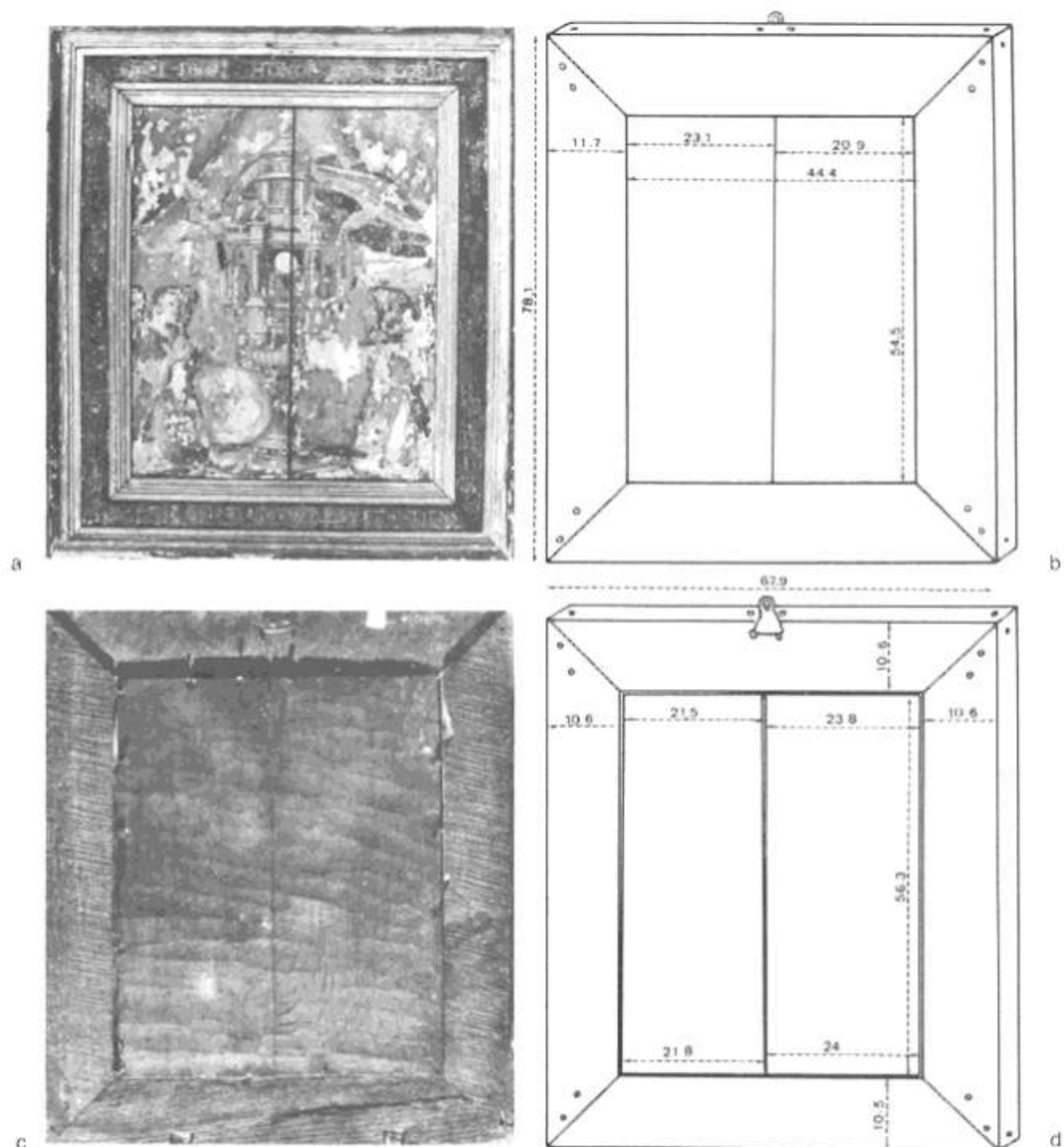


Fig. 8. Anonymous, the Holy Sacrament of Miracle, Flanders, 2nd half of the 16th century-18th century, Kuringen, Herkenrode Abbey (Neg. Lab. Art, U.C.L.)

- a. front ;
 b. corresponding diagram of the support ;
 c. reverse ;
 d. corresponding diagram of the support ;
 e. section of the rebated frame.

The original 16th century painting was completely over-painted in the 18th century. The 16th century support is composed out of two planks, held with nails against the upright edge of the rebated frame. Gouge and saw were adopted to plane the reverse.



joint, groove-and-tongue and rabbet-joint. A glued butt-joint, reinforced or not by dowels, is the simplest system and the most often used by the different schools at various epochs. One of the earliest examples of a glued butt-joint reinforced with dowels is the *Maestà*, Duccio, 1311 (Opera del Duomo, Sienna).

One can presume that over the 90 % of Flemish panels from 14th to 19th century were assembled that way (Figs. 6, 7, 8).

The groove-and-tongue joint is found primarily in the Northern schools and in Germany. Its usage is less frequent elsewhere. A loose-tongue joint has been rarely observed.

The rabbet-joint (halved-joint or overlapping joint) with a more or less deep shoulder, is frequently found in Southern schools of painting and particularly in Spain of the 14th and 15th century. It was occasionally observed in Netherlandish painting.

An assembly with keys, reinforced with pegs perpendicular to the plane of the panel, is rarely used. This later type of construction is found in a number of works by Hugo Van der Goes (*The Death of the Virgin*, Groninge Museum, Brugge ; *The Portinari Altarpiece*, Uffizi, Firenze ; *The Adoration of the Shepherds*, Gemäldegalerie der Staatlichen Museen, Berlin).

Supports for Jérôme Bosch, *Adoration of the Magi* (Prado, Madrid), and for Quentin Metsijs, *Altarpiece of the Holy Kindred* (Musées royaux des Beaux-Arts, Brussels) are assembled that way.

A simple dove-tail construction — sort of extended tenon that can be inserted into the corresponding slot — is rarely found. It can be found in altarpieces with wings painted on both sides.

Nevertheless, double dove-tail wedges inserted halfway into the wood are sometimes observed as in Bellegambe's *Madonna and child* (Musées royaux des Beaux-Arts, Brussels). They are more often used at the reverse of the panels, and generally are restorations.

As shown, wooden supports are made up of one or several elements. Their number is usually determined by the size of the support. Their width may vary (\pm 30 cm in Flemish paintings). The joints are frequently parallel — usually the case in Flemish painting. They can be oblique, as for example in the Troyes School of the 16th century²⁰. Generally, when the support is longer than it is wide, the wood planks are arranged vertically ; when the width is longest, they are arranged horizontally. This, however, is not a fixed rule. Certain panels of the Troyes School which are much wider than their height consist of a vertical arrangement of planks²⁰. The support of the central panel of the *Descent from the cross* by P.P. Rubens (H. 421, L. 311 cm) (Cathedral, Antwerp) is composed of numerous elements superimposed horizontally²¹. The

wings show predominantly vertical planks completed with a few horizontal planks. The complexity of panel-construction in Rubens' work has been described²²⁻²³.

3.4. Reinforcements

There exist many types of reinforcements of the joints on the surface and on the reverse: strips of parchment, strips of canvas sometimes associated with paper, vegetable fibers or animal hair.

Those reinforcements were observed in all European painting schools; they occur only occasionally in Flemish painting where the excellent joinery technique did not call for them. Strips of canvas glued on the joints were observed in the *Last Judgment of Diest* (Musées royaux des Beaux-Arts, Brussels)²⁴, and strips of parchment were glued on the joints of the *Annonciation de Walcourt* (Musée de Gaiffier, Namur)²⁵. Those reinforcements could be related to the older practice of overall covering the wooden panels with skins or fabrics, that aimed at offering elasticity and thus absorbing dimensional movements of the wood.

From early times on, all sorts of battens fixed with nails or wooden pegs, or cross-bars inserted into the wood were used to reinforce panels on the back. They occur in all painting schools.

A type of reinforcement used extensively by restorers in the 19th century and to a lesser degree in the 20th century is cradling. It is made up of a network of fixed and sliding cross-bars. Due to its excessive rigidity, this method has caused an innumerable amount of damage to old supports²⁶.

4. COPPER

Copper is the most used of metal supports²⁷. It is found primarily from the middle of the 16th century through the 17th century in the Netherlands and Germany and to a lesser degree in Italy, France and Spain. It is only exceptionally used in the 18th century. This support is normally adopted for works of small or medium size. The question of origin as well as that of its disappearance has not yet been elucidated. A relationship probably exists between enamel paintings or the use of copper in engravings.

The state of conservation of these works is usually good. The paint layer isolates the copper from the air and deters corrosion. This support is practically insensitive to humidity variations and to heat. A disadvantage, however, is poor adhesion of the paint layers. In fact, paintings of this type show few or no age cracks which gives them often a smooth surface similar to that of enamel. This is especially noticeable when glazes are used.

5. FRAMES

5.1. *Still and grooved frames*

Still frames — those cut from the same block of wood — and grooved frames, show a complete integration between the frame and the painting (Fig. 9). The first type is a frame cut from the same mass of wood as the support and is found in some of the oldest examples of small Flemish paintings of the 14th and 15th centuries. These paintings can be composed out of a single or out of more planks. The other type, used more frequently in the 15th century, is a grooved frame in which the entire painting is fixed. The insertion is facilitated by a tongue or a chamfer on all sides of the reverse. This grooved frame is positioned before the application of the ground and the paint layer so that once the original frame is removed an unpainted border is revealed. At the join between the painted surface of the panel and the frame, a deposit of material called « barbe » can be observed. At times, these grooved frames are mounted with various relief motifs (analogous to tracery found on windows) that form an integral part of the whole and represent reserved areas with regard to the paint layer.

It is the case for the panels of the *Justice of Othon* by Thierry Bouts (Musées royaux des Beaux-Arts, Brussels).

Curtains hanging from rings on a rod protected priceless 15th century Flemish paintings or those that were particularly exposed. The system of protection could also be a stretched canvas on a wooden frame fitted as wings to the panel. For the above mentioned *Justice of Othon*, such canvas was 'prepared' in red by Hubert Stuerbaut before February 9th, 1492. In 1578 an explanatory text was written on those 'wings' that thus still existed at that time²⁸.

Arranged before the application of the paint layer and painted at the same time as the picture, these still and grooved frames by their type, decoration and inscriptions illustrate the thoughts of the artist and his patron. The loss of these frames or any significant alteration deprives the historian of precious elements of identification. In the works of Jan Van Eyck, not including the *Mystical Lamb*, eight paintings maintain their original frames. Seven of these frames carry, with other inscriptions, the artist's name and the date of the work²⁹.

A considerable number of frames have been lost or removed from 15th century Flemish paintings. The problem of attribution would undoubtedly be dealt with differently had these losses not occurred (Figs. 10 and 11).

5.2. *Frames applied to the surface, frames with a rabbet*

The other types of frames — those applied to the surface (nailed or dowelled to the support), frames with a rabbet — are of similar interest.

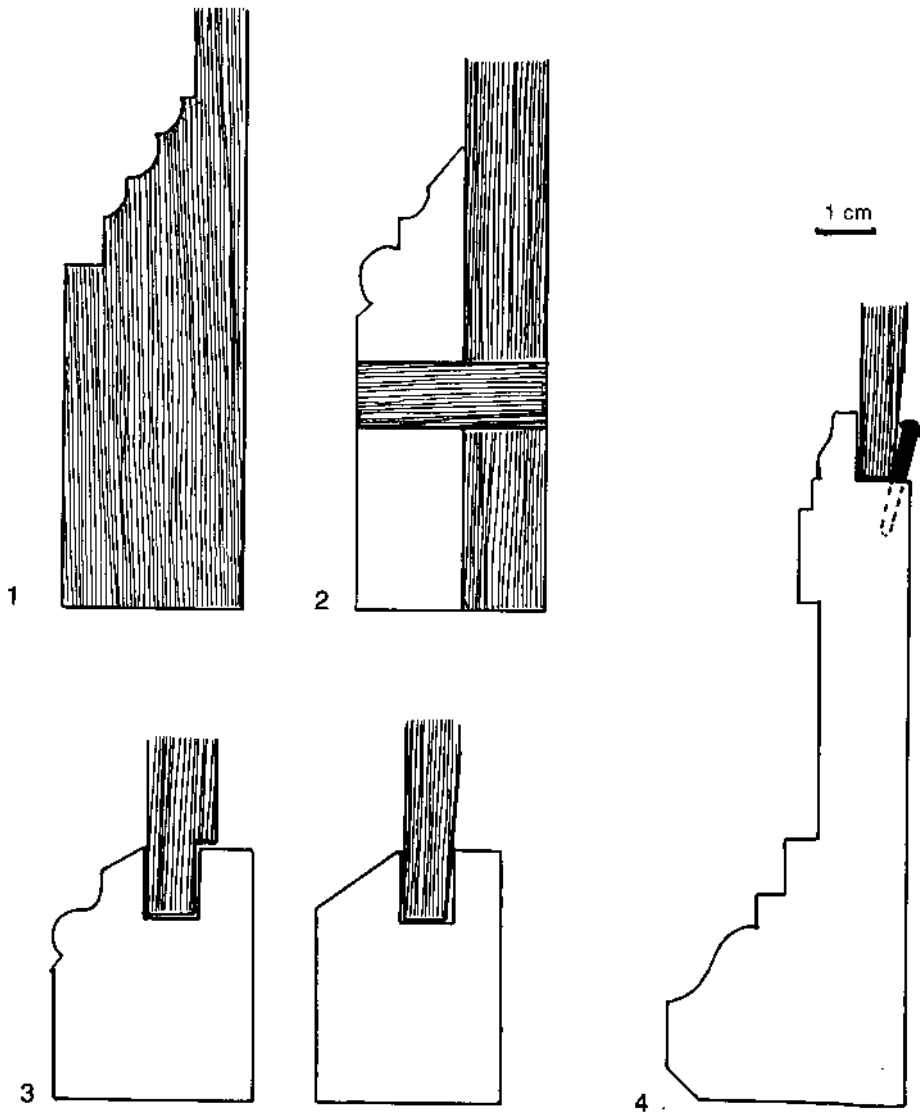


Fig. 9. There were various ways of assembling the frames to the support. Panel and frame could be cut out of the same piece of wood (1), unregarded the support consisted out of one or more planks. This system is often seen in the 14th and 15th centuries, usually in small size paintings. The frame could also be pinned on the support (2) and present a mitred adjustment at the angles. Favoured by Jean Van Eyck, this system was frequently adopted in the 15th century. Very commonly, supports with a tongue or a chamfer were inserted in a groove of the independent frame (3). This classic 15th century framing system remains in use throughout the 16th century, mostly in triptychs, for wings that had to be seen on both sides. Rebated frames (4), allowed the painting to be executed out of the frame. Their use seems to originate in the Antwerp school in the early 16th century, mainly in central panels. This system is still in use today.

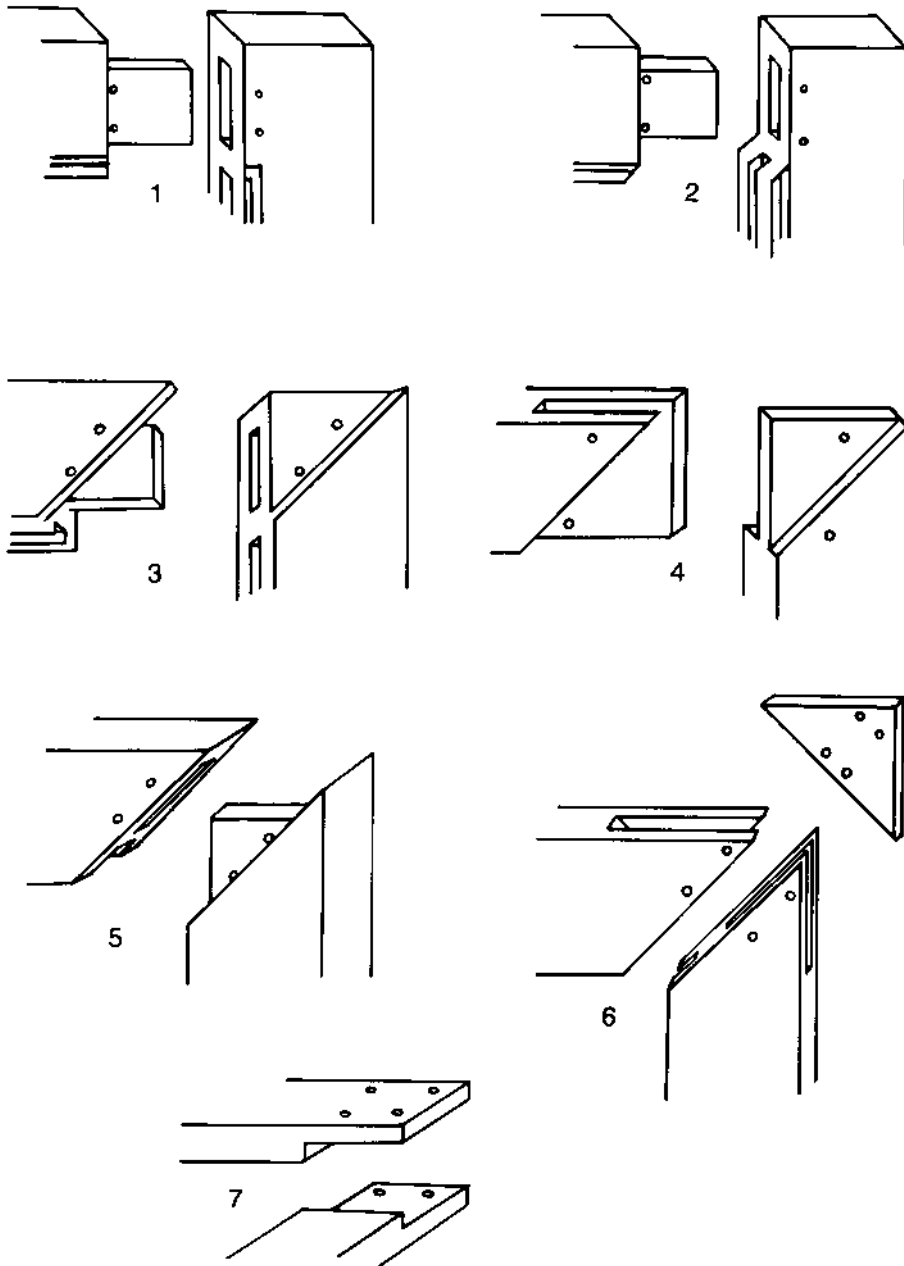


Fig. 10. Joinery techniques in elements of the frames encountered in 15th and 16th century flemish and northern french frames. The tenon and mortise joinery with a square adjustment (1) evolves towards a mitred adjustment of the moulding (2) and of the entire frame (3), thus allowing independant carving of the moulding before assembly, as well as better adjustment. Simplified assembling techniques (4, 5, 6) appear in the 16th century. In 16th century frames, the inner part of the frame could be assembled as in no. 7.

However, certain restrictions are evident. Pictures showing painting collections reveal a limited diversity in their frames³⁰. It is not unusual to find some paintings without a frame, either because the artist wished to simplify his work or the collector selected a standard frame as others sometimes do with bookbindings to maintain a sense of uniformity. This hypothesis is strengthened when paintings from the collection of Nasilius Amerbach which was acquired in 1662 by the city of Basel are studied. They show a specific type of frame without consideration of their origin or type³¹.

The transition between grooved frames and frames with a rabbet is present in painted altarpieces from the Antwerp and Brugge schools at the beginning of the sixteenth century. For the wings, the panels and frames form an integral whole, whereas the central panel is mobile. It is painted independently, and put after completion in the central frame with a rabbet. This evolution in workshop habits corresponds to a certain standardization of the work on the wings (sometimes left black or with a text).

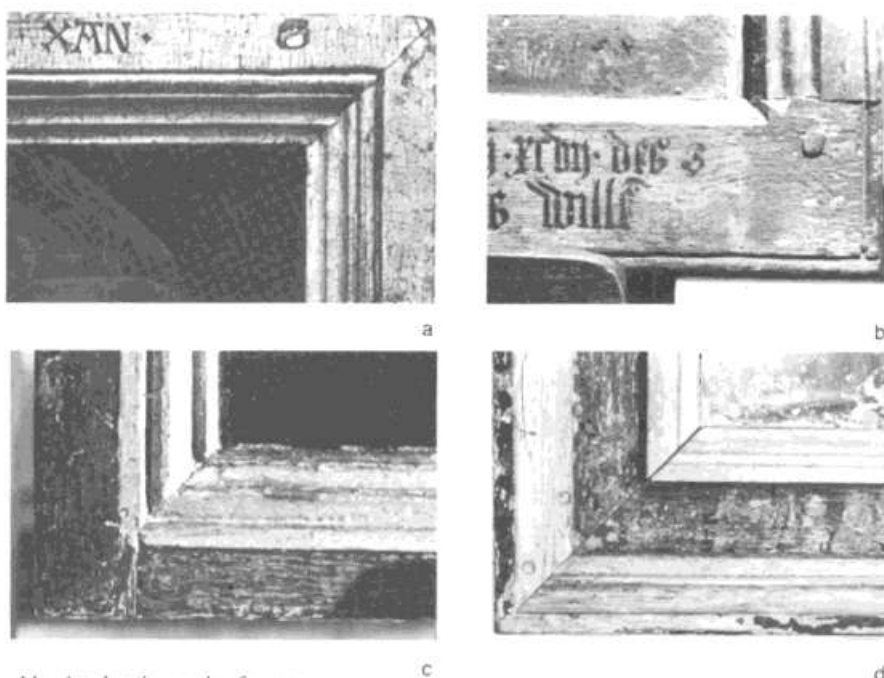


Fig. 11. Angles in early frames :

- a. mitred adjustment of the moulding in a frame pinned on the support (Jean Van Eyck, *The man with the Turban*, London, National Gallery) ;
- b. square adjustment of elements in an independant frame (15th century) ;
- c. mitred adjustment of the moulding combined with square alignment of the flat part of the frame ;
- d. mitred adjustment of the elements of frame, with double moulding (16th century).

5.3. Principal types of frames³²⁻³³⁻²⁰⁻¹⁴

To simplify the problem, it is possible to divide old frames into three principal types : the tabernacle frame, the flat frame and the profiled frame. The tabernacle frame is topped by a pediment and sits on a pedestal-like base. Frequent at the end of the Middle Ages and in the Renaissance, this type of frame appears rarely later. It is usually used in works of small or medium size in relation to private devotion. It is also found in altarpieces notably in Italy where the decoration on the top may be highly developed.

The flat frame can be conceived with or without mouldings. Its general aspect is relatively simple-more from the choice of materials than the colors. Precious or semi-precious materials, quite diversified, are sometimes used for the flat surface or for its decoration. In addition, it can be painted with various motifs related to the main subject of the picture. This type of frame is frequently found through the various epochs³⁴.

The profiled frame can show a great diversity of style. Its evolution is associated with that of various styles from the Renaissance to the dawn of the 20th century. Through many epochs, certain examples are particularly representative : dark frames in ebony from 17th century Holland³⁵, baroque frames, heavily ornate, from the Italian 17th century, the sumptuous Regency and Louis XV frames of the French 18th century, the severeness of the neo-classical 19th century frames²².

Color is an essential element in frames³⁶. During the Middle Ages, many have colors that are both vibrant and diversified. Often, red is present as well as blue and green and metallic leaves. Imitating marble and other stones is not unusual.

6. NOTES

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3. K. NICOLAUS, *Du Mont's Handbuch der Gemäldekunde. Material-Technik-Pflege*, Cologne, 1979.
4. H. KÜHN, H. ROOSEN-RUNGE, R.E. STRAUB and M. KOLLER, *Reclams Handbuch der künstlerischen Techniken*, t. 1, *Farbmittel, Buchmalerei, Tafel- und Leinwandmalerei*, Stuttgart, 1984.
5. F. SANCHEZ CANTON, *Libros, Tapices y Cuadros que colecciona Isabel La Católica*, Madrid, 1950, p. 151-189.
6. A. PHILIPPOT, N. GOETGHEBEUR and R. GUISLAIN-WITTMANN, *L'Adoration des Mages de Bruegel au Musée des Beaux-Arts de Bruxelles. Traitement d'un « Tüchlein »*, in *Bulletin de l'Institut royal du patrimoine artistique*, XI, 1969, p. 5-33.
7. Two authors recently devoted extensive and excellent chapters to supports in painting : R.E. STRAUB, *Tafel- und Tüchleinmalerei des Mittelalters*, in H. KÜHN, H. ROOSEN-RUNGE, ..., see note 4 and p. 133-149 ; and M. KOLLER, *Das Staffeleibild der Neuzeit*, in H. KÜHN ..., see note 4, 16th century : p. 282-299, 17th and 18th centuries : p. 336-343, 19th and 20th centuries : p. 384-388.

8. W. SCHÖNE, *Dieric Bouts und seine Schule*, Berlin-Leipzig, 1938.
9. P. VANDENBROECK, *Laatmiddeleeuwse doekschilderkunst in de Zuidelijke Nederlanden. Repertorium der nog bewaarde werken*, in *Jaarboek van het Koninklijk Museum voor Schone Kunsten. Antwerpen, 1982*, Antwerp, 1982, p. 29-59. See also D. WOLFFHAL, *The technique of early Netherlandish canvases*, in *Actes VI. Colloques pour l'étude du dessin sous-jacent dans la peinture*. Septembre 1985, edited by H. VEROUGSTRAETE-MARCQ and R. VAN SCHOUTE, Louvain-la-Neuve, 1986 (to be published).
10. M. DAVIES, *The National Gallery London. (Les Primitifs flamands. 1. Corpus de la peinture des anciens Pays-Bas méridionaux au quinzième siècle, 3)*, t. 1, Antwerp, 1953, p. 25.
11. J. PLESTERS and L. LAZZARINI, *Preliminary Observations on the Technique and Materials of Tintoretto*, in *Conservation and Restoration of Pictorial Art*, edited by N. BROMELLE and P. SMITH, London-Boston, 1976, p. 7-26; J. PLESTERS, *Tintoretto's Paintings in the National Gallery*, in *National Gallery Technical Bulletin*, 3, 1979, p. 3-24.
12. D. DE JONGHE and J. VYNKIER, *Eigenaardigheden in de weefselstructuur van een aan Maarten De Vos toegeschreven doek*, in *Bulletin de l'Institut royal du patrimoine artistique*, XVIII, 1980-82, p. 81-91.
13. The study of Verhaghen's stretchers was possible during the 1977 exhibition of his work in the Leuven Museum, see *Pieter-Jozef Verhaghen*, Stedelijk Museum, nov. 1977-janv. 1978, catalogue of exhibition, Louvain, 1977.
14. P.J.J. VAN THIEL and C.J. DE BRUYN-KOPS, *Prijst de Lijst. De Hollandse schilderijlijst in de zeventiende eeuw*, catalogue of exhibition, Rijksmuseum Amsterdam, The Hague, 1984.
15. R. LEFÈVE, *Het Laatste Avondmaal van Tongerlo. Materiele gegevens*, in *Bulletin de l'Institut royal du patrimoine artistique*, X, 1967-68, p. 16-24.
16. W. PERCIVAL-PRESCOTT, *The Lining cycle*, in *IIC Greenwich-conference on relining*, London, 1974 (National Maritime Museum).
17. See the important work by J. Marette, note 2. It is evident that the use of one or another variety has a significant importance. Even though the author furnishes a great deal of information, she is limited by the content of the collections studied. For example, in Spain, the collections of the Catalan national Museum of Art in Barcelona have been examined but apparently not those of the Prado Museum in Madrid.
One can consider that artists working abroad adopted certain local techniques. This is the case with Joos van Ghent who used poplar wood as a support for the *Communion of the Apostles* painted in Urbino (J. LAVALETTE, *Le Palais ducal d'Urbino (Les Primitifs flamands. 1. Corpus de la peinture des anciens Pays-Bas méridionaux au quinzième siècle, 7)*, Brussels, 1964, p. 5). Hispanic-Flemish painters should also be re-examined; see R. VAN SCHOUTE, *Les peintres hispano-flamands. Considérations générales*, in *Actes du Colloque hispano-belge*, Brussels, 1982 (to be published), and a study on the paintings by Sopetrán (M. GARRIDO and J.M. CABRERA, *El dibujo subjacente y otros aspectos técnicos de las tablas de Sopetrán*, in *Boletín del Museo del Prado*, III, 7, 1982, p. 15-31).
18. N. GOETGHEBEUR, *The Treatment of panels at the Institut royal du patrimoine artistique, Brussels*, in *Conservation of wood in Paintings and the Decorative Arts*, Preprints of the contributions to the Oxford Congress IIC, 1978, p. 165-167.
19. D. HOLLANDERS-FAVART, R. VAN SCHOUTE and H. VEROUGSTRAETE-MARCQ, *Les « Chefs de Saint Jean-Baptiste » attribués à l'entourage de Bouts. Considérations sur la datation à partir de l'étude de l'état matériel*, in *Arca Lovaniensis, Jaarboek 1975*, p. 66-81.
20. R. VAN SCHOUTE and H. VEROUGSTRAETE-MARCQ, *Cadres et supports dans l'école troyenne de peinture au XV^e siècle*, in *Revue des archéologues et historiens d'art de Louvain*, X, 1977, p. 26-68.
21. R. LEFÈVE, *La Descente de croix de Rubens, Étude préalable au traitement. Les supports*, in *Bulletin de l'Institut royal du patrimoine artistique*, V, 1962, p. 128-145.; R.H. MARIJNISSEN and J. GROSEMANS, *Twee specifieke paneelproblemen. De Johannes de Doper van het Lam Gods en Rubens' Kruisoprichting*, in *Bulletin de l'Institut royal du patrimoine artistique*, XIX, 1982, p. 120-132.

22. H. VON SONNENBURG, *Rubens' Bildaufbau und Technik*, 1, *Bildträger, Grundierung und Vorskizzierung*, in *Maltechnik Restaura*, 85, 1979, p. 77-100.
23. C. BROWN, A. REEVE and M. WYLD, *Rubens' The Watering Place*, in *National Gallery Technical Bulletin*, 6, 1982, p. 27-39.
24. R. SNEYERS and N. VERONÉE-VERHAEGEN, *Le Jugement dernier de Diest*, in *Bulletin de l'Institut royal du patrimoine artistique*, X, 1967/68, p. 99-120.
25. P. COLMAN, *Les panneaux pré-eyckiens de Walcourt*, in *Bulletin de l'Institut royal du patrimoine artistique*, III, 1960, p. 36-54.
26. R.H. MARIJNISSEN, *Dégradation, Conservation et Restauration de l'œuvre d'art*, Brussels, 1967, 2 vol., and *Conservation of Wood in Painting and the Decorative Arts*, edited by N.S. BROMELLE, A. MONCRIEFF and P. SMITH, London, 1978.
27. J.A. VAN DE GRAAF, *Development of Oil Paint and the Use of Metal Plates as a Support*, in *Conservation and Restoration of Pictorial Art*, edited by N.S. BROMELLE and P. SMITH, London-Boston, 1976, p. 43-53.
28. F. VAN MOLLE, *La Justice d'Othon de Thierry Bouts. Archival sources*, in *Bulletin de l'Institut royal du patrimoine artistique*, I, 1958, p. 11 and 12.
29. These seven works are : *The Man with a Turban* (1433), London, National Gallery ; *The Goldsmith Jean de Leeuw* (1436), Vienna, Kunsthistorisches Museum ; *Virgin and Child with Canon van der Paele* (1436), Brugge, Groeninge Museum ; *Triptych of the Virgin and child* (1437), Dresde, Gemäldegalerie ; *St. Barbara* (1437) and *The Virgin at the Fountain* (1439), Antwerp, Musée royal des Beaux-Arts ; *Marguerite van Eyck* (1439), Brugge, Groeninge Museum. The fundamental article on attributions to Flemish Primitives is : J. FOLIE, *Les œuvres authentifiées des Primitifs flamands*, in *Bulletin de l'Institut royal du patrimoine artistique*, VI, 1963, p. 183-251.
30. See G. SPETH-HOLTERHOFF, *Les peintres flamands de cabinets d'amateurs au XVII^e siècle*, Brussels, 1957.
31. C. LAPAIRE and M.R. SCHARER, *Guide des Musées suisses*, Bern and Stuttgart, 1980, p. 11.
32. C. GRIMM, *Alte Bilderrahmen. Epochen, Typen, Material*, Munich, 1977.
33. An exhibition with a scientific catalogue has been devoted to Italian frames : L. CREMER and P. EIKEMEIJER, *Italianische Bilderrahmen des 14.-18. Jahrhunderts. Sonderausstellung Alte Pinakothek München*, Munich, 1976.
34. Most of the paintings of collections of the 17th century seem to be mounted in flat frames (see G. SPETH-HOLTERHOFF, *op. cit.*, *passim*).
35. Besides these frames, in the same epoch in the Netherlands ornately carved frames can be found that are heavily decorated with putti, garlands of flowers and horns-of-plenty, overflowing with fruit.
36. J.R.J. VAN ASPEREN DE BOER, *A technical examination of the frame of Engelbrechtsz's Crucifixion and some other 16th century frames*, in *Scientific examination of Early Netherlandish Painting. Application in Art History. Nederlands Kunsthistorisch Jaarboek*, 26, 1975 (1976), p. 73-87.

7. RÉSUMÉ

Une grande variété de supports a été adoptée dans l'exécution de la peinture de chevalet ancienne. Les plus fréquemment utilisés furent la toile et le bois. Quoique en usage pendant tout le Moyen Âge, ce n'est qu'aux XVII^e et XVIII^e s. que l'emploi de la toile supplante celui du bois. Les toiles de lin étaient les plus appréciées. Divers types de tissage se rencontrent dans toutes les écoles de peinture. Pour résoudre le problème de la perte de tension de la toile, on développa dès 1750 l'usage de clés à insérer dans les assemblages mobiles des châssis.

Le bois a été employé de tous temps dans toutes les écoles de peinture. L'essence adoptée varie dans le temps et selon les pays. De même, on peut observer des variantes dans la coupe, l'assemblage, le renforcement des joints à la face et au revers.

Le cuivre a été utilisé dès la seconde moitié du XVI^e s., et pendant le XVII^e s., mais il est pratiquement abandonné au XVIII^e s.

Les cadres font partie de l'œuvre et méritent à ce titre d'être étudiés et conservés. La relation entre le cadre et le support a évolué dans le temps (cadres taillés dans la masse, cadres chevillés, cadres à rainure ou à batée) de même qu'a évolué le style du cadre (couleurs, mouluration, décoration).