The Anatomy of Masaccio's Holy Trinity
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Masaccio’s Holy Trinity fresco in Santa Maria Novella has the double distinction of being one of the most original and admired paintings of the early Renaissance, as well as the most travelled (fig. 1). Indeed, it is a miracle it has survived at all. Vasari lauded it, and then covered the fresco with his altar.¹ In the nineteenth century it was rediscovered, transferred to canvas and moved (in 1860) to the inside wall of the church facade (fig. 2). Cavalcaselle, who had observed the fresco before and after this transit and who had praised it highly, commented on the damage which it sustained as a consequence of this move.² But the history of its travels does not end there. After the last war the fresco was found to be in such a perilous condition that it was thoroughly restored another time. Fortunately, recent advances in the techniques of restoration permitted the recuperation of its surface in that measure in which it can still be admired at this time. This arduous restoration was thoroughly executed by Leonetto Tintori during the years 1950–54. He also supervised the return voyage of the Trinity to its original location on the left aisle wall in the third bay from the church entrance. Its exact location on this wall could be fixed with considerable precision. The lower portion of the original fresco, depicting a corpse lying on a sarcophagus, was found in situ just where it had been located by Antonio Billi.³ The height of the fresco could be precisely fixed by a fragment of the original cornice which was left behind on the wall at the time of the nineteenth century transfer. This fragment included a plumb line made with a snapped rope which established the central vertical axis. A lateral was then made with a snapped cord fixed at the level of the intersections of two arcs drawn with a compass which was centered on the plumb line. This lateral was independent of the level of the church floor. It extended along the lower termination of the egg frieze, where it can still be observed on the original fresco surface. These features can be seen on a scale drawing after the fresco made by Leonetto Tintori (see photo no. 68526 of the Soprintendenza alle Gallerie, Florence).

The experience of the Holy Trinity as it now appears is misleading since it gives the false impression of completeness. During the nineteenth century transfer the missing portions – and they include all the border areas – were painted in, and the recent restoration respected this completion of the missing parts in the treatment of the area, largely destroyed, below the Trinity panel. Closer inspection reveals many buckles and repairs, surely scars of the many moves and injuries the fresco has suffered. It is indeed a marvel,

and a tribute to Tintori’s excellence as a restorer, that the fresco has retained its unique power of attraction.

Before the recent cleaning in January of 1969 I was offered the opportunity of examining the fresco at close proximity from a scaffold. Some observations made during this examination I wish to share with the reader in the hope that they will add to our understanding of the fresco and its process of creation.

No preparatory studies have survived. To this writer it would seem inconceivable that the ordered space, that the proportion and mass of architecture and figures of the Holy Trinity should have been developed more or less directly on the wall without thorough prior preparation. The very process of painting in buon fresco which is additive, proceeding from giornata to giornata, would exclude this procedure. Nor would a sinopia, however detailed, since it was covered by the plaster of the giornata to be painted, have sufficed to guide the artist in sufficient detail. Masaccio must have developed the composition of the fresco slowly and meticulously. In the short time available during each giornata for the pigment to form a solid bond with the fresh plaster the artist had no time for theoretical reflection. All the procedures of the giornata of painting had to be organized ahead.

The Holy Trinity was painted in buon fresco. Twenty-four giornate can be distinguished from the top of the fresco to the bottom of the Trinity panel (fig. 5), around the level of the step supporting the kneeling donors. In the normal sequence, Masaccio, painted from top downward. As far as possible, his progress followed the architectural setting around the figures. During the first eight giornate the monumental archway was completed down to the level of the kneeling donors. The artist then painted most of the barrel vault in the next two giornate, and only after this did he turn to the figures. The reason for this procedure is simple enough. The symmetry and order of the composition is defined by the archway in large measure. Once it is fixed the placement of the figures poses no great problems.

Naturally, the artist must have begun by locating the dimensions of the fresco on the wall. He then applied the plaster for the first giornata, which comprises the whole entablature and cornice extending from the pilaster capitals and the arch frame to the upper limit of the fresco. The upper portion of the entablature is nearly wholly modern, with...
the exception of an original segment at the right of the center. A section of this segment, located at the center of the fresco, was unfortunately lost shortly after its discovery at the time of the last transfer. It included the plumb line giving the vertical axis and two crossing arcs made with a compass resting on two points of this vertical plus a lateral line drawn through their intersections. Obviously, these aid lines were made after the dimensions of the fresco had been fixed since they are located on the intonaco of the first giornata. The lateral rope line so carefully levelled probably served as guide for the laterals above and below it. One of these can be clearly distinguished (fig. 4), serving to establish the upper edge of the dentil frieze.
In the first giornata Masaccio used a diversity of means to locate and elaborate the architectural detail. The dentil frieze was simplified so that the width of the interval is equal to that of the dentil. The vertical edges of the dentils were scratched in. Points indented in the plaster are clearly visible at the lower corners of the dentils’ projecting faces. Toward the right side of the original fragment the scratched verticals veer gently diagonally downward toward center – ideally toward the vanishing point. Masaccio thus depicted the dentil in proper perspective recession. The indented points surely preceded the scratched verticals as they served to fix the sequence of the dentils as well as their lower limit.
The perspective treatment of the architectural ornament was not systematically applied. The recessed central portion of the entablature is decorated with a pseudo-meander, difficult to “read” as a coherent architectural form (fig. 5). This pseudo-meander was painted with the assistance of a spolvero. It divided the surface into a pattern of horizontal and vertical lines formed by fine points over which the pseudo-meander was then painted with a free brush work.\(^7\)

During the second and third giornate — they may possibly have been done during the same day — Masaccio painted the two pilaster capitals. The one at the left is nearly wholly destroyed, but the other is well preserved with only a minor portion of the original surface missing at the lower right (fig. 6).

It is interesting to note how Masaccio went about painting this capital. He first formed a grid of rectangles by means of snapped rope lines. He was guided by points indented in the plaster. The width of this grid is 51.5 centimeters, which is nearly that of the pilaster below the capital. This grid must have served for locating the acanthus leaves which are scratched roughly into position free hand. The scalloped contour of the lower leaves is also scratched into the plaster, but with a coarse, heavier line. The grid divides the area covered into three rows of superposed rectangles. Of these the lowest is the shortest, and they get wider in ascending order.

The upper portion of the capital which projects forward into space departs from the order of the grid. Masaccio shifted the rosette and the terminals of the volutes systematically to the right. This rightward shift can be explained by the oblique view of the capital from below and from the left. As a consequence, the left volute, seen in partial foreshortening, is compressed, and the right volute is extended. The indented point marking the center of the rosette is moved a short distance to the right of the center of the grid. The circle defining the contour of this rosette was scratched into position with a compass. Masaccio’s capital is very similar to Brunelleschi’s pilaster capitals from the Ospedale degli Innocenti (fig. 7).

The pattern of snapped rope lines informs how Masaccio interlinked the giornate. The lower termination of the first giornata, which coincides with the bottom edge of the face of the entablature, is extended in form of a snapped rope line through the capital painted during the third giornata. This extended lateral marks the upper termination of the grid covering this capital. It follows that in this area the scheme of assisting snapped rope lines antedates the giornata. The center point of the rosette lies on this extended lateral even though it should have been situated slightly above since it projected forward — hence upward in corrected optical vision. Masaccio was satisfied with the “sufficient”. In the formation of the capital he probably used a scale drawing laid in position and then pierced to give the essential reference points. The same drawing, reversed, would have served in the formation of the opposite capital. The scratched contours of the acanthus leaves are surely made free hand, since they are so cursory.

The fourth giornata comprises the area of the arch frame and of the spandrils bordered

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\(^7\) The use of spolvero for the formation of architectural ornament was known already to the shop of Orcagna (E. Borsook, *The Mural Painters of Tuscany*, New York, 1960, p. 21, pl. III C).
by the ionic capitals, the *intrados* of the arch frame, and above by the front face of the entablature (fig. 8). This entablature projects a short distance from the wall. The underside of the entablature is shaded, and its width defined by a snapped rope line. The parts of the moulding of the arch frame are defined by a series of concentric arcs scratched into the surface. A central plumb line crosses the arch frame. Four indented points are visible along this line, forming three equal intervals from the bottom, and locating the rope line marking the juncture of the underside of the entablature with the wall face. Although arcs are scratched through the three lower points they are unrelated to the moulding of the arch frame which consists of three forward staggered strips topped by a cyma. Above this cyma extends a thin terminal strip which brings the arch frame forward to the level of the face of the entablature above, and below of the pilaster strips and the abaci of the ionic columns. All the edges of the mouldings are defined by arcs scratched on the plaster.

The two tondi set in the spandrels are of particular interest (figs. 9 and 10). They are
so situated that they touch on the entablature, the pilaster capital and the arch frame. Their frames project to the face of the lower entablature strip and of the adjoining arch frame. Inside the tondi appears a sunken fluted rosette, the flutes widening as they extend away from a central point at which they merge. The rosettes are framed by a reversed cyma followed by a final projecting strip.

The tondi are fascinating because their scrutiny reveals a careful perspective construction. It will be noted that the circles sectioning the tondi into component parts are not all concentric, but are made with a compass centered on points lying on a diagonal line oriented toward the vanishing point. This diagonal can still be observed scratched into plaster and also the points marked on it, extending upward from the center of the rosette. This central point is level with the wall face on which the tondo sits, since it is from this point that the circle was made which defines the juncture of the tondo with the face of the wall. Another point lies four-and-a-half centimeters above the former serving as the center for the outer circle of the projecting face of the tondo and the two circles which follow on the inside defining the outer strip of the tondo frame and a portion of the cyma. This point must have been disturbingly irregular on account of the repeated circling of
the compass, and for this reason it was stuccoed over and retouched on both tondi. The changes in color and texture of the pertinent areas with respect to their surrounding are clearly evident. Somewhat below this area is another point from which was drawn the circle defining the bottom edge of the cyma. Beneath it, at a distance of two-and-three-quarter centimeters from the center of the rosette, another point served for establishing the circle which marks the termination of the fluting of the rosette at its widest. This termination, at which level the flutes are truncated along a plane parallel to the picture plane forming a sort of melon dome seen from the inside, is defined by a regular sequence of points marking the terminals of the ridges separating the flutes. These ridges are determined by lines scratched free hand into the intonaco.

It can be observed that the same procedure was followed for both tondi, wherever the original surface allows confrontation. Their diameter is about 56 centimeters. When Masaccio formed the grid for painting the right pilaster capital he already planned ahead the location of the tondo. On the vertical defining the left side of the grid he fixed an indented point at 18 centimeters below the bottom edge of the entablature, equal to the radius of the tondo. The circumference of the tondo, if extended through the projecting volute of the overlapping portion of the pilaster capital, passes through this point.

During the fifth giornata Masaccio painted the ionic capital at the left side of the

*Fig. 1. See fig. 1. Detail of first giornata: pseudo-meander with spolvero*
Fig. 6. See fig. 1. Detail of third giornata: right pilaster capital
archway (fig. 11). Its scrutiny reveals indented points used for the deployment of a scheme of snapped rope lines. The basic element of this scheme is a square of 51 centimeters which is the width of the abacus and the height of the capital down to the column shaft. At the left side this square conforms to the edge of the pilaster (which is also the giornata line) and at the top it is coextensive with the upper edge of the abacus. At the right side and at the bottom the square crosses the surface of the capital which is seen at a sharp angle from below. There is also a vertical rope line which sections the capital in the width of the arch frame at slightly more than 20 centimeters from the edge of the pilaster. Indented points are evident at the terminations of the rope lines. In addition, three indented points fix the centers of the volutes and of the knob situated midway between them. The arcs of the volutes and the half circle of the central knob were made with a compass centered on these points. In contrast to these precise lines one finds others roughly scratched into the plaster shaping the moulding of the neck of the capital in its perspective recession. The roughness of these lines shows that they were made free hand.

An interesting feature on this giornata is the relationship of the column shaft to the capital (fig. 12). The column shaft was conceived as about equal in width to the arch frame at its juncture with the capital, about 20 centimeters. Masaccio had difficulty in shaping the elliptical optical path of the upper edge of the column shaft. The segment of the bottom side of the square covering the capital which extends from the side of the pilaster to the vertical connecting with the inside of the arch frame is made into the upper side of a tilted square, oriented toward the vanishing point. This tilted square is abbreviated by the edge of the giornata but enough remains to show that it followed the plane of the upper side of the column shaft and that the elliptical path of the neck, its circular shape distorted by the optical angle, was inscribed in this square. A number of indented points and lines, ruled or drawn free hand, are evident along the perimeter of the tilted square and of the column neck and in the space between. Their quantity suggests that Masaccio was caught unprepared and searched for a solution on the spot. The upper side of the tilted square was sectioned into six equal parts, and so were probably the tilted sides. The center point of the upper side is connected to the points marking the first interval on the tilted sides. The point marking the first interval from the right on the front side is connected to the point probably marking the center of the tilted side at the right, and a similar arrangement would correspond
Fig. 8. See fig. 1. Central portion of arch frame and adjacent section of the vault
on the opposite side of the tilted square. This system, extended to the missing portion of the tilted square, would form a tilted octagon inserted within this square which would have served in turn for approximating the path of the ellipse of the column shaft’s upper face (fig. 13).

The relationship of the pilaster edge to the column shaft is not quite clear. The shaft stands free of this edge by 3 centimeters. It is 19 centimeters wide, but its actual width is slightly more since it is recessed from the picture plane. Since one side of the tilted square into which the column shaft is inserted is coextensive with the receding face of the corner pier supporting the pilaster, the column would touch the wall. On the other hand, the optical impression leaves a fringe of uncertainty whether the shaft is barely freestanding or not.

During the giornata which followed, the sixth, was painted the ionic capital at the right side of the archway (fig. 14), and also the intrados of the arch frame (fig. 15). Observation of this capital reveals the same pattern of snapped rope lines and indented points observed in the other: the square 31 centimeters long and 31.5 centimeters high; the vertical descending at about 20.5 centimeters from the edge of the pilaster. The tilted square in which the upper edge of the column shaft is inscribed is also present — that is, the portion visible within the area of the giornata (fig. 15). On the whole, there are fewer reference points and rope lines evident. This capital was painted after the other, and Masaccio dismissed whatever marks he would have found superfluous. The three dots marking the centers of the volute ends and of the central knob are present. However, with the exception of the furthest, the compass was not used in forming the respective arcs.

The study of the capitals yields within narrow limits their real dimensions, and those of the column shafts below them. It can be observed that the egg frieze of both capitals is symmetrically centered inside of the vertical strip in the width of the arch frame (being slightly over 20 centimeters wide in the left capital and 20.5 in the other). The total width of the capital at the level of the abacus would be the width of this strip plus twice the distance from the edge of this strip to the end of the abacus, that is, close to 41.5 centimeters. The widths of the column shafts must be considered in two ways. Their actual readings amount to 19 centimeters for the left one, and 18 centimeters for the other. But it has been observed that they are partially recessed from the picture plane. Since they were inserted within a tilted square of sides equal to the width of the lower arch frame, their real width can be given accordingly as close to 20 centimeters.

The intrados of the arch frame was painted during the same day as the right ionic capital because the scratched arc defining its inside border extends into the plaster surface of the capital. The seams of the giornata comprising the intrados are clearly evident along both long curving sides, and there is also to be observed a change in the shade of red between its surface and that of the arch frame above it.

Masaccio reduced the number of scratched curves and applied them with greater care when he articulated the moulding of the neck of the capital at the right side of the entrance arch. Also, judging by the few points and lines Masaccio seemed more certain of how to establish the elliptical optical path of the upper edge of the column shaft. A tilted square was drawn with its diagonals — visible within the area of the giornata. Points are marked off on these diagonals so that the ellipse can be inscribed in such a way that it touches on the midpoints of the sides of the tilted square and crosses the diagonals at the above mentioned points. How he obtained their location is not clear.
The intrados was divided longitudinally into strips by arcs scratched into the surface (fig. 15). From one of these, situated toward the middle, was suspended a frieze of inverted pyramids set on square bases. It is interesting to observe how these pyramids were formed. Four arcs were made which located the levels of their reversed tips, the upper and lower sides along the front face of their bases, and the upper side of their rear face (invisible to the beholder). On the line defining the junction of the inverted pyramid with their base, points were marked off at equal intervals establishing the widths of the pyramids and of the spaces between them – these being equal. Points were then made locating the reversed tips of the pyramids, and two lines scratched in to mark the visible receding
sides of the bases. With these marks the hanging pyramids could be easily painted into position.

During the two giornate which followed (the seventh and eighth) the column shafts and pilasters were painted down to the kneeling donors. Accordingly, at the end of the eighth giornata the vital figural portion yet to be painted and the most difficult perspective problem of the sharply receding vault seen *di sotto in sù* had been framed by the archway. Masaccio then turned to the area within.

At this point perspective and its transfer from preparatory study to wall became a crucial problem. How Masaccio went about this task can be observed partially in the ninth
giornata when he painted the left half of the barrel vault down to the cross arm. This giornata abounds with assisting marks of various kind: snapped rope lines or scratched lines and indented points. During the tenth giornata when he completed the right half of the vault down to the cross arm he was guided by the portion of the vault already painted, and reduced his assisting scheme of lines and points considerably.

In the ninth giornata the orthogonal ribs are defined by three lines each forming their sides and axis (fig. 16). Surely, these lines were not snapped into position from the vanishing point, but from points made at their extremes. Some of the indented points serving
Fig. 12. See fig. 1. Detail of juncture of left ionic capital with column shaft

Fig. 13. Diagrams for Masaccio’s schemes of approximating the optical ellipse of the upper edge of the column in shafts flanking the archway of his Trinity fresco.
Fig. 14. See fig. 1. Right ionic capital

This function are still visible, for instance, at the ends of the lines shaping the first orthogonal rib at the left of the center. They are located at the upper limit of the giornata. The points toward the opposite ends of these three lines are found on the inside edge of the curving halfrib closing the vault in depth. Other indented points of similar function are also evident along the upper edge of the giornata, at the left side of the central orthogonal rib and at the right side of the second rib to the left of the center, etc.

The curving transversal ribs were also defined by three lines each forming their sides and axis, and these were scratched into position with a compass. In addition, the spaces between the curving ribs are bisected by a scratched curve. The arcs of the ribs are
scratched firmly into the plaster. The question of how Masaccio determined the centers of the arcs forming the curving ribs, essential to the perspective structure of the vault, will be examined later. Whatever this procedure may have been, it was too elaborate to be solved during the very giornata of painting. Surely, the points marking these centers must have been fixed beforehand on a scale drawing and transferred thence onto the wall. Since these points lay along the vertical axis in the area covered by the plaster of later giornate no traces are evident.

There is one snapped rope line which does not relate to the curve of the vault directly. It extends from the upper edge of the abacus of the left ionic column laterally to the upper edge of God the Father’s halo (fig. 17). This line conforms to the radius of the outer curve of the archway. But even so, it had no structural purpose for when it was made the archway had already been painted down to the inside edge of the intrados. It thus repeated a radius which was significant structurally only at an earlier moment in the painting of the fresco. In all likelihood this lateral formed part of a surface geometry (see ahead) which established the upper level of God the Father’s location in the fresco.

There is also the problem of the indented points located in the fields of the recessed
coffers. Each recessed coffer face, depicted red and blue in alternation with a central rosette barely visible at best, is joined to the surface of the ribs by a staggered moulding. The perspective treatment of these coffers in their changing optical settings was quite difficult and must have been worked out ahead. Most probably, many of the visible indented points served as guides for their optical locations. This can be discerned in the coffers situated immediately above God the Father’s halo. In the first one observes a point situated at the lower left corner of the inner coffer face. In the coffer above one finds points placed slightly below both lower corners of the inner face, and at the same level on the right edge of the left adjoining rib. A line connected these points, and it was extended to the
left side of the right adjoining rib. From the junctures of this line with the adjoining ribs diagonals were extended crossing the coffer so that they terminated at the sides of where the interior coffer face was crossed by the rib above it. Obviously, these lines were ruled into place when the coffer frame was already established. The purpose of these diagonals was to fix the center of the rosette: at their point of intersection. It is singular that these crossing diagonals appear only once in the entire vault. Most likely, Masaccio preferred to locate the rosettes by hand after this experiment. In the two coffers which follow above the former Masaccio abbreviated his system. He marked on both coffers the lower level of the inner coffer face by a point located on the edge of the adjoining left rib. He also
marked the lower right corner of the inner coffer face on the highest coffer, and the left
end of the inner coffer face along the line of the edge of the upper rib. A slanting brush-
stroke descends from this point slashing across the lower coffer frame and the rib which
follows. This overly impetuous stroke was intended to define the left side of the inner
coffer face.

A number of indented points lie along the scratched curved line which divides the space
between the lowest ribs. This line corresponds closely to the width of the lower coffer
frames in their distorted optical locations. These points are located close to but not ex-
actly on the spots they would relate to -- corners of inner coffer faces or sides of ribs --
implying that Masaccio corrected himself as he laid out the perspective of the vault on
the wall.

In the tenth giornata the quantity of observed assisting lines and points is reduced (fig.
18). Now the curving ribs are defined by just two lines marking their sides. Experimenta-
tion with a string imitating a compass would show that the centers of the curving ribs
fall along a vertical shifted slightly to the right of the vertical axis used for drawing the
arcs of the curving ribs in the previous giornata. Like shifts in vertical axis can be ob-
served elsewhere in the fresco, for instance, as one moves from the archway (fourth gior-
nata) to the central rib of the vault (ninth giornata), or from it to the head of God the
Father (eleventh giornata). The plumb line which probably marked the vertical axis of
the fresco on the arriccio was only roughly followed on the successive giornate which covered it.

Indented points of relevance are also to be observed in the tenth giornata. On the upper edge of the curving rib connecting with the upper portion of God the Father’s halo these points locate the intersections with the orthogonal ribs. It seems curious why these should have been fixed in the middle of the vault rather than at the extremities of the giornata.

![Fig. 19. See fig. 1. Detail of vault painted during giornata 10 with rope impressions showing](image)

Obviously, two points are necessary for snapping a rope line into place. Surely, the vanishing point was not used as one of these points since its remoteness would have made the procedure inconvenient. Besides, the scaffold on which the painter stood would have been located between the vanishing point and the vault.

Interesting irregular rope marks are imprinted in relief on the intonaco of the vault between God the Father’s head and the ionic capital on the right side. It seems that the artist’s (or his assistant’s) hand slipped when the lines for the sides of the third rib from center were snapped into position. These lines were done over, one line to each side being irregular, curving or tilting into the rib and then disappearing. Most probably the irregular rope marks resulted from the whiplike action of a released taught line (fig. 19).

In this paper the scrutiny of the fresco is extended to those areas especially pertinent for its perspective structure and the problem of the transfer from preparatory study to wall. Presently, we move on to the left ionic capital situated at the rear of the vaulted
Fig. 20. See fig. 1. Upper body of Virgin and area above
space, painted during *giornata* 16 (fig. 20).\(^9\) It has been observed that Masaccio worked from left to right and abbreviated the assisting lines and points when he repeated subject matter identical with the exception of its reversal. For this reason we shall omit considering the ionic capital at the right side of the rear of the vaulted area.

Actually, the *giornata* comprising the left rear ionic capital includes part of another capital belonging to the side space compartment of the vaulted room which is connected to the same pier. The *giornata* line begins some three centimeters above the abacus. From this level on down the surface of the *giornata* reveals a web of vertical and horizontal rope lines. The two verticals present are extensions of the sides of the arch frame coming to rest on the capital (identical to the respective verticals found on the ionic capitals located at the front of the vaulted room). The laterals define the width of the abacus; the torus which extends sideward to form the spiral of the volute; the width of the egg frieze; the width of the neck down to the column shaft. Two diagonal rope lines are also visible, one being an extension of the lower edge of the lowest orthogonal rib, the other crossing the axis of the volute.

It will be observed that the ionic capital in the side space compartment is adapted to the same laterals extending through the adjoining capital, with the exception of the one following the bottom edge of the abacus. However, to express the capital’s forward and upward projection its parts are raised so that its neck is level with the egg frieze of the other, and its volute with the abacus of the other (it extends somewhat above it). The abacus of this capital, and of the respective capital in the side space compartment across the vaulted space, is eliminated. The reason for the elimination can be discerned. When Masaccio painted the vault down to these capitals in earlier *giornate* which included the locations of these abaci he omitted them, not thinking sufficiently ahead, and he simply did not bother to correct this error when this omission must have become evident as he painted the capitals at a later time. Probably, Masaccio paid little heed to this “capital decapitation” in view of their near hidden location.

We now turn to the Virgin Mary, painted during the seventeenth and eighteenth *giornate*. The body of Christ Crucified had been completed when Masaccio turned to the lower area of the archway comprising the Virgin and John the Evangelist. Each figure was done in two *giornate* which were on the whole symmetrically distributed. During the first *giornata* was painted the head and closer arm (fig. 21), and the remainder of her body was added later. These *giornate* extended beyond the figure of Mary comprising the space between the cross and the left side of the arch. A feature of capital importance is the quadratura of snapped rope lines which covers the Virgin’s body. To be precise there are two quadrature of which the more detailed covers the portion of her body painted in the first *giornata*, excluding just the lower section of the closer arm and its broad open sleeve. The two quadrature are related in such a way that each square in the lower grid is sectioned in the upper finer grid into sixteen square parts.

Only the Virgin possesses a grid in Masaccio’s fresco and there can have been only one reason for its execution: to assist the precise transfer of the figure from the preparatory

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\(^9\) In figure 5 the ionic capitals at the rear of the vaulted space are assigned to the same *giornata*. Of course, they might have been done as well on different days.
Fig. 21. See fig. 1. Virgin's head and arm.
drawing to the wall. The evidence strongly supports this assertion. The grid is unrelated to the area around it— even to the bottom of the archway since the grid only begins one-and-a-half centimeters above the upper step. The finer grid was laid out over an area conforming generally to her head. The terminal points used for making this grid are clearly visible along the two side verticals. Additional indented points at key intersections within the grid locate key features: points along the silhouette of her head cover; and especially a point at the corner of her right eye. One vertical is omitted from the grid: the vertical which would have crossed her nose and mouth. Masaccio surely wished to keep her face clear of an excessive assisting line.

The larger grid spread over her main body was extended from the one located above it in a later giornata— except for her closer arm where one witnesses the transition within the first giornata. The laterals were snapped into place from points lying along verticals of which one crosses the Virgin’s advanced foot and the other her right shoulder.

For why only the Virgin demonstrates a grid in Masaccio’s fresco one must examine his dramatic concept in the context of the early Renaissance. Within the emotional tradition of late medieval crucifixions the Virgin’s appearance is revolutionary! She does not wilt in grief as does Giotto’s Virgin Mary in the Padua Crucifixion. Instead, she stands erect: severe, impassive, her temporal connection to the Crucifix uncertain. Her look in the direction of the beholder is general and unfocused; her gesture toward her Crucified Son is made for the sake of the beholder’s instruction. She is clearly raised to a supernatural symbolic role: the embodiment of Mater Ecclesiae. Her normal appearance must have been particularly striking for an audience accustomed to her intimate emotional concern toward her supplicants: witness, for example, her hand extended toward Enrico Scrovegni who offers her his chapel in Giotto’s Paduan Last Judgement. Differently, Masaccio’s Virgin’s “reach” transcends individual relationship. It is universal. It extends beyond the donors kneeling below her, unaware of their presence, to enfold the beholder, present and future, who represents the Community of Christians. Through her, the Christian is presented to the Throne of Grace.10

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10 For the symbolism of Masaccio’s Holy Trinity fresco and particularly of the Throne of Grace see, recently, Otto von Simson’s article: “Über die Bedeutung von Masaccio’s Trinitätsfresko”, Jahrbuch der Berliner Museen, 1966, pp. 119–159.

Masaccio’s Virgin is closely related to the Virgin on a Crucifixion from S. Giusto in Piazzanese exhibited in the recent fresco exhibition in Prato (Due secoli di pittura murale a Prato. Mostra di affreschi, sinopie e graffiti dei secoli xiv e xv, catalogue by G. Marchini, Prato, September–November 1969, p. 44, fig. 8). The fresco belongs around 1400 and seems related to Agnolo Gaddi. Both the Virgin, gaze turned toward the beholder and hand gesturing toward the Crucified Christ, and Saint John, looking toward Christ in sorrow with this hands clasped before his chest, recall the respective figures in Masaccio’s Holy Trinity. It is interesting that another fresco from Prato in the same exhibition, a Virgin and Christ Child Enthroned from the Tabernacolo del Ceppo, given to Niccolò Gerini, depicts an absolutely naked Christ Child standing on his mother’s lap and grasping her veil in a way strikingly similar to Masaccio’s Christ Child on his S. Giovenale triptych in the Uffizi (photo: Soprintendenza alle Gallerie, Florence, no. 17156). Marchini dates the fresco around 1591 (op. cit., p. 52, fig. 4). Regardless of the vast differences in quality, the connection of these frescos to Masaccio would indicate that Masaccio borrowed substantially from his close predecessors—be they minor artists active in the neighborhood of Florence, or Florentine painters of the later trecento whom these minor masters would have imitated.

Obviously, Masaccio’s fresco cannot be compared to crucifixions generally because it merges the Holy Trinity with the Crucifixion and, in all probability, a Florentine funerary memorial. Its layered meanings are focused and raised by the concrete delivery: the mass and weight of the figures; the obedience of the Divine to Natural Law and Its enclosure within Man’s architecture. The Virgin Mary, deprived of her emotional “participation”, is made real in a different, optical dimension. She is observed, exceptionally, di sotto in sù. God the Father, Christ and John the Evangelist are seen straight on. Only the Virgin’s face is tilted in a calculated manner with the left features raised above the right — to realize the relationship of the Virgin to the beholder in a concrete dimension. (The shoulders of Saint John also seem to indicate vision from below, but not so much his profiled face).

The grid used for her transfer from preparatory drawing to wall attests her special role in Masaccio’s fresco. He went out of his way to retain her precisely as planned.

From the observations thus far presented some conclusions can be reached. A comprehensive quadratura is not present. A spolvero is used only in one ornamental frieze in the entablature. Architectural detail was located as needed by lines and points. The types of assisting marks used changed from giornata to giornata. Straight lines were snapped in with rope, circles and curves scratched in with the use of a compass, their locations fixed with indented points made through scale drawings. Masaccio broke down the fresco into its constituent giornate, and adapted his assisting marks to the requirements of each. But Masaccio was aware of quadratura for purposes of transferring model to wall, as the grid on the Virgin demonstrates. Thus far, no earlier grids are known in Italian painting. Two alternatives can be proposed for why Masaccio did not use quadratura for the whole fresco: either this means of transfer was not yet known and practiced or he considered it unnecessary.

From a technical viewpoint Masaccio thus represents a transitional moment in the history of fresco painting. Simplified conventions for the transfer or build-up of compositions on the wall which only approximated the shape and scale of component parts did not meet the requirements of the Holy Trinity. The rigorous perspective of the architecture enveloping the composition imposed from the beginning fixed relationships of shape and scale, and extended its order over the figures within. Masaccio’s genial vision of enclosing the Trinity within a real architecture conceived in a real space required new modes of developing and transferring the composition to the wall so that these relationships fixed by the perspective structure would be maintained without distortion. This excluded a primary study on the arriccio, hardly a suitable place for creating such a re-

11 The funerary character of the Holy Trinity is given by the connection of the donors with the corpse of “Everyman” and the Throne of Grace. It remains uncertain, pending their satisfactory identification, whether they were actually alive or dead when the fresco was painted. John Pope-Hennessy has observed that “initially the role of the Renaissance portrait was commemorative; it was consciously directed to a future when the living would no longer be alive” (The Portrait in the Renaissance, New York, 1966, p. 8). With the availability of death masks retrospective portraits of striking likeness would have depended essentially on the artist’s skill. Masaccio himself used the retrospective portrait when he depicted Coluccio Salutati, who died in 1406, in the counselor seated below Theophilus in the Raising of his Dead Son in the Brancacci Chapel (ibid., p. 7).
volutionary fresco. The *Holy Trinity* must have been bred and born on “desk” and “paper” in a situation of intense and sustained meditation, in a limited scale which allowed the artist to capture and project concepts in an initial stage of development. It is relevant that when Tintori stripped the lower portion of the fresco with the skeleton from the wall no traces of *sinopie* were uncovered.\(^\text{12}\)

From the previous observations we must turn presently to the rational organization of Masaccio’s composition and space and relate our findings to those of other students of these problems. These include primarily Kern’s investigation of the perspective construction, written some fifty years ago,\(^\text{13}\) and an interesting recent paper by Horst Janson which offers a scheme of proportions and measurements very tempting in its inner logic.\(^\text{14}\) However, this logic is not quite as tight as Professor Janson’s presentation would have it.

First we turn to the problem of dimensions. All dimensions here given were measured *in situ* more than once, unless otherwise commented.

A crucial fix on the fresco is the vanishing point. Kern located it a short distance below the step on which the donors kneel, which is situated about 180 centimeters from the church floor.\(^\text{15}\) Considering the location to represent the normal eye level of the beholder standing before the fresco, Janson places the vanishing point lower at 155 centimeters from the church floor. This level would put the vanishing point even with the eyes of the "normal" *quattrocento* Florentine, smaller than his contemporary relation, if one uses the skeleton of "Everyman", 160 centimeters long, as the standard.\(^\text{16}\) However, our observations bear out Kern’s location.

Three participants and a rope were used to trace the paths of crucial orthogonals in order to establish the area of their coming together. The orthogonals selected were the fine axial rib lines snapped in with rope in the left half of the vault. The orthogonal ribs of the vault were selected because they constitute the longest “depth” lines in the fresco. Only the ribs in the left side of the vault were used because its construction preceded that of the right side and seems more reliable, as has been stressed. Considering that these orthogonals were probably transferred from a scale drawing the vanishing point – better: the vanishing area – can be established with a surprising consistency in an area centering close to five or six centimeters below the bottom step. Another vanishing point of unknown manufacture can be observed on the modern wall (at this level the original surface of the fresco is obliterated) at 8.5 centimeters below the bottom step, but it is too perfectly defined to sustain confidence. This point is still about 174 centimeters above the church floor and considerably above Janson’s. We conclude that “Everyman’s” eye level

12 Verbal information offered by Leonetto Tintori. It leads to a reassessment of Oertel’s insistence on Masaccio’s use of an elaborate *sinopia* (bibliography given in note 5).


16 Janson, *op. cit.*, p. 85
did not determine Masaccio’s horizon unless he made a glaring error of 20 centimeters or more.

We now turn to a second problem: whether Masaccio used standard measurements. This has been proposed by Professor Janson who considers the palmo (or half braccio) of 29.18 centimeters as the base measure.\(^\text{17}\) With some exceptions (see ahead) our measurements taken in situ deviate substantially from Janson’s half braccio scheme. Some decisive examples can be given. At the springing of the arch frame the width of the vault (equal to the distance between the pilasters) is not 204 centimeters, but instead 210.5–211 centimeters. Over this short span six or seven centimeters would represent a remarkable margin of error. Seven half braccia would come to 204.26 centimeters. Our reading can be confirmed by the vertical distance from God the Father’s halo to the apex of the arch (inclusive of the arch frame). This distance measures 105.5 centimeters, exactly half that of the vault’s width. This relationship is explained by the fact that the former is the radius and the latter the diameter of the same circle which extends through the outer edge of the archway frame and defines the intersection of the vault, if carried forward, with the picture plane. Furthermore, the abaci of the ionic columns in front of the vault measure exactly 51 centimeters in length – nearly two whole centimeters more than Janson’s measurement of exactly one palmo. These examples could be extended. Nor do the schemes of assisting lines follow the palmo. The rope grid on the pilaster capital to the right is somewhat more than 51 centimeters wide and 43.7 centimeters high. The tondi in the spandrels of the archway measure 35.5–36 centimeters in diameter. The grid on the Virgin is composed of squares whose sides measure mostly around 13.2 centimeters (they vary from circa 12.9 to 13.2 centimeters). The front sides of the coffers on the vault – indeed, all sides if they be square, as seems probable to this writer – can be measured indirectly. This can be done by extending the diverging orthogonals forming the sides of the adjacent ribs (the moulded frames connecting the sunken faces of the coffers with the projecting faces of the ribs are considered part of the coffer) to their points of intersection with the outer edge of the arch frame (which would correspond to the intersection of the vault, if continued forward, with the picture plane). The straight line distance between these points can be measured and would give the desired result. Like means can be adapted for obtaining the width of the ribs. The first area tested was the orthogonal row of coffers to the left of center. The lines extended forward were the axial rib lines and the respective inner edges of the ribs touching on this coffer row. The results are interesting. The coffer side comes to 28.5 centimeters, and the width of the rib to 11 centimeters. In the right half of the vault the lines extended involved the ribs bordering on the second coffer row from the center. The lines chosen for extension were the inner edges of the adjacent ribs and the furthest edge of the left rib. This time the coffer side came to 29 centimeters, and the width of the rib to 8.5 centimeters. The proximity of these coffer sides to the half braccio is remarkable, and raises the possibility that Janson’s theory ought not to be completely discarded. Some irregularities in proportions might be accounted for by lax transmissions of dimensions from cartoon to wall. But even an ex-

\(^{17}\) Ibid., pp. 84 ff.
tremely permissive reading of our dimensions would not accommodate a comprehensive palmo scheme.

We now turn to another vital problem: the presence of a surface geometry and its relationship to the perspective structure of the architecture. Professor Janson has observed acutely that the receding vault, including the frame of the archway, can be inserted within a square defined by the inner edges of the pilasters and extending vertically from the lower edge of the entablature to the abacus of the ionic capitals set at the rear of the vaulted space. Measurements bear out this observation, the height of this square being 207 and 206 centimeters at the left and right sides, respectively, and its width 211–210.5 centimeters at the level of God the Father’s halo, and 211.8 centimeters at the level of the cross arm. The difference between height and width amounts to circa 4 centimeters. This margin would suggest doubt were it not that this surface geometry can be extended. A

Fig. 22 A. See fig. 1. Diagram of fresco with
surface geometry indicated
second square would cover the lower portion of the archway. Its height would be 207.5 centimeters, subtracting the height of the upper square from the distance of sightly more than 414 centimeters separating the vanishing point from the lower edge of the entablature. The archway, including the height of the upper step, is thus inserted within a rectangle composed of two superposed squares. Janson has also noted that the distance to the top step from the church floor (our reading: 204 centimeters) equals the width of the archway (211 centimeters at the level of the donor’s heads) so that it is placed on a square raised from the church floor. This would cause on overlap in the height of the upper step in Masaccio’s surface arrangement of squares.

The purpose of this surface geometry (fig. 22 A) is probably found in the artist’s working method. Surely, it preceded the perspective of the vault, since its formation by a method other than insertion within a square would hardly have given this result. Quite probably this geometry constituted a first division of the surface defining the general proportion of the architecture. This architecture obviously evolved into a revolutionary statement imposing its realism and classicism upon the religious event enclosed within. However, in its gradual formation detail and perspective were worked into an outlined composition. Relationships of surface geometry with spacial depth can be observed. The head of God the Father is defined at the top of the halo by the diameter of the vault which divides the upper surface square, and at the bottom by the arc defining the termination of the vault in depth which curves to meet His shoulders and neck. A related play of depth and surface relationships can be discerned, probably, in Christ Crucified. The arm of the cross, and with it the arms and head of Christ, follows the lateral at the center of the panel taken vertically from the very top down to the vanishing point. Simultaneously, it can be observed that the orthogonals extended through the volute centers of the ionic capitals in back and in front of the vaulted space touch the fingers of the Crucified cupped around the nails. These cupped fingers respond to the curl of the volutes, but in reversed direction. Furthermore, since the cross arm is close to the middle of the vertical distance between the capitals (read from the respective abaci), an impression is created that Christ might be suspended well inside the vaulted space. One wonders in what measure this impression is connected to the thesis of God the Father’s location well within the vaulted space which has found no few advocates. Of course, it is incorrect as Janson has emphatically stressed. The Crucifix, the Virgin, Saint John and God the Father are located in closely connected planes. John casts a shadow on the box whose forward extending lid supports God the Father, and the shoes of both the Virgin and John are visible for their greater height thus underscoring their locations close to the foreground. This gamesmanship of depth and surface might have developed casually, but once consciously examined it must have been retained as a subtle countermeasure to the essential emphasis on rational nature.

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Of course, this rational nature remains the primary factor. It effects a Holy Trinity without precedent. All figures are of the same family according to scale, with Christ and God the Father being slightly taller (151 and 149 centimeters, respectively) than the Virgin (133.5 centimeters) and Saint John (129.5 centimeters). This fact alone removes Masaccio’s Trinity from those preceding his. Traditionally, God the Father was vastly larger than his Crucified Son whose cross he touched or supported enthroned in an undefined space. In a rare example of a standing (instead of seated) God the Father: Lorenzo di Niccolò Gerini’s Trinity in Greenville, North Carolina (fig. 22), the difference in size between Father and Son is especially marked. Only one rare and exceptional instance – Luca di Tommè’s striking Holy Trinity in Pisa (fig. 23) – exhibits a consistency of scale which is as rigorously enforced as Masaccio’s already in the sixties of the trecento: even to the reduction of the sagging body of Christ to a lesser height than the Virgin’s and Saint John’s, as if the artist’s measure had been the erect figure. God the Father follows their
scale appearing in form of a bust floated on clouds, anticipating Andrea del Castagno’s *Holy Trinity* in Ss. Annunziata, where all three – God the Father, Christ Crucified and the Holy Spirit – are carried aloft by flying seraphim. It is tempting to suppose that Masaccio saw and reflected on Luca’s painting, the most dramatic *Holy Trinity* in early Italian Renaissance painting preceding his.\(^{21}\)

However, scale is only one element in Masaccio’s reasoned nature. His figures, divine or mortal, are enveloped in a measured space and respond to gravity and force. God the Father must stand immediately behind the cross which he supports physically. Towering above Christ, his feet are planted solidly on a base which is the lid of a large box filling nearly the whole width of the vaulted area, bracketed forward toward the cross in order to receive Him. This stringent subordination of God the Father to Natural Law is marvelous to behold just because He retains His Divine Presence in spite of this. His appearance, standing solidly planted on a ground connected firm object is unique, and later Renaissance artists returned God the Father, significantly, to the sky in their ‘Trinities. In Pesellino’s in the National Gallery in London (fig. 24), He sits on a thin stiffened cloud-bank,\(^{22}\) and in Raphael’s *Disputà* where the *Deesis* replaces the Crucifix, the Trinity comprises God the Father who stands in an uncertain space above Christ, cut off at the waist by the arch which unifies the *Deesis*, itself suspended on a cloud. Perhaps the north supplies a Trinity closest to Masaccio’s in realism: the *grisaille* panel by the Master of Flémalle in Frankfort (fig. 25). There Christ and his Father are of similar size and are standing on a base projecting from a niche, architecture and figures lit from the same direction. But there the realism of the figures is supported by their being imitation sculptures.

It stands to reason that Masaccio’s determination to connect God the Father to the solid ground determined in large measure the size and location of the box on whose projecting lid He is standing. The level of God the Father’s halo is determined, as has been seen, by the diameter of the circle defining the intersection of the vault (if continued forward) with the picture plane. His location and scale then determined in all likelihood the height of the box on which he stands. A discussion of the symbolism of this box, considered with good reason as being the tomb of Christ,\(^{23}\) must take these factors affecting the shape of the box into consideration. Whether this symbolism was intended from the start or whether it evolved in the process of the formation of the composition will probably never be known. In any case, it would support the essential funerary meaning of the fresco. This fresco could well contain three tombs: below the *Trinity* that of “Everyman”, below

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\(^{23}\) See recently Janson, *op. cit.*, p. 21.
God the Father that of Christ; in back of God the Father in the rear niche another — that of the donors?24 This multiplication of sarcophagi holding diverse categories of deceased would have its parallels, albeit in simplified form, in trecento funerary monuments. In

24 It can be observed on figure 1 that the rear wall of the chapel is not flat, but opens into a niche whose juncture with the rear wall is clearly shown. The curving extension of this niche is depicted in form of changing chiaroscuro along the curving surface of the wall. This niche is indicated in cross section on Sanpaolesi’s figure opposite page 52 of his book on Brunelleschi (bibl. in note 19). The entire lower portion of this niche is closed off by an oblong stone slab, cut off partially by the lid on which God the Father is standing. This stone slab is decorated along the edge by a thin molded rim, and its central portion is hidden by the lower body of God the Father. The combination of niche with transversal slab recalls the funerary niches so widely used in the trecento, for instance, along the very precinct wall of S. Maria Novella. The molding of the rim of this slab recalls the moldings on the sides of the sarcophagi set inside these niches. Often the sides of such trecento sarcophagi are composed of a series of three square or rectangular fields, and it is probable that Masaccio imitated them. This sarcophagus was intended to hold a corpse. If God the Father stands on the tomb of Christ, then it was not Christ’s. It is possible then that it was the burial place of the donors. The assumption would add a significant dimension to the fresco’s iconography. Below the crucifix lies “Adam—Everyman”. His corpse would represent the beginning of death’s rule which extends from the fall of man to the end of the world. Of course, the Crucifix symbolizes Christ’s victory over death and the redemption of mankind. Could this redemption be depicted extending to the donors by way of the superposition of the Holy Trinity: the Throne of Grace — over their tomb?
the Bardi di Vernio chapel in S. Croce the woman buried in the sarcophagus at the right side of the northern wall reappears painted in small scale on the central panel of the sarcophagus of Christ in Taddeo Gaddi’s fresco of the Entombment which decorates the funerary niche (fig. 26). Her praying position recalls that of the woman donor in Masaccio’s Trinity fresco.

Masaccio’s reasoned nature does not exclude conservative or extraneous modes of centering attention on the Divine Personages. The same vault which recedes convincingly into distance projects God the Father and Christ in the direction of the beholder. The orthogonal ribs of the vault receding toward the vanishing point are like rays spreading outward from the Divine, and the curving ribs echo in ever ascending arcs the scene with-
Simultaneously, in contrast to the deep vaulted space the figures remain singularly close to the picture plane, partially projecting forward. Witness, the sarcophagus supporting the skeleton of “Everyman”, or the donors kneeling in front of the archway framing the Crucifixion-Trinity which is situated a short way within. As one admires the composition one notices how the figures, beginning with the skeleton, are stepped inward as one’s vision rises. The triangular formation of the figures assists their spacial adherence to the foreground.

Analyzing Masaccio’s integration of the figures within the architecture is no simple matter. However, since the receding vault is the most decisive spacial component in the fresco it deserved special attention.

We begin by questioning an assertion generally taken for granted: that the plan of the vaulted space is significant and that it can be measured. This has resulted in some questionable assertions. Kern considered that the plan of the vaulted space was square and as a consequence concluded that the coffers had to be rectangular. Differently, Janson wished to combine the square plan of the vaulted area with the square shape of the coffers, and he believed this possible by extending the significant area to include the two side space compartments which are only partially visible in the fresco. However, we have observed earlier how the ionic capitals flanking these side space compartments have no abaci, and it seems unlikely that a significant space should have been so crudely treated. Indeed, the whole question of the significant, measurable plan of the vaulted area ought to be re-examined. Certain conclusions previously reached are important. The vault was shaped by insertion within a surface square. To all appearances, the nearest coffers in the central area of the vault seem square, but the others are excessively distorted in their optical locations for drawing safe conclusions.

Additional information can be gleaned from further scrutiny of the vault. The assisting marks in giornata 9 where Masaccio considered the construction of the vault in greatest detail have been described before. Some aspects of these assisting marks must be reconsidered. In laying out the ribs two kinds of lines can be observed: rope lines and scratched curves which barely dent the surface of the intonaco, and scratched curves which penetrate quite deeply. The rope lines defining the sides and central axes of the

25 Also Otto von Simson, bibliography in note 10, pp. 152.
26 See recently Janson, op. cit., p. 84. He refers to the importance of the square as a “perfect figure in Renaissance humanistic speculation and religious architecture” following R. Wittkower (Architectural Principles in the Age of Humanism, London, 1952, passim). The general validity of this thesis does not mean that in Masaccio’s case the notion of the square dimension of the vaulted area should escape empirical scrutiny.
27 Kern, op. cit., p. 45.
28 Janson, op. cit., pp. 84 ff. Actually, Janson’s calculation of the depth of the vault as being 9 palmi is not quite precise. Janson assumes that “the farthest band of coffers abuts directly against the arch of the ‘rear entrance’”. But this is not correct. A rib half the normal width (one sixth of a palmo wide, following Janson’s calculation) joins the furthest coffer row to the arch frame of the terminal wall, and a similar half rib surely would correspond to it at the hidden front of the vault. It follows that the corrected depth of the vault, accepting Janson’s thesis that each coffer row measures one palmo and each intervening rib one third of a palmo, would amount to 9 1/3 palmi.
orthogonal ribs, and also the curves halving the spaces between the hemicircular transversal ribs are finer than the more penetrating scratched lines of the latter, defining sides and axis. This made them more distinct and contributed to the clear articulation of the vault’s recession. The presence in giornata 9 of all axial rib lines (we recall that they were discarded in giornata 10) indicates that the coffering was defined originally by a plain grid adapted to the curve of the vault which these lines would document. Accordingly, it can be observed that the vault terminates at the back of the room with a rib half the normal width – that is, at an axial rib line. The ribs and coffers would have been added as a second step. Of course, this process of development would relate to the preparatory study and not the fresco. Just why these axial lines were transferred to the fresco is not clear. Possibly, Masaccio might have automatically transferred structural lines of significance in a preparatory study but no longer necessary unless he considered that they assisted in the development of the perspective in the giornata.

To all appearances, the vault comprises seven transversal rows of coffers, of which the one closest to the beholder is hidden in back of the arch frame cutting off its vision. This impression is generally acceptable, but it remains to be sustained by detailed observation. Indeed, an interesting detail is relevant. Along the vertical axis the visible portion of the vault comprises exactly six rows of coffers. Is this mere coincidence or part of Masaccio’s calculated design?

Several alternatives can be proposed. Masaccio might have formed the arch frame first, and then accomodated a series of six transversal coffer rows within the visible vault; or Masaccio might have deducted the optical width of the intrados of the arch frame down from its apex along the vertical axis and deployed seven rows of coffers over the remaining surface of the vault (partially hidden) – in which case the extension over the visible portion of the vault of precisely six rows of coffers would seem a strange coincidence; or again he might have formed the vault inserted within the surface square (as previously noted) as composed of a grid of eight by eight coffer bands, then adapting the arch frame to cover the two nearest ones.

The last alternative has the advantage of offering the simplest perspective construction (fig. 27). The surface geometry of the fresco in its initial phase offered the square into which the vault was to be inserted. The diameters of the hemicircles forming the front and rear of the vault lay conveniently along the lateral bisecting the square and its bottom side. The lengths of the radii were given by the lateral distance from the respective centers lying on the vertical axis to the orthogonals defining the sides of the vault, set along lines connecting the midpoints of the vertical sides of the square to the vanishing point below. The outer hemicircle was divided into eight equal segments, and from the seven points defining them lines were drawn to the vanishing point, these being the axial lines of the orthogonal ribs. The spacing of the eight curving coffer rows was also a simple matter. On the extended diameter of the hemicircle closing the vault in the foreground at its intersection with the picture plane a sequence of eight equal segments of reasonable length are marked off starting at center (experimentation shows that their lengths are not fixed). From the end point of this sequence a line is drawn to the horizon so that this line passes through the center of the hemicircle closing the vault in depth. Lines are
then extended from the intersection of this diagonal with the horizon to the other seven points defining the segments of the above sequence. The intersections of these lines with the vertical axis locate the centers of the hemicircles forming the axial lines of the other seven transversal ribs, the radii being the lateral distances from these centers to the orthogonals defining the sides of the vault.

Fig. 27. Diagram of Masaccio’s initial perspective construction of the coffered vault in the Trinity fresco, as proposed by the writer

For this perspective structure the measured depth of the vaulted space is clearly unnecessary. Masaccio surely tested the result in that it corresponded empirically to a concrete spacial image – and this impression has born the test from Vasari’s time\textsuperscript{29} to the present.

Let us observe how this alternative corresponds to the evidence. The primary problem

is whether the width of the arch frame (including its *intrados*) would correspond to that of the two nearest coffer bands which it would replace. This problem is connected to another which must be considered first: finding out the width of the nearest visible coffer band. This is no simple matter. Observation of the axial rib lines indicates that with the exception of the nearest two visible ribs these axial lines are fairly well centered within the rib. On the rib at the further side of the closest visible coffer row this axial line is located well below center, and on the rib crossed by the *intrados* of the arch frame this
axial line is most probably the line located but half a centimeter above the lower edge of
the rib (fig. 16). It can be observed that the surface of this rib above this line up to the
overlapping intrados, three centimeters wide, is clear of lines (the demarkation line is also
the edge of the giornata). Measurements bear out this assertion. The sequence of widths
of the coffer rows from the rear of the vault forward is as follows: 11.8; 12.1; 14 (the
previous dimensions are approximate since along the central vertical axis either one or
both axial rib lines are covered by the head and halo of God the Father); 15.8; 16.6; 18.5
centimeters. Measured from the approximate centers of the respective ribs, the closest
visible coffer band would measure about 19.5 centimeters — involving an excessive jump
of nearly 5 centimeters over the width of the adjacent coffer row. It follows that the two
nearest ribs were raised slightly with respect to their axial lines which would have been
drawn first. This correction would have connected the nearest coffer band precisely to
the edge of the intrados which lies at the line of the giornata. It is possible that an error in
transposition made this correction necessary.

We now turn to the next problem: whether the available space corresponds to the width
of the two replaced coffer bands. This space must be measured from the closest visible
axial rib line, situated, as has been seen, half a centimeter above the lower edge of
the rib. The pertinent distance extending from this line to the apex of the arch frame
amounts to about 45.7 centimeters. This distance would accommodate conveniently two
such coffer bands — say of about 20.7 and 25 centimeters — to be joined to the series ex-
panding in the sequence of 11.8; 12.1; 14; 15.8; 16.6; 18.5 centimeters.

The solution here proposed for how Masaccio formed the perspective of the vault has
the advantage of simplicity of design. The construction of the vault would have developed
logically from the surface square into which it was inserted. This would not be the case
in the two other alternate solutions previously proposed since the centers for the nearest
hemicircle of the vault would have to be located empirically. After the perspective scheme
of the vault was fixed Masaccio then elaborated the archway in full, adding the arch
frame and the columns which separate the vaulted space from that of the kneeling donors
and the beholder. We have observed that the front face of the arch frame is of the same
width as the column shafts at its juncture with the ionic capitals. At the apex the front
face gains two centimeters in width. All the fluctuations in measurements cannot be ac-
counted for. Possibly, the increased width of the face assisted in extending the archway
and its intrados over the area of the two coffer bands which they replaced.

In surveying the previous discussion we can propose some general assertions. Masaccio
was obviously deeply bound to Brunelleschi in the shaping of his architecture and in his
concern and ability in perspective construction. But it would seem exaggerated to consider
the Trinity a thorough study in perspective on the same order of Brunelleschi’s studies of
the Piazza della Signoria or the Piazza di S. Giovanni.31

The perspective of the vault is successful in the eye of the beholder, and it was formed

30 The measurements here given are taken from a tracing of the assisting lines and marks evident on
the vault.
by adapting a perspective easy to construct within a surface geometry. From our scrutiny of the fresco Masaccio emerges as a practical painter. He did not adhere slavishly to system or detail. Some errors he left uncorrected as long as they did not interfere with the vision of the whole (we recall the missing abaci of the capitals in the side space compartments). The brushwork is broad and sufficient for specifying space and shape. Here and there an inquisitive and restless spirit reveals itself investigating problems directly on the final intonaco which had not been solved beforehand, such as the pattern of scratched lines attempting to locate the elliptical path of the upper edge of the column shafts at the sides of the arch.

In some measure it can be observed how Masaccio transferred the composition from model to wall. A spolvero was used for just one architectural ornamental frieze of minor importance. For the transfer of architectural shapes the artist made use of cartoons in the size of the giornate. Through these cartoons essential points were indented on the intonaco. These points were then connected to form schemes of lines sufficient for the detailed reproduction of the objects to be painted. Occasionally, these schemes of lines were amplified by details scratched on the intonaco. A grid was used, but exceptionally for the transfer of just one figure, albeit a vital one: the Virgin Mary.

In the development of fresco painting during the Renaissance Masaccio’s Holy Trinity plays a vital role. This fresco initiates a new phase of technical requirements. Before its time a sinopia could accommodate the artist’s control over the desired final statement. But with the Trinity the traditional sinopia lost a good measure of its value. In its composition all parts, figural and ambiental, were united in determined relationships of real appearances and measurable proportions. These had to be transposed from the study to the wall faithfully. This service the sinopia could not render and it is no wonder that no sinopia has been found beneath Masaccio’s fresco. On the other hand, the comprehensive grid is yet missing or was consciously shelved. It will be recalled how insistently Alberti advocates its use for the transfer of compositions, and how it appears on Uccello’s drawing in the Uffizi for his fresco of John Hawkwood in the Cathedral of Florence (fig. 28). In the Presentation in the Temple by the Prato Master in the Cathedral of that city the mechanical process of the transfer of a complex composition from preliminary study to the wall by means of quadratura is clearly evident: there the grid appears as well on the grezzo as on the intonaco levels.

Masaccio’s Holy Trinity has impressed its realism upon centuries of criticism. The fresco testifies to Masaccio’s ingenuity in developing a vaulted space which is the shrine of a humanised Divinity and an archway which is the threshold of Renaissance art.

33 Giuseppe Rosi, who restored the Presentation in the Temple from Prato Cathedral, was very generous with information. The appearance on the arriccio and intonaco levels of identical quadrature is mentioned by Giuseppe Marchini in the recent catalogue of the exhibition of frescoes in Prato (bibliography in note 10, p. 18, figures on pp. 101, 105).
34 The writer extends his gratitude to the Harvard Institute of Renaissance Studies at Villa I Tatti, to its director Myron Gilmore, and to Millard Meiss, without whose interest and support this paper would not have materialized.
THE ANATOMY OF MASACCIO’S HOLY TRINITY

PROVENANCE OF THE PHOTOGRAPHS

Soprintendenza alle Gallerie, Firenze: Fig. 1, 2, 5 (with some changes made by writer), 12, 19, 26, 28. - Luigi Artini, Villa I Tatti: Fig. 4-11, 14-18, 20, 21, 25. - The writer: Fig. 7. - Bob Jones University, Greenville: Fig. 22. - National Gallery, London: Fig. 24. - Bildarchiv Marburg: Fig. 25.

RESUMEE

Masaccios »Trinität« in S. Maria Novella zu Florenz stellt nicht nur ein hervorragendes Beispiel des Strebens nach Naturwahrheit im frühen 15. Jahrhundert dar, sondern auch eine überaus wichtige Stufe in der Entwicklung der Freskenmalerei. In diesem ersten Wandgemälde der Renaissance, in welchem die menschliche Figur und eine reiche, realistisch proportionierte wie auch tiefenräumliche Architektur eine künstlerische Einheit bilden, hatte der Maler die entsprechenden Mittel erst zu erfinden, um die Komposition von dem gewiß kleinformatigen ersten Entwurf auf die Wand zu übertragen, ohne die vorbestimmten Größenverhältnisse und Details zu verändern.


