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FRONT COVER

Garofalo, *Saint Augustine with the Holy Family and Saint Catherine of Alexandria* (NG 81), (detail of PLATE 4, p. 23).

TITLE PAGE

Garofalo, *The Virgin and Child with Saints William of Aquitaine, Clare (?), Anthony of Padua and Francis* (NG 671), (detail of PLATE 3, p. 22).

The Technique of Garofalo's Paintings at the National Gallery

JILL DUNKERTON, NICHOLAS PENNY AND MARIKA SPRING

BENVENUTO TISI OF FERRARA – also (and now usually) known as Il Garofalo after the town in the province of Rovigo whence his family originated – came of age in 1502. In Ferrara, where he was living, this meant that he was then 25 years old. So he was presumably born in 1476 or 1477. He is in fact first recorded as a painter in 1497 when he was placed in Boccaccino's workshop. By 1506 he was established as one of the leading painters in Ferrara and was employed by the court. He may already have visited Rome and perhaps Venice. He seems to have been in Rome in 1512 and to have come into close contact with Raphael. Between 1513 and 1545 he executed major altarpieces for Ferrara and its neighbourhood at the rate of at least one a year. These can often be dated by their inscriptions or by the contract and provide touchstones for dating his other works, many of them small panels and canvases with religious subjects, which may have been regarded as cabinet pictures as well as domestic devotional aids. He also painted some mythologies and allegories, usually on canvas, although many fewer than Dosso Dossi, his principal rival in Ferrara, who seems to have been in much less demand for ecclesiastical commissions but was more closely attached to the court of Duke Alfonso I (1505–34). Garofalo, however, received more court commissions under Alfonso's successor, Ercole II, including commissions for a number of murals which have not survived. Shortly after his marriage in 1529 or 1530 Garofalo lost the use of one eye and went completely blind in 1550. He died in 1559.

The size of Garofalo's oeuvre, the number of large ecclesiastical commissions and above all his continuous activity as a painter in fresco (palace ceilings decorated by him date from the first decade of his maturity) make it certain that he had assistants and pupils. He was also influential and much imitated. In addition, it should be said that some of the copies of and variants on his paintings made in the mid-nineteenth century, when his reputation was especially high, are remarkably proficient. For the purpose of this study we have treated all eight

works associated with Garofalo in the National Gallery as by him. Although there are variations in condition, the quality of execution remains high, and in most of them technical examination has revealed features that indicate his direct participation in their painting. Nevertheless, some workshop participation cannot be excluded. One of the paintings, the *Saint Catherine of Alexandria* (NG 3118; PLATE 2), has occasionally been attributed to other artists – Roberto Longhi considered it to be by the young Correggio and the idea has never completely died. However, as will be demonstrated, there is nothing in its technique to suggest Correggio, and it should probably be accepted as a relatively early work, dating perhaps from soon after 1510. The little *Virgin and Child with Saints Dominic and Catherine of Siena* (NG 3102; PLATE 1) – the 'Madonna della Scimmia' (the 'Madonna with the Monkey'), as it was known to connoisseurs in the nineteenth century – was always regarded as something of an attributional puzzle. Cecil Gould thought that it 'hardly seems possible to settle the attribution', but there are many details which connect this with Garofalo's earliest signed works and we feel confident that it is by him and must date from the last years of the fifteenth century when Garofalo was most influenced by Lorenzo Costa, Niccolò Pisano and Domenico Panetti.

After about 1512 Garofalo may be said to have reached maturity as a painter and thereafter his style developed relatively little. This creates problems for the dating of his paintings. Only two in the collection are securely dated: *The Virgin and Child with Saints William of Aquitaine, Clare(?)*, *Anthony of Padua and Francis* (NG 671; PLATE 3), a splendid and highly typical altarpiece (and a notably Raphaellesque painting), is documented as completed by 1517 for the high altar of the Church of San Guglielmo in Ferrara, and is therefore a work of the artist's early maturity. The other is *A Pagan Sacrifice* (NG 3928; PLATE 7), which is inscribed as completed in August 1526. The *Two Couples with Cupid* (NG 1362; PLATE 8) (previously known at the



PLATE 1 Garofalo, *The Virgin and Child with Saints Dominic and Catherine of Siena* (NG 3102), c.1500. Panel, 46 x 35 cm.

National Gallery as *Mythological Figures in a Landscape* and as *An Allegory of Love*) is a painting of comparable size and secular character (both of them with mysterious subject matter which will be discussed in a future volume in the series of National Gallery catalogues), yet it was probably painted over a decade later. It may date from after 1540 and was certainly not painted before 1535. The elaborately plaited hair and somewhat cubic-shaped mountains are found also in dated paintings of the early 1540s, and the over-accentuated anatomical features must be a response to Giulio Romano's frescoes in Mantua. The small-scale works are less easily dated. For example, Fioravanti Baraldi in her monograph associates *Saint Augustine with the Holy Family and Saint Catherine of Alexandria* ('*The Vision of Saint Augustine*') (NG 81; PLATE 4) with the *Apparition of the Virgin* dated 1530 in the Gemäldegalerie, Dresden, but Stella Mary Pearce proposed a date of over a decade earlier based on the style of dress and coiffure, and it seems unlikely that it dates from after 1525. It is probably earlier in date than the *Agony in the Garden* (NG 642; PLATE 6), which is closely related to other versions of the subject, including one dated 1524 (see below). *The Holy Family with Saints John the Baptist, Elizabeth,*

Zacharias and Francis (?) (NG 170; PLATE 5) is particularly hard to date. Fioravanti Baraldi places it in the early 1520s, but certain details, notably the shape of the cradle and the ornament on the cradle's feet, appear in pictures dated 1533 and 1537. Garofalo could, of course, have used these motifs at an earlier date, and in its technique the painting has much in common with the '*Vision of Saint Augustine*'. Whether this connection is of any value for its dating is discussed below.

The National Gallery's paintings by Garofalo therefore span some forty years or more. Furthermore, they are on both panel and canvas, and vary in size from small devotional works to large altarpieces and decorative mythologies. Given this diversity, one of the purposes of the present study has been to investigate the extent to which he adapted his technique according to support and scale, and also to consider whether it altered and developed under changing influences. Garofalo's education in the late fifteenth-century workshop of Boccaccio and the probable influence of Lorenzo Costa, active in Ferrara in the last years of the century, mean that his training in panel and canvas painting was principally in the oil-based methods, originating from Northern Europe, that had become current in Venetian and North Italian workshops in the later part of the century. Yet for most of his career Garofalo worked in parallel with the



PLATE 2 Garofalo (attributed to), *Saint Catherine of Alexandria* (NG 3118), c.1510. Panel, 46 x 39 cm.



PLATE 3 Garofalo, *The Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis* (NG 671), 1517. Poplar, 203 × 211 cm (without added lunette).

other dominant figure in Ferrara, Dosso Dossi. He must, therefore, have been aware of Dosso's innovative, and often idiosyncratic, approach to technique, and been familiar with the works painted by Titian for Alfonso d'Este, and their influence might be expected to have affected his painting technique.

Supports

The earliest painting, *The Virgin and Child with Saints Dominic and Catherine of Siena* (PLATE 1), is on a panel, presumed to be of poplar, and consisting of a single plank, about 2 cm thick, with the grain running vertically. The two horizontal channels, cut for battens, now missing, may be original.

The paint and ground extend to the edges of the panel, and so it is possible that it has been trimmed slightly. Strips of pine added around the edges mean that this cannot be confirmed. The panel of *Saint Catherine of Alexandria* (PLATE 2), however, which because of its design and the horizontal direction of the grain might be thought to be a fragment of a larger altarpiece, shows signs of gesso extending over the edges at the sides. The top and bottom edges also appear uncut. Moreover, at only 1 cm thick, it is too thin for an altarpiece – there is no evidence that it has been thinned. The large *Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis* (PLATE 3) has certainly been altered. It was constructed from



PLATE 4 Garofalo, *Saint Augustine with the Holy Family and Saint Catherine of Alexandria* ('*The Vision of Saint Augustine*') (NG 81), c.1518–25. Poplar, 65 × 81.8 cm.

planks of poplar, about 3 cm thick and laid horizontally, although the almost square format of the altarpiece means that they could equally well have been arranged vertically. Four notably wide poplar planks are completed with a fifth plank of about half the width at the top. The vertical battens, set into channels, appear to be old and may be the original ones. The cutting of some old and possibly original butterfly keys inserted across the joins at the left edge suggests that the width of the panel has been reduced by a few centimetres. A lunette, made of lime and painted with a canopy, was added, probably in the nineteenth century. This is now covered when the painting is on display. The extension was inset at the front with a half-lap join, which seems to have necessitated sawing off the upper corners of the original panel, which were then reattached. Of the two small panels probably dating from the 1520s, '*The Vision of Saint Augustine*' (PLATE 4) is in relatively intact condition, the join between the the wide horizontal poplar plank and

the narrower one above having remained tightly glued and difficult to detect except in the X-radiograph, where the glue line shows as white and the different wood grain becomes apparent (FIG. 1). As with the other smaller panels, the batten channels were cut for quite slender battens and they taper at alternate ends, as was usual in the sixteenth century. *The Agony in the Garden* (PLATE 6), however, is no longer on its original support, having been transferred to canvas, apparently before its acquisition by the National Gallery in 1860. The canvas is now mounted on a synthetic board. Judging by the cracking of the paint and ground, the panel seems likely to have consisted of a single vertical plank.

The Holy Family with Saints John the Baptist, Elizabeth, Zacharias and Francis(?) (PLATE 5) is another small devotional picture, and yet it is painted on canvas and not on panel. It is just possible that it has been transferred, but the ground layer is still present, and in fact between 15 and 20 per cent of Garofalo's surviving smaller paintings,



PLATE 5 Garofalo, *The Holy Family with Saints John the Baptist, Elizabeth, Zacharias and Francis (?)* (NG 170), c.1525–35. Canvas, 60.5 × 47.2 cm (painted area).

including Madonnas, are on canvas supports, chosen perhaps for their relative cheapness as well as for their portability. The canvas is a notably fine tabby weave, as is that of the two large canvases, *A Pagan Sacrifice* and *Two Couples with Cupid* (with thread counts of 22 warp, 26 weft, and 22 warp, 22 weft threads per cm respectively) (PLATES 7 and 8; FIG. 2). The edges of both these canvases have been trimmed, and so there is no evidence for the method of stretching. *A Pagan Sacrifice* is made up of two lengths of canvas joined with a central vertical seam, sewn with very small neat stitches (FIG. 2), while the slightly narrow *Two Couples with Cupid* is made up of one piece of the full width (about 3cm wider than the other canvas) on the left and a narrower piece to the right. The stitching is less fine and the seam now is more prominent on the picture surface.

Preparatory layers

Regardless of the support, the first stage in the preparation of a painting in Garofalo's workshop was the application of a layer of gesso, calcium sulphate. This has been identified on all the pictures (for example PLATES 20–26) except the transferred panel, *The Agony in the Garden*, where the gesso



PLATE 6 Garofalo, *The Agony in the Garden* (NG 642), c.1525–30. Canvas, transferred from wood, 48.5 × 37.4 cm (painted area).

must have been removed during the transfer process. On the panels the gesso layers are usually relatively thin; the texture of the planks of wood of the large altarpiece is conspicuous in a raking light, and the wood grain of *The Vision of Saint Augustine*, although not so evident on the surface, registers clearly in infra-red reflectograms (see FIG. 4). Both panels and canvases then received some form of sealing layer or *imprimitura* to reduce the absorbency of the gesso and, in some cases, to alter the colour of the painting surfaces. The ground of the very early panel, *The Virgin and Child with Saints Dominic and Catherine of Siena*, was sealed with an unusually thick layer of almost pure oil (see Table, pp. 40–1), which now appears as a yellow-brown translucent layer in paint samples. In the sample, a few particles of lead white and lead-tin yellow are also present, but the small amount suggests that the pigment was added to improve the drying of the oil layer rather than to colour the *imprimitura*. A much thinner translucent layer of either oil or glue features above the gesso in the *Saint Catherine of Alexandria*, the other panel generally assigned a relatively early date.

More opaque primings, with lead white as the principal component, occur on the other three panels with intact preparations and on the small



PLATE 7 Garofalo, *A Pagan Sacrifice* (NG 3928), 1526. Canvas, 128.5 × 186 cm (painted area). During restoration.



PLATE 8 Garofalo, *Two Couples with Cupid* (NG 1362), c.1535–45. Canvas, 127 × 177.8 cm.

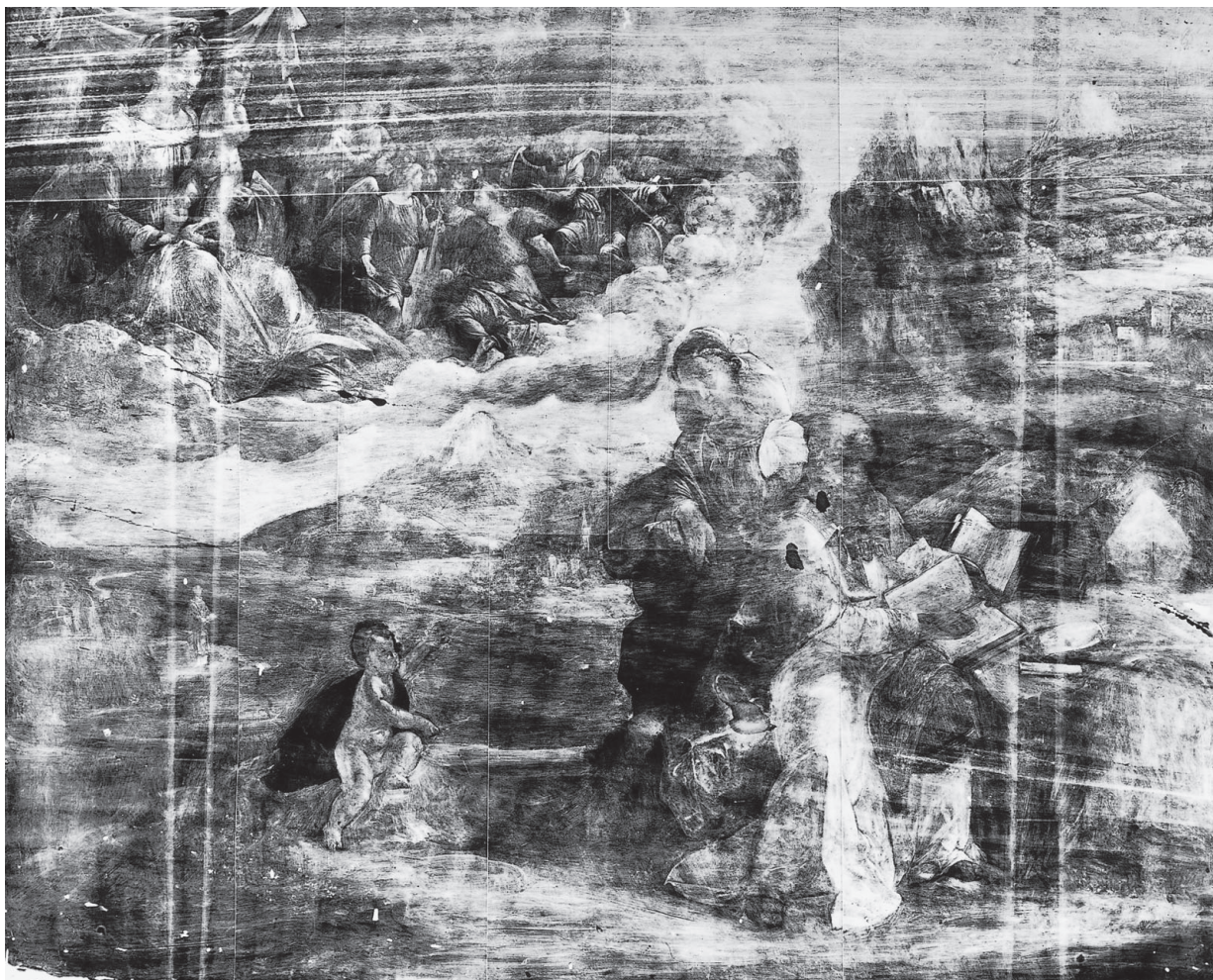


FIG. 1 Garofalo, *Saint Augustine with the Holy Family and Saint Catherine of Alexandria* ('*The Vision of Saint Augustine*'), X-ray mosaic composite.

canvas, *The Holy Family with Saints*, where the support seems to be treated almost as though it were a panel. These primings also contain some lead-tin yellow with the lead white. Similar primings with a small amount of lead-tin yellow in addition to lead white have been found on paintings by

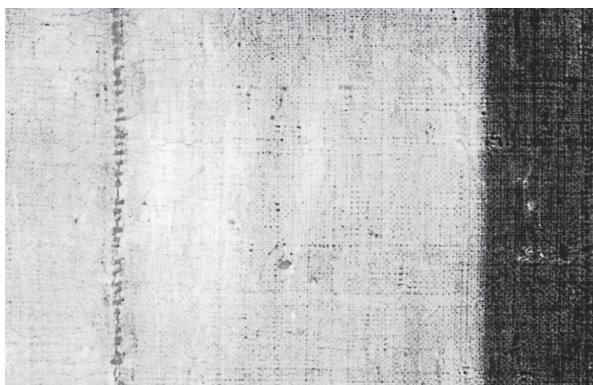


FIG. 2 Garofalo, *A Pagan Sacrifice*, X-ray detail, reproduced actual size.

Lorenzo Costa in the National Gallery, and also on *Saints Sebastian, Roch and Demetrius* (NG 669) by Garofalo's Ferrarese contemporary, Ortolano. However, this type of preparation has been observed on several other paintings in the National Gallery Collection, all dating from the first half of the sixteenth century. This group is surprisingly diverse geographically, ranging from Jan Gossaert's *Adoration of the Kings* (NG 2790) and *Saints Peter and Dorothy* by the Master of the Saint Bartholomew Altarpiece (NG 707) to paintings from both Tuscany and Northern Italy, by among others, Raphael, Pontormo and Lorenzo Lotto. On Garofalo's panels some of the samples also show occasional particles of charcoal black as well as the lead-tin yellow. In most cases these seem likely to be stray particles from the underdrawing (applied over the priming – see below), but the *imprimitura* of '*The Vision of Saint Augustine*' contains sufficient black for it to be slightly tinted to a very pale yellowish grey. The priming of the canvas for A

Pagan Sacrifice is a similar colour, but a little darker, and contains the same components, and also, rather unusually, small amounts of the three pigments are found mixed with the calcium sulphate of the gesso. Conversely, the *imprimitura* of the other large canvas, *Two Couples with Cupid*, includes calcium sulphate (which is translucent when mixed with oil for a priming) with the more opaque lead white and charcoal black (PLATE 9). Here sufficient black pigment is present for the priming to be a mid-grey colour, making this the only one of the paintings surveyed to have a darker toned preparation. However, it is nowhere near as dark as the primings observed on many paintings by Dosso Dossi, and it does not necessarily indicate his influence, since by the 1530s and 40s mid-grey and darker primings were in widespread use, especially in Northern Italy.

Underdrawing

Dosso's dark preparations allowed him to work with almost unprecedented compositional freedom. He occasionally sketched in forms with lines of lead white paint, but more often he seems to have worked out his designs as he painted, making numerous alterations and sometimes even painting over another, apparently unrelated composition. Garofalo, on the other hand, seems always to have been more disciplined in his approach. As might be expected, infra-red examination of the early panel, *The Virgin and Child with Saints Dominic and Catherine of Siena*, reveals a simple, but careful underdrawing, with the principal forms and drapery folds delineated with fine lines drawn in a liquid

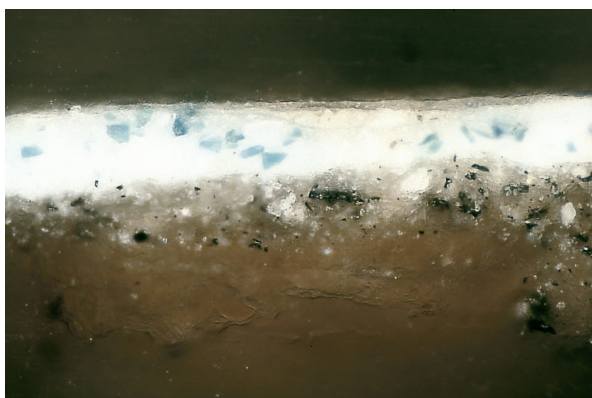


PLATE 9 Garofalo, *Two Couples with Cupid*. Cross-section from a cloud in the sky, showing the preparatory layers. There is a layer of gesso directly on the canvas, followed by an *imprimitura* consisting of calcium sulphate, charcoal black and lead white. Original magnification 400x, actual magnification 250x.

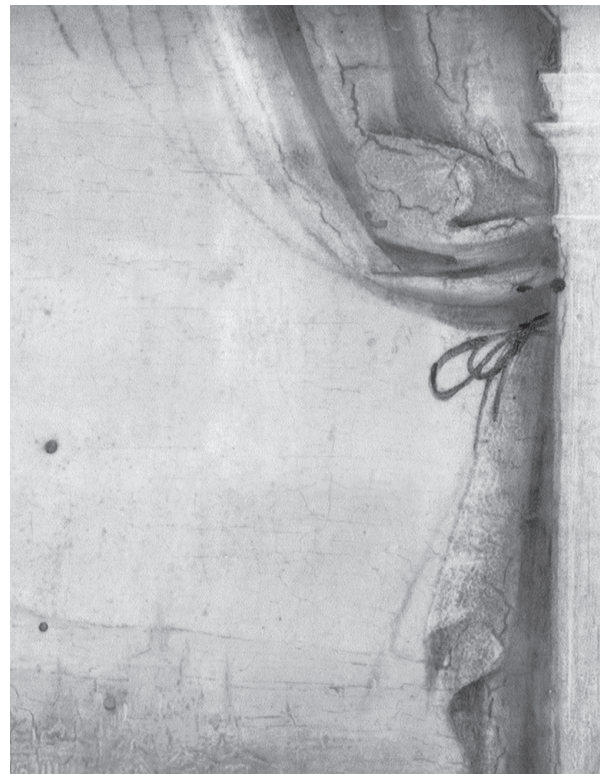


FIG. 3 Garofalo, *The Virgin and Child with Saints Dominic and Catherine of Siena*, infra-red reflectogram detail.

medium. The character of the underdrawing is most evident in the red curtains which are tied back on either side of the Virgin's throne, and particularly on the left, where the bunched folds were drawn wider than they were painted (FIG. 3).

The complicated design of '*The Vision of Saint Augustine*' called for an extensive underdrawing (FIGS 4 and 5), made with a brush and a liquid medium, and the presence of very similar underdrawing in *The Holy Family with Saints* supplies further evidence that Garofalo treated his small canvases in the same way as his panel paintings (FIG. 7). In both, the brush drawing is over the sweeping brushmarks of the *imprimitura* (PLATE 12; FIG. 6). Therefore the lines tend to appear broken and beaded, but they should not be mistaken for lines drawn in a dry medium. In style, the underdrawing, with its combination of long fluent lines and interrupted, more cursory notations, especially for facial features, hands and feet, is close to that visible on Garofalo's unfinished *Circumcision* (PLATE 10) on the reverse of the panel of *The Holy Family with Saints Joachim, Anna and the Infant Baptist* in the Pinacoteca Capitolina, Rome. Garofalo's underdrawings also have much in common with some of his drawings on paper, for example the detailed compositional study for a *Virgin and Child with*



FIG. 4 Garofalo, 'The Vision of Saint Augustine', infra-red reflectogram detail.



PLATE 10 Garofalo, *The Circumcision*, c.1520-5. Unfinished painting on panel, 82 x 64 cm. Rome, Pinacoteca Capitolina. © Pinacoteca Capitolina, Rome.



FIG. 5 Garofalo, 'The Vision of Saint Augustine', infra-red reflectogram detail.



PLATE 11 Garofalo, *Virgin and Child with Saint Joseph and Music-making Angels*, c.1530. Pen and brush drawing with wash and highlighting on paper, 23.5 x 18.5 cm. Chantilly, Musée Condé. © RMN, Paris. Photo: R.G. Ojeda.

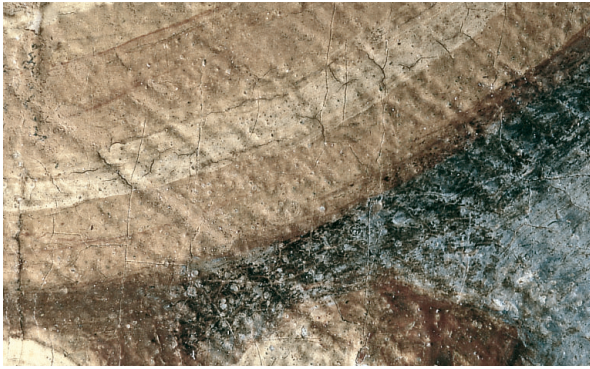


PLATE 12 Garofalo, *The Holy Family with Saints John the Baptist, Elizabeth, Zacharias and Francis (?)*. Photomacrograph taken in raking light showing the brush-marked *imprimitura*.

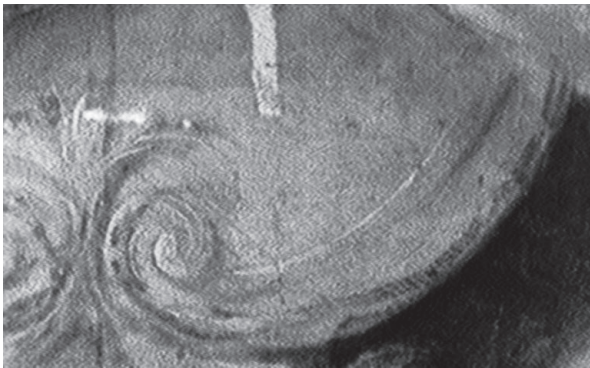


FIG. 6 Garofalo, *The Holy Family with Saints John the Baptist, Elizabeth, Zacharias and Francis (?)*, infra-red reflectogram detail.



FIG. 7 Garofalo, *The Holy Family with Saints John the Baptist, Elizabeth, Zacharias and Francis (?)*, infra-red reflectogram detail.

Saint Joseph and Music-making Angels in the Musée Condé, Chantilly (PLATE 11). A similar study on paper is likely to lie behind the 'The Vision of Saint Augustine', with particular attention given to the accurate representation of the musician angels. Nevertheless, in both pictures there are small differences between the underdrawing and the final painting, most evidently in the Gallery's *Holy Family with Saints*, where it can be seen that the Christ Child was originally drawn in profile.

Many more changes made between the underdrawing and painting stages can be observed by infra-red examination of *The Agony in the Garden* (FIGS 8 and 9), despite the loss of the gesso layer in the transfer. The subject was a familiar one to Garofalo, who had already painted the small canvas *Agony in the Garden*, dated 1524, now in the City Museum and Art Gallery, Birmingham, and perhaps also the large panel in the Pinacoteca Nazionale, Ferrara. Yet these paintings differ considerably from one another in composition, and the design for the National Gallery version seems to have been worked out by improvising directly onto the priming, using

a finer line than in the other two small paintings. The figure of Christ, together with the arrangement of his draperies, is sketched with rapid, almost scribbled lines, often ignored in the painting. Originally his draped knees – indicated in the underdrawing with a simple double curve very like that to be seen in the angel holding the curtain on the left of the Chantilly drawing – were positioned considerably higher. The sleeping apostles have been altered considerably, and in particular the one on the right, who was drawn with his head turned in a different direction and his mantle draped over it, an idea eventually transferred to the central apostle, whose pose seems largely to have been worked out in the course of painting.

More often, however, Garofalo kept to his underdrawn designs. X-radiographs show that figures and draperies were always reserved, and may indeed sometimes have been painted before the landscapes and architectural settings. Often the shapes in X-rays are surrounded by dark borders where the gap between figure and background is barely covered by paint. This is particularly evident



FIG. 8 Garofalo, *The Agony in the Garden*, infra-red reflectogram detail.



FIG. 9 Garofalo, *The Agony in the Garden*, infra-red reflectogram detail.

in the 'The Vision of Saint Augustine', where the water has been carefully brushed in around the underdrawn, and possibly already painted, figure of the child who attempts to empty the sea into a hole dug in the sand (FIG. 10). In places the gap reveals his underdrawn outline (PLATE 13). The larger paintings must also have been underdrawn: simple lines drawn to indicate folds, not followed carefully in the painting, can be detected under some draperies in

the altarpiece and in *A Pagan Sacrifice* (but not in *Two Couples with Cupid*, probably because of its darker grey priming). These underdrawings may perhaps have been closer to the *sinopie* found under Garofalo's wall paintings. On all of them the pentimenti made during the course of painting are mostly relatively minor, for example the extension of the habit of Saint Clare(?) over the corner of the dais in *The Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis*, or a revision to the lip of the jug in *A Pagan Sacrifice*, as well as slight adjustments to contours, as in the jawline of the female figure on the right in *Two Couples with Cupid* and the legs of some figures in *A Pagan Sacrifice*. The X-radiograph (FIG. 11) of the latter, however, also reveals a considerable pentimento, at least by Garofalo's standards. Originally the female figure second from the left was painted with her head inclined to the left and in profile, and the end of her inverted flaming torch curved towards the woman next to her. Perhaps to avoid an awkward collision or overlap, Garofalo reversed the curve of the torch, extended slightly the basket of fruit and repainted the head.

Medium and paint handling

All the pictures were painted in an oil medium. Samples from seven were available for analysis by Gas Chromatography–Mass Spectrometry (GC–MS), and in every case all the colours analysed were



FIG. 10 Garofalo, *'The Vision of Saint Augustine'*, X-ray detail.

found to be in walnut oil. This was the most commonly used painting oil in Northern Italy in the early sixteenth century, and has been identified on

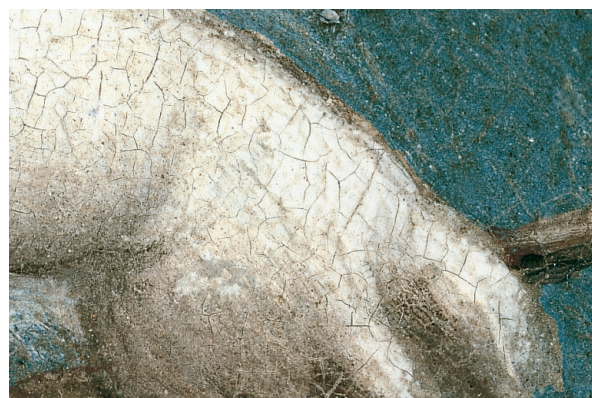


PLATE 13 Garofalo, *'The Vision of Saint Augustine'*. Photomacrograph of the hand of the child holding the spoon.

other Ferrarese works at the National Gallery, including examples by Costa and Dosso. Nonetheless, such consistency of use is remarkable. Pine resin was added for green glazes (discussed below) and a heat-bodied oil was chosen for glazes of all colours. This would have improved their drying, but it also results in a smoother, less visibly brushmarked finish. To make his glazes more even, and to remove excess paint, Garofalo sometimes blotted them with a fabric-covered pad, leaving a typical pattern of regular dots in the red and blue



FIG. 11 Garofalo, *A Pagan Sacrifice*, X-ray detail.

glazes of *'The Vision of Saint Augustine'*, for example (PLATE 14). In the lighter colours the walnut oil is not usually heat-bodied, and, especially in the larger-scale works, the paint surface is often distinctly brushmarked. Garofalo's paint seems to have been quite stiff and pastose, with relatively large amounts of lead white added to increase the opacity of the colours, especially for underpaintings. This results in well-defined and legible X-ray images. A more opaque technique is essential when working over a coloured priming as in the case of *Two Couples with Cupid*, the latest work, but the same opacity is evident in X-radiographs of works with light-coloured primings.

The disadvantage of walnut oil, especially when it is used in a bodied paint, is that it does not dry as well as linseed oil. Several of the paintings surveyed here exhibit drying defects. They range from the fine wrinkling and cracking apparent on small panels such as *The Virgin and Child with Saints Dominic and Catherine of Siena* (here perhaps exacerbated by the oil-rich priming), *Saint Catherine of Alexandria* and *'The Vision of Saint Augustine'* to the wide 'alligator' cracks to be seen in the hair of Saint William and around the head of Saint Clare (?) in the large altarpiece. Evidence that these cracks formed within a few years of completion of the

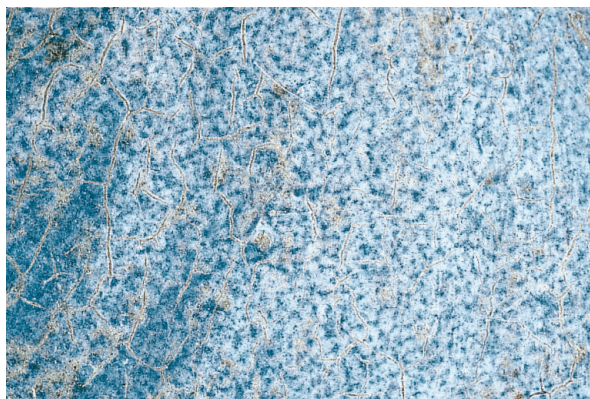


PLATE 14 Garofalo, *'The Vision of Saint Augustine'*. Photomacrograph of the Virgin's mantle, showing an ultramarine glaze blotted with a fabric pad.

paintings is supplied by the technical examination of the enormous Costabili Polyptych, commissioned for the high altar of Sant'Andrea in Ferrara and now in the Pinacoteca Nazionale, Ferrara. Initial payments for this polyptych were made to both Garofalo and Dosso Dossi in 1513, but judging by the appearance of the paintings themselves, it seems that during the first phase of execution, which involved mainly (and possibly exclusively) the central panel, Garofalo alone was active. By the time Dosso came to repaint large areas of this panel



PLATE 15 Garofalo, *Two Couples with Cupid*, detail.

(as well as working on the side and upper tier panels, some of them begun from scratch), Garofalo's paint layers had dried, but not without developing cracks which were then filled in by Dosso's alterations. How long it took for these cracks to appear is crucial to the debate about when Dosso developed his extraordinarily bold and impressionistic paint handling, particularly in the representation of landscapes. If, as seems likely, the cracks developed after years rather than months, then Dosso's contributions to the altarpiece cannot be used in making the case that his distinctive style had already evolved by 1513, as has recently been argued.

Furthermore, if Dosso did not work alongside Garofalo in painting the Costabili Polyptych, then it is less surprising that their techniques remain so distinct. Clearly, however, Garofalo became increasingly aware of aspects of the younger painter's style, and in a detail such as the soldiers with flaming torches in the background of *The Agony in the Garden* the highlights are picked out with a flickering touch that seems particularly close to Dosso. The mountain landscape of *Two Couples with Cupid* (PLATE 15) is painted with a bold economy of technique, with the more distant slopes and trees represented with smears and flicks of light yellow-green paint over the ultramarine mountains. In order to avoid disturbing gaps in the rapid, open brushwork, the whole further distance of the picture, including the townscape, was underpainted with the same mixture of azurite and white that forms a base for the clouds and ultramarine-streaked sky. Although this is a relatively late work, the freedom of handling may be related as much to its scale and original location as to its date, since the altarpiece of 1517 also displays a considerable breadth of handling. Here the thick sticky paint is brushed on with long sweeping strokes in the draperies of the Virgin and saints and the highlight on the knot of Saint Francis's cord belt forms a notably raised impasto. In particular the painting of the Virgin's cloth of honour, its borders, and the tassels on the throne, depends on the pastose properties of lead-tin yellow in oil, a quality that had been exploited by Raphael in his later Roman works, which so evidently influenced Garofalo.

Pigments and colour

Garofalo's panels and canvases are remarkable for their brilliance of palette, and most appear little affected by the alterations in colour that have

disrupted artists' intentions in so many sixteenth-century paintings. He used a relatively limited range of pigments with great skill and some subtlety to achieve highly distinctive colour effects.

The only blue pigments found are azurite and ultramarine. Azurite, mixed with lead white, was the most important colour for skies, appearing on its own in *The Virgin and Child with Saints Dominic and Catherine of Siena* and *The Agony in the Garden* and covered thinly with streaks of ultramarine in 'The Vision of Saint Augustine' and *Two Couples with Cupid*. For the drapery of the old man in *A Pagan Sacrifice*, good-quality azurite of large particle size was glazed over an underpainting containing azurite of smaller particle size and consequently less intense in colour. A decorative echo of the sleeves is created by the use of the same rich blue in the mountains behind the figure. The blue of the Virgin in the large altarpiece is also azurite, but with some red lake added in the upper layers to intensify the shadows and perhaps to shift the colour towards the more purple ultramarine. Ultramarine itself appears mixed with azurite for the Virgin in *The Virgin and Child with Saints Dominic and Catherine of Siena* and for the blotted glazes over an azurite underpainting in the deep blue draperies in 'The Vision of Saint Augustine'. However, the costly pigment is reserved for the thin final glazes, and so *Two Couples with Cupid* is the only painting by Garofalo in the collection to be painted with significant amounts of ultramarine.

The landscape and foliage in this painting are painted with several shades of green. The cold blue-green of the wooded slopes on the left contains azurite, with yellow earth, some lead-tin yellow and a translucent yellow lake. Otherwise the areas of green are based on mixtures of verdigris, with lead-tin yellow and lead white. This is also the basic combination for green colours in all the other paintings sampled, with the addition of charcoal black for darker tones as in the cloaks of Saint William in the large altarpiece (PLATE 26) and the old woman in *A Pagan Sacrifice* (where there is also some red lake). Green draperies are completed with a saturated glaze of verdigris. As is usual, the verdigris has reacted with the binding medium to some extent – there is evidence of copper-oil and copper-resin acid interaction in the FTIR spectra – but discrete particles of green pigment are still visible in the glazes. However they were made, the green glazes in Garofalo's paintings have usually retained much of their original brilliance, discolouring only minimally at the upper surface.



PLATE 16 Garofalo, *The Vision of Saint Augustine*, detail.

Areas of red are also exceptionally well preserved, with little evidence of fading of red lakes, probably because they were applied over strongly coloured underpaintings. In the only area where vermilion was used on its own, in the highlights of the *cangiante* tunic of the angel on the far right in *The Vision of Saint Augustine* (PLATE 16), it has blackened slightly at the surface. More often it occurs as an underpaint for red lake, mixed with red lake and lead white, and, for the deeper shadows, with charcoal black (PLATE 20). The red lake glazes contain a variety of dyestuffs, with lac being used for the Virgin's dress in *The Holy Family with Saints*, kermes for the altarpiece and both madder and kermes in the cloak of the male figure on the right in *Two Couples with Cupid*. Two different lakes are also present in the very early panel, *The Virgin and Child with Saints Dominic and Catherine of Siena* (PLATES 21 and 22): one was prepared from kermes on a conventional alumina substrate, but the other has an orange fluorescence, characteristic of madder, its presence confirmed by High Performance Liquid Chromatography (HPLC). This lake is interesting for the technology of its manufacture, because Energy Dispersive X-ray (EDX)

analysis of the substrate detected alum (potassium aluminium sulphate) instead of the more usual alumina. Alum is a starting material used in lake making, but usually an alkali is added to the dye solution so that alumina, which has formed a salt with the dyestuff, precipitates from the solution. This red lake pigment may be something similar to the red lake called 'flowers of madder', which is mentioned in the Tournai guild statutes of 1480. By analogy with 'flowers of indigo', which is described in historical sources as the scum collected from the top of the woad dyeing vat, 'flowers of madder' could be the scum that collects at the top of a madder dyeing vat, dried for use as a pigment. It is likely to consist essentially of unreacted alum with madder dyestuff.

The pale yellow draperies are based on lead-tin yellow of the most common 'type I' form; characteristic transparent whitish inclusions of lead fatty-acid soaps are visible in samples. For the deeper yellow half-shadows, yellow earth and yellow lake (with a calcium-containing substrate) are mixed with the lead-tin yellow. The deepest shadows of yellow draperies are generally glazed with a warm translucent brown, and samples of these

glazes from *Two Couples with Cupid* and *The Holy Family with Saints* have been found to contain a softwood pitch. Brown glazes with fine drying cracks indicative of the possible use of pitch (PLATE 17) can also be found in other areas of some of the paintings examined, including the deep brown shadows of rocks in the landscapes and the modelling of features, particularly of shadowed faces.

In addition, lead-tin yellow was used to depict embroidered hems and other golden details, but often in conjunction with real gold, usually in the form of shell gold. In the haloes of 'The Vision of Saint Augustine' the fine strokes of shell gold are broken and beaded, in this case perhaps as a result of the use of an aqueous binder for the powdered gold (PLATE 18). Gold is also used here to highlight ornaments painted in yellow on the principal figures' robes and the draped curtain behind the Virgin (PLATE 19), while the haloes on two small works (*The Virgin and Child with Saints Dominic and Catherine of Siena* and *The Holy Family with Saints*) are also executed with paint followed by shell gold. Conversely the edging of the cuffs and neckline of the green dress of *Saint Catherine of Alexandria* was first gilded, probably with some form of mordant, and then glazed with a golden brown paint. There is no real gold on the large altarpiece, or on *The Agony in the Garden*, yet, rather unexpectedly, given its late date and different function, delicate touches of shell gold appear on the edges of some of the textiles in *Two Couples with Cupid*.

In common with many other North Italian painters of the period, Garofalo seems to have had a particular predilection for shades of orange, a colour that first seems to have become popular in Venice at the turn of the century. There it was usually achieved using the orange and yellow arsenic sulphide pigments, orpiment and realgar. This combination also appears on works by Ferrarese painters, a notable occurrence being on the tunic of Saint Roch in Ortolano's altarpiece in the National Gallery (NG 669). Here, however, the patchy disruption of the modelling of the folds shows that the pigments have suffered from the degradation that often affects them. In Garofalo's paintings, on the other hand, areas of orange are in good condition, and examination of samples has shown that this is because their main component is an intensely coloured red earth pigment, with only a small quantity of yellow arsenic sulphide (PLATES 23 and 24). The use of an earth pigment also accounts for the transparency of these colours to X-rays, for exam-



PLATE 17 Garofalo, 'The Vision of Saint Augustine'. Photomacrograph showing the cracked brown glaze, possibly a softwood pitch, in the shadow of the yellow cloak of the angel at the front of the group.



PLATE 18 Garofalo, 'The Vision of Saint Augustine'. Photomacrograph showing the shell gold of the Virgin's halo.



PLATE 19 Garofalo, 'The Vision of Saint Augustine'. Photomacrograph showing shell gold over yellow paint on the gold-embroidered edge of the green curtain.

ple the cloak of the child in 'The Vision of Saint Augustine' (FIG. 10). Examination of samples showed that the red earth has a particularly high

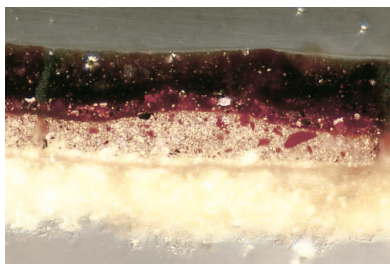


PLATE 20 Garofalo, *The Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis*. Cross-section of a sample from a shadow of the Virgin's skirt. The layer structure is extremely similar to that in PLATE 21; the opaque underpaint, which has been glazed with red lake, is a mixture of vermilion, red lake, lead white and black. The thin off-white layer below (lead white and lead-tin yellow) is the priming, lying on a layer of gesso. Original magnification 440x, actual magnification 225x.

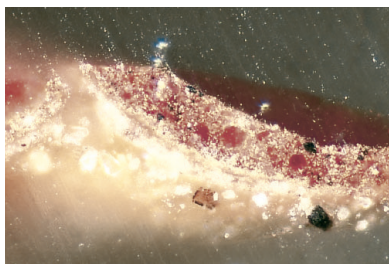


PLATE 21 Garofalo, *The Virgin and Child with Saints Dominic and Catherine of Siena*. Cross-section of a sample from the red curtain around the throne. The medium-rich priming of oil with a little lead white and lead-tin yellow is visible at the bottom of the cross-section. The opaque underpaint, beneath a red lake glaze, consists of vermilion, red lake, lead white and black. The paint is cupped, as can be seen from the shape of the cross-section. Original magnification 500x, actual magnification 225x.



PLATE 22 Garofalo, *The Virgin and Child with Saints Dominic and Catherine of Siena*. Cross-section of a sample from the red curtain around the throne, ultraviolet light. Two different red lake pigments are visible, one of which consists of madder and has a characteristic orange fluorescence. Spot EDX analysis of the fluorescent areas detected Al, K and S, indicative of unreacted alum (potassium aluminium sulphate). Original magnification 500x, actual magnification 225x.



PLATE 23 Garofalo, *A Pagan Sacrifice, 1526*. Cross-section of a sample from a highlight of the putto's orange drapery. The orange paint consists of a mixture of red earth, lead-tin yellow and some yellow arsenic sulphide. Beneath it is the yellow-grey priming. Original magnification 500x, actual magnification 225x.

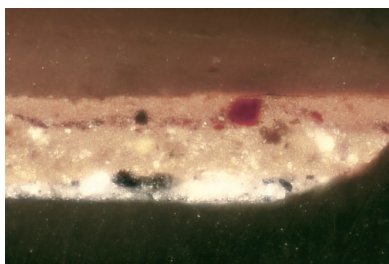


PLATE 24 Garofalo, *The Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis*. Cross-section of a sample from a shadow in the orange lining of Saint William's cloak. The underpaint is very similar to the orange paint in PLATE 23. The uppermost layer, which models the shadow, contains a higher proportion of red earth, with some red lake. Original magnification 500x, actual magnification 225x.

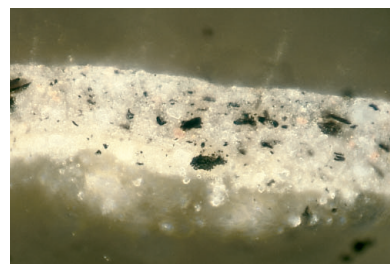


PLATE 25 Garofalo, *Two Couples with Cupid*. Cross-section of a sample from the grey shadow of the flesh of the woman in the foreground. The flesh paint consists of lead white, vermilion and a considerable amount of charcoal black. Original magnification 600x, actual magnification 225x.

iron oxide content (hence its intense colour) and that it was modelled in the shadows with red lake. The highlights contain mainly lead-tin yellow, but combined with some yellow arsenic sulphide pigment. It is possible that this may have altered to some extent and that the highlights of the lining to Saint William's mantle in the large altarpiece, which are now a pale creamy yellow, may once have been a more golden or orange colour.

In paintings with many draped figures, for example *The Holy Family with Saints* and especially '*The Vision of Saint Augustine*' (PLATE 16), Garofalo achieves a considerable range of gold, orange and red-brown hues simply by varying the proportions of the mixture. He balances these with an equally extensive array of mauve, lilac and blue-grey shades, all based on lead white, charcoal black, azurite or ultramarine, and a red pigment, either vermilion or

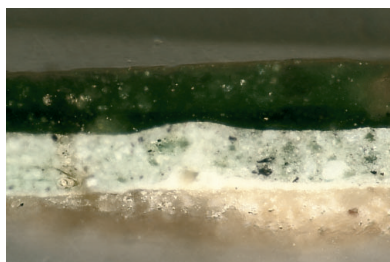


PLATE 26 Garofalo, *The Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis*. Cross-section of a sample from Saint William's green cloak. Gesso and the thin off-white priming are visible at the bottom of the sample. The opaque green underpaint consists of lead white, lead-tin yellow, verdigris and charcoal black. It is glazed with several layers of verdigris. Original magnification 400x, actual magnification 180x.

red lake, depending on the colour. For the slightly *cangiante* fabrics of lilac shot with pink that appear as the linings of the Virgin's mantle in the very early *Virgin and Child with Saints Dominic and Catherine of Siena*, and in *The Holy Family with Saints*, the highlights which consist of vermilion and lake with white have been painted over the basic lilac mixture. Many of the grey-blue shades contain azurite, including the veil in *Saint Catherine of Alexandria*, and the monkey at the foot of the throne in *The Virgin and Child with Saints Dominic and Catherine of Siena*, but the cool tones can also be attributed to Garofalo's use of charcoal, apparently to the exclusion of other black pigments. It appears in the *imprimature* and, bound in a liquid medium, in the underdrawing, as well as in all the paint mixtures.

Charcoal black is also an important component of the flesh tints, where it is combined with lead white, vermilion, and sometimes a little red lake, the amounts varying according to the age and sex of the subject. The male figures usually have warm red-brown flesh tones, in some cases possibly glazed with softwood pitch, but the women and children are always a cool pink with cold grey undertones and shadows. This grey cast is particularly apparent in the female nudes in *Two Couples with Cupid*. It may have become exaggerated through abrasion (this is perhaps the most damaged of Garofalo's paintings in the collection), but as the sample shows (PLATE 25), a large amount of charcoal is present and the use of vermilion rather than red lake means

that none of the pigments can have changed colour.

Looking back from *Two Couples with Cupid*, a work of his late maturity, to the very early *Virgin and Child with Saints Dominic and Catherine of Siena*, Garofalo's consistency of practice appears all the more remarkable. In spite of the wide timespan and the different supports, sizes and functions, his choice of painting materials and the ways in which he combined them remained essentially the same. Perhaps this is one reason why he is one of the most immediately recognisable artists of the sixteenth century.

Acknowledgements

We would like to thank Jo Kirby for her analyses of dyestuffs, Raymond White and Catherine Higgitt for analyses of paint media, and Rachel Billinge, Rausing Research Associate in the Conservation Department, for supplying the infra-red reflectograms. We are also grateful to Paul Ackroyd for useful discussion of the X-radiographs of *A Pagan Sacrifice* during its recent restoration, and Rachel Grout for comparative material on paintings in the National Gallery by Lorenzo Costa.

Notes and references

- 1 A.M. Fioravanti Baraldi, *Il Garofalo*, Rimini 1993. This is the latest monograph on the artist and includes a full bibliography and all biographical documentation.
- 2 The two early paintings, *The Virgin and Child with Saints Dominic and Catherine of Siena* (NG 3102) and *Saint Catherine of Alexandria* (NG 3118), both came to the National Gallery in 1916 as part of the Layard Bequest. They have not been cleaned since. Under the discoloured varnish the former appears to be in very good condition, with no significant retouching, and is affected only by fine drying cracks. The *Saint Catherine* is more extensively retouched, especially over eroded cracks in the flesh paint and there appears to be a large loss in the area of her ear. This has been skilfully, but possibly misleadingly, reconstructed. The impression of soft, almost *sfumato* modelling may be a result of this restoration. The *Virgin and Child with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis* (NG 671) was cleaned in 1970. For a panel of its size it is in good condition, with relatively minor losses as a result of splits, flake losses and drying defects. During the restoration it was confirmed that the lunette-shaped addition at the top, painted with a *baldacchino* to support the draped curtains, was made in the nineteenth century, presumably to emphasise the Raphaelesque aspects of the altarpiece. A large payment made by the National Gallery in 1861 to the celebrated Milanese painter and restorer, Giuseppe

Molteni, suggests that he was responsible for the extension (see the annual report, *The National Gallery, January 1969–December 1970*, 1971, p. 50. ‘*The Vision of Saint Augustine*’ (NG 81) was cleaned in 1965–6, and is in excellent condition with only a few small losses. *The Holy Family with Saints* (NG 170) was cleaned in 1970 and is generally well preserved, except around the edges and in an area of the landscape which has suffered losses through blistering. *The Agony in the Garden* (NG 642) was transferred to canvas from its original wood support at some time before its acquisition in 1860. Since it came from the Beaucousin Collection, the transfer is likely to have taken place in France in the nineteenth century. Although the texture is altered, cleaning in 1968 revealed that it had not been much damaged. There are two fairly large losses in the drapery of the central apostle and some of the glazes are worn. Of the two mythological scenes, *A Pagan Sacrifice* (NG 3928), the restoration of which will be completed in 2002, is in good condition, with only one loss of significant size, in the green drapery of the old woman on the left. On the other hand, *Two Couples with Cupid* (NG 1362), relined, cleaned and restored in 1991–2, is quite considerably damaged. At an early stage in its history, the canvas appears to have been folded, resulting in losses along the folds, and then crushed, causing extensive flaking. The largest losses, which have all been reconstructed, are in the middle distance of the landscape and in the patch of grass to the right of Cupid.

- 3 See Fioravanti Baraldi 1993, cited in note 1, pp. 121–2. The painting was attributed to Marco d’Oggiono when it was in the Costabili collection and to Caroto by Frizzoni at the end of the nineteenth century.
- 4 See C. Gould, *National Gallery Catalogues; The Sixteenth Century Italian Schools*, London 1975, p. 85. Fioravanti Baraldi 1993, cited in note 1, pp. 66–8.
- 5 A fuller argument will be presented in a future volume of the series of National Gallery catalogues. See also Fioravanti Baraldi 1993, cited in note 1, pp. 206–7.
- 6 Fioravanti Baraldi 1993, cited in note 1, pp. 174–5.
- 7 Ibid., pp. 157–9; for the comparisons mentioned here see p. 226 (no. 157) and p. 238 (no. 172).
- 8 Dosso’s technique, unlike Garofalo’s, has been extensively investigated. For recent studies see A. Rothe and D. Carr, ‘Poetry with Paint’, J. Bentini, ‘Dosso’s Works in the Galleria Estense, Modena and the Pinacoteca Nazionale, Ferrara’ and A. Coliva, ‘Dosso’s works in the Galleria Borghese: New Documentary, Iconographical, and Technical Information’, in P. Humfrey and M. Lucco, *Dosso Dossi. Court Painter in Renaissance Ferrara*, ed. A. Bayer, exh. cat., New York 1998, pp. 55–64, 65–71, 72–80. Further notes on technique are included in the individual catalogue entries. See also A. Braham and J. Dunkerton, ‘Fragments of a Ceiling Decoration by Dosso Dossi’, *National Gallery Technical Bulletin*, 5, 1981, pp. 27–37, and B. Berrie and S.L. Fisher, ‘A Technical Investigation of the Materials and Methods of Dosso Dossi’, in *10th Triennial Meeting, Washington, DC, USA, 22–27 August 1993: Preprints*,

ICOM Committee for Conservation, ed. J. Bridgland, Paris and Lawrence, Kansas, 1993, Vol. I, pp. 70–4.

- 9 See note 2.
- 10 These statistics are based on the *catalogue raisonné* in Fioravanti Baraldi 1993, cited in note 1.
- 11 The canvases sent from Ferrara by Alfonso I to Titian for his paintings for the Camerino are similarly fine in weave, with a thread count for that of *Bacchus and Ariadne* of 24 warp and 23 weft threads per cm (see A. Lucas and J. Plesters, ‘Titian’s “Bacchus and Ariadne”’, *National Gallery Technical Bulletin*, 2, 1978, pp. 25–47, esp. p. 38).
- 12 If the painting were by the young Correggio, as suggested by Longhi, then some form of *imprimitura*, possibly quite strongly coloured, might be expected. See J. Dunkerton and M. Spring, ‘The Development of Painting on Coloured Surfaces in Sixteenth-century Italy’, *Painting Techniques. History, Materials and Studio Practice*, Contributions to the Dublin Congress of the International Institute for Conservation, 7–11 September 1998, A. Roy and P. Smith eds, pp. 120–30, especially p. 122.
- 13 In the case of the transferred painting, *The Agony in the Garden*, the *imprimitura* as well as the gesso appeared to be missing in the few samples taken. However, the visibility of the underdrawing in infra-red suggests that the priming is probably still present in most areas, and also that it must have been light in colour, providing sufficient contrast with the black underdrawing for the drawing to be detected.
- 14 Dunkerton and Spring 1998, cited in note 12, pp. 121–2 and 126. Since that publication further examples have been identified of primings on paintings by Costa which contain lead-tin yellow as well as lead white.
- 15 ‘Gossaert’s “Adoration of the Kings”’, *National Gallery Technical Bulletin*, 18, 1997, pp. 87–97, esp. p. 89.
- 16 See note 14.
- 17 The calcium sulphate was probably added as a cheap extender to the priming for this relatively large picture.
- 18 See Rothe and Carr 1998, cited in note 8, p. 60, and Dunkerton and Spring 1998, cited in note 12, p. 122.
- 19 For examples of Dosso’s ‘underdrawings’ in lead white see Rothe and Carr 1998, p. 58, and Coliva 1998, both cited in note 8, p. 75.
- 20 For the fullest critical (in every sense) account of Garofalo as a draughtsman, see P. Pouncey, ‘Drawings by Garofalo’, *Burlington Magazine*, 97, 1955, pp. 196–202.
- 21 Fioravanti Baraldi 1993, cited in note 1, pp. 174–5 and 186–8.
- 22 For example that found under the fresco of the *Taking of Christ* from the basilica of San Francesco, Ferrara (reproduced in Fioravanti Baraldi 1993, p. 169).
- 23 Neither position of the head is the same as that in the woodcut from the *Hypnerotomachia Poliphili*, the source for Garofalo’s painting, and there are many differences between the print and the painting. As will be argued in a future volume of the series of National Gallery catalogues, Garofalo’s design seems to have

- derived as much from the text as from the illustration.
- 24 Confirmed by FTIR if no samples suitable for GC–MS were available.
 - 25 Some analyses were made especially for this study. Others have been published previously. See J.S. Mills and R. White, 'The Gas Chromatographic Examination of Paint Media. Some Examples of Medium Identification in Paintings by Fatty Acid Analysis', *Conservation and Restoration of Pictorial Art*, London 1976, eds N. Brommelle and P. Smith, pp. 72–7, esp. p. 75; R. White and J. Pilc, 'Analyses of Paint Media', *National Gallery Technical Bulletin*, 16, 1995, pp. 86–7.
 - 26 For the results of medium analysis on paintings by Dosso in the National Gallery see J. Mills and R. White, 'Analyses of Paint Media', *National Gallery Technical Bulletin*, 5, 1981, p. 67; White and Pilc 1995, cited in note 25, pp. 88–9; and R. White, J. Pilc and J. Kirby, 'Analyses of Paint Media', *National Gallery Technical Bulletin*, 19, 1998, p. 87. The suggestion in Rothe and Carr 1998, cited in note 8, pp. 62–3, that Dosso achieved certain effects by using an egg-oil emulsion is not supported by medium analysis. For Costa see Mills and White 1976, cited in note 25, p. 74.
 - 27 This was a common practice, both in Italy and Northern Europe. See J. Dunkerton, 'Observations on the Handling Properties of Binding Media Identified in European Painting from the Fifteenth to the Seventeenth Centuries', in *Bulletin de l'Institut Royal du Patrimoine Artistique/Bulletin van het Koninklijk Instituut voor het Kunstpatrimonium*, 27, 1996/98, pp. 287–92, esp. p. 290; and for the blotting of glazes by Dosso see Rothe and Carr 1998, cited in note 8, p. 63.
 - 28 The altarpiece was included in the Ferrara stage of the Dosso exhibition cited in note 8, and displayed with photomicrographs and cross-sections taken during examination of the panels. An unpublished typescript reporting the findings was made available, and is referred to here.
 - 29 When the documents concerning the initial payments to both Garofalo and Dosso were first published, scholars tended to assume that the artists worked alongside one another and that this was therefore confirmation that Dosso had already developed his bold painting style as early as 1513 (see for example, P. Humfrey, 'Dosso Dossi: His Life and Works' in the exhibition catalogue cited in note 8, pp. 6–7, and catalogue entry no. 6, pp. 98–103), but the technical evidence suggests that his contributions to the altarpiece more probably date from several years later.
 - 30 See J. Pilc and R. White, 'The Application of FTIR–Microscopy to the Analysis of Paint Binders in Easel Paintings', *National Gallery Technical Bulletin*, 16, 1995, pp. 73–84, especially p. 82. Analysis of a green glaze in the landscape of *Two Couples with Cupid* is discussed here, with the suggestion that a 'copper resinate' pigment may have been used.
 - 31 A thin brown surface layer was visible in cross-sections from areas of green on the altarpiece. This was not a separate glaze layer, and may have been formed as a result of reaction of an early varnish with the green pigment.
 - 32 All dyestuff identifications were carried out by HPLC by Jo Kirby. The substrates were analysed by EDX in the SEM.
 - 33 Alphonse Goovaerts, 'Les ordonnances données en 1480, à Tournai, aux métiers des peintres et des verners', *Compte rendu des séances de la Commission Royale d'Histoire, en recueil de ses Bulletins*, 5^e série, VI (1896), p. 179. *Florée de warance* (garance) is mentioned in a list of pigments suitable for painting.
 - 34 J. Kirby, 'Pigments used in the theater at Greenwich', Appendix 1 to S. Foister, 'Holbein's Paintings on Canvas: The Greenwich Festivities of 1527', *Hans Holbein: Paintings, Prints and Reception*, M. Roskill and J.O. Hand eds, Studies in the History of Art 60, Symposium Papers XXXVII, National Gallery of Art, Washington 2001, p. 119.
 - 35 'The methods and materials of Northern European painting 1400–1550', *National Gallery Technical Bulletin*, 18, 1997, note 16, pp. 45–6.
 - 36 See C. Higgitt, M. Spring and D. Saunders, 'Pigment-medium interactions in oil paint films containing red lead or lead-tin yellow', *Deterioration of Artists' Paints: Effects and Analysis, Extended Abstracts of Presentations*, ICOM-CC and UKIC meeting, British Museum, London, September 2001, pp. 21–4.
 - 37 R. White and J. Pilc, 'Analyses of Paint Media', *National Gallery Technical Bulletin*, 16, 1995, p. 86–7. For an earlier use by Cima of these softwood pitch glazes see R. White, 'Brown and Black Organic Glazes', *National Gallery Technical Bulletin*, 10, 1986, pp. 58–71, esp. pp. 66–7. They have also been found in walnut oil on *The Adoration of the Kings* by Girolamo da Carpi (NG 640), whose technique may well have been influenced by that of Garofalo. See R. White and J. Pilc, 'Analyses of Paint Media', *National Gallery Technical Bulletin*, 17, 1996, pp. 96–7.
 - 38 For discussion of the increased use of orange in Venetian painting towards the end of the fifteenth century see P. Hills, *Venetian Colour: Marble, Mosaic, Painting and Glass, 1250–1550*, New Haven and London 1999, pp. 146–50.
 - 39 The arsenic sulphide pigment may have degraded, but the sample also contains translucent inclusions which are indicative of reaction of the lead-tin yellow with the oil medium. See note 36.
 - 40 These mixtures are best observed by examination with a stereo binocular microscope.
 - 41 The mid-nineteenth-century writer on Ferrarese paintings and collections, Conte Camillo Laderchi, in his notes to A. Frizzi, *Memorie per la storia di Ferrara*, V, 1848, pp. 363–5, admired Garofalo as 'la prima stella della scuola pittorica ferrarese', observing that he is 'un de' piu facili ad essere conosciuto dagli intelligenti. Non c'è pericolo di confonderlo con alcun altro: eccetto forse qualche ignoto discepolo'. Nevertheless, in his catalogue of the Costabili collection, he attributed the *Saint Catherine of Alexandria* to Marco d'Oggiono (C. Laderchi, *Descrizione della quadreria Costabili*, III and IV, Ferrara 1841, p. 61).

Painting, date and support	Preparatory layers	Flesh	Green	Yellow
<i>The Virgin and Child with Saints Dominic and Catherine of Siena</i> (NG 3102), c.1500, panel.	Yellow-brown translucent priming layer (drying oil ^b with a small amount of lead white and lead-tin yellow). ^a		Green foreground: verdigris, lead-tin yellow and lead white.	Halo: lead-tin yellow and shell gold.
<i>Saint Catherine of Alexandria</i> (NG 3118), c.1510, panel.	Gesso (calcium sulphate), over which is an unpigmented sealing layer.	Saint Catherine's flesh: lead white, vermilion and charcoal black. ^f	Saint Catherine's green dress: underpaint of verdigris, lead-tin yellow and lead white, with some black in addition in the shadows. Verdigris glaze.	Edging around cuffs and neck of green dress: mordant gilding and yellow paint.
<i>The Virgin and Child, with Saints William of Aquitaine, Clare(?), Anthony of Padua and Francis</i> (NG 671), 1517, panel.	Thin off-white priming (lead white and a little lead-tin yellow) ^a over gesso (calcium sulphate). ^a	Half-shadow in the Christ Child's knee: lead white, vermilion and charcoal black	Green curtain and Saint William's green cloak: underpaint of verdigris, lead-tin yellow and lead white, with charcoal black in addition in the shadows. Verdigris glaze, more layers in the shadows.	Gold braid on Virgin's cloak: lead-tin yellow.
<i>Saint Augustine with the Holy Family and Saint Catherine of Alexandria</i> (' <i>The Vision of Saint Augustine</i> ') (NG 81), c.1518–25, panel.	Thin yellowish-grey priming (lead white with a little lead-tin yellow and charcoal black) ^a over gesso (calcium sulphate). ^a	Virgin's flesh: lead white, charcoal black, opaque red which is probably vermilion, possibly some azurite and red lake in the shadows. ^f	Yellow-green landscape: lead white, verdigris and lead-tin yellow. Green curtain behind the Virgin: underpaint of verdigris, lead-tin yellow and lead white. Verdigris glaze, more layers in the shadows.	Yellow drapery of a music-making angel, and yellow of Virgin's sleeve: lead-tin yellow, with yellow and brown glazes in the shadows. ^f Very similar in appearance to NG 1362.
<i>The Agony in the Garden</i> (NG 642), c.1525–30, canvas transferred from panel.		Flesh of one of the sleeping apostles: lead white, red lake, charcoal black and possibly some opaque red. Some cracked brown glazes. ^f	Green cloak of one of the sleeping apostles: underpaint of verdigris and yellow. Verdigris glaze. ^b	Hair of one of the sleeping apostles, Christ's halo: lead-tin yellow. ^f
<i>The Holy Family with Saints John the Baptist, Elizabeth, Zacharias and Francis(?)</i> (NG 170), c.1525–30, canvas.	Thin off-white priming (lead white and a little lead-tin yellow) ^a over gesso (calcium sulphate). ^a			Halo: lead-tin yellow and shell gold. ^f
<i>A Pagan Sacrifice</i> (NG 3928), 1526, canvas.	Thin light yellowish-grey priming (lead white with a little lead-tin yellow and charcoal black) ^a over gesso (calcium sulphate containing a little lead-tin yellow, lead white and black). ^a		Green drapery of the old woman: verdigris, lead-tin yellow and lead white, with some black and a little red lake in addition in the shadows. Verdigris glaze, several layers.	Yellow drapery around the young woman on the left: lead-tin yellow, with yellow lake (with a calcium-containing substrate) and yellow ochre in the half-shadows, ^a and dark brown glazes in the deepest shadows.
<i>Two Couples with Cupid</i> (NG 1362), c.1535–45, canvas.	Translucent mid-grey priming (lead white, calcium sulphate and charcoal black) ^a over gesso (calcium sulphate). ^a	Shadow of flesh, from woman's leg: lead white, charcoal black and vermilion. ^a	Cool green in the landscape: azurite, lead-tin yellow, lead white and translucent yellow (probably yellow lake). Opaque light yellow-green in the landscape: verdigris, lead-tin yellow and lead white.	Yellow drapery beneath the reclining woman: Lead-tin yellow 'type I', ^g yellow lake (with a calcium-containing substrate), yellow ochre, brown softwood pitch glazes. ^{a, b}

Blue	Orange	Red	Binding Medium	Notes to the table
Sky: azurite and lead white. ^f Virgin's robe: ultramarine mixed with azurite and lead white. ^a		Red curtain: underpaint of vermilion, lead white, red lake and black. Red lake glaze containing madder lake (associated with alum) and kermes lake (with a conventional alumina substrate). ^{a, c}	Green grass: heat-bodied walnut oil. ^b	a Identified by EDX in the scanning electron microscope. b Identified by FTIR and GC-MS. c Identified by HPLC. d The results were first published in J.S. Mills and R. White, 'The Gas Chromatographic Examination of Paint Media. Some Examples of Medium Identification in Paintings by Fatty Acid Analysis', <i>Conservation and Restoration of Pictorial Art</i> , London 1976, eds N. Brommelle and P. Smith, pp. 72–7, esp. p. 75.
Virgin's robe: azurite, white and a little red lake, with more red lake in the shadows. Greener and less intense blue azurite in the underpaint.	Orange lining of Saint William's cloak: lead-tin yellow, red earth, a little arsenic sulphide pigment and red lake. ^a The highlights are cream in colour, and contain lead-tin yellow with translucent yellow inclusions in which Pb and a very small amount of As was detected by EDX. A pigment change may have occurred.	Virgin's red skirt: underpaint of vermilion, lead white and red lake, with charcoal black in addition in the shadows. ^a Glaze of red lake containing kermes dyestuff on an alumina substrate. ^{a, c}	Green curtain, Saint William's flesh paint and armour: walnut oil. ^{b, d}	e The results were also published in R. White and J. Pilc, 'Analyses of Paint Media', <i>National Gallery Technical Bulletin</i> , 16, 1995, pp. 86–7. f Observation of the pigment mixture was made by examination of the surface of the painting with a stereo microscope, and is therefore not as reliable as the other identifications, which are made from examination of samples at a higher magnification.
Sky: lead white and azurite, with lead white and ultramarine streaked over in some areas. ^f Saint Augustine's blue drapery: lead white and azurite underpaint. Blotted ultramarine glaze. ^f Saint Catherine's cloak: azurite, possibly also ultramarine. ^f	Orange drapery of the putto: fine-grained orange with some red lake. ^f Similar in appearance to the uppermost orange layer in PLATE 24. Dull orange of Joseph's drapery: red earth and yellow arsenic sulphide. ^a	Saint Catherine's red cloak: blotted red lake glaze on an opaque red underpaint of lead white, vermilion, red lake and possibly black. ^f	Blue sky: heat-bodied walnut oil. ^b Pink of sky: heat-bodied walnut oil. ^b	g Identified by X-ray diffraction.
Christ's blue cloak: azurite and lead white. ^f Sky: azurite, lead white and a little red lake. ^f Grey-blue sleeve of one of the sleeping apostles: azurite, lead white and red lake. ^f	Orange sleeve of the elderly sleeping apostle: fine orange with a little red lake, similar in appearance to the upper layer in PLATE 24. Cream highlights, similar in appearance to Saint William's cloak lining on NG 671. ^f	Christ's red drapery: red lake and lead white. ^f	Pink sky, green robe of one of the apostles: heat-bodied walnut oil. ^b	
Virgin's cloak: azurite, lead white and red lake. ^a		Virgin's red dress: underpaint of lead white, vermilion, red lake and black. Glaze of a red lake pigment containing lac dyestuff. ^c	Red glaze in the shadow of the Virgin's dress: partially heat-bodied walnut oil. ^d White floor, orange sky: walnut oil. ^d Green cloak of male saint: walnut oil and pine resin. ^d Brown outline around the female saint's headdress: walnut oil and softwood pitch. ^d	
Drapery of the boy with a jug: Azurite of an intense colour with red lake, over a purple layer (lead white, azurite, red lake, a little black). Blue lining of the coat of the man with a beard: intense blue azurite over azurite of a smaller particle size.	Putto's orange drapery: red earth, some yellow arsenic sulphide and lead-tin yellow. ^a	Red drapery of the man with a beard: underpaint of vermilion, lead white and red lake, with black in addition in the shadows. Red lake glaze.	White undershirt of the old woman: heat-bodied walnut oil. ^b	
Blue drapery of woman: Ultramarine and lead white. Mountainscape: ultramarine over azurite. Clouds: azurite.		Red cloak of the man in the foreground: underpaint of vermilion, lead white and red lake, with some black in addition in the shadows. Glaze of a red lake pigment containing kermes and madder dyestuffs. ^c	Red lake glaze on the cloak of the man in the foreground, white cloth: walnut oil. ^e Translucent green of a leaf on the tree: heat-bodied walnut oil and pine resin. ^e Green underpaint of the foliage: walnut oil, possibly heat-bodied. ^e Brown glaze over yellow drapery: walnut oil and softwood pitch. ^e	