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FRONT COVER

Vincenzo Foppa, *The Adoration of the Kings*  
(NG 729) (detail of Plate 1, p. 19)

TITLE PAGE

Attributed to Pedro Campaña, *The Conversion of the Magdalen*  
(NG 1241) (detail of Plate 1, p. 55)

# Two Panels by Ercole de' Roberti and the Identification of 'veluto morello'

LORNE CAMPBELL, JILL DUNKERTON, JO KIRBY AND LISA MONNAS

THE TWO SMALL PANELS of *The Adoration of the Shepherds* (NG 1411.1) and *The Dead Christ* (NG 1411.2) are attributed by most authorities to Ercole de' Roberti, who was from 1486 until his death in 1496 in the service of Ercole I d'Este, Duke of Ferrara, and his wife the Neapolitan princess Eleonora of Aragon (PLATE 1).<sup>1</sup> Both panels are 9 mm thick; the painted surfaces are intact but the unpainted edges have been slightly trimmed. They were once concealed under applied frames. The reverses are covered in purple velvet. In or after 1809 and perhaps before 1836, an attempt was made to brand the reverses with the letters CGBC: the initials of the owner, Conte Giovanni Battista Costabili.<sup>2</sup> When the brand did not burn through the velvet, areas of the textiles were ripped away to expose surfaces of wood large enough to be branded effectively (PLATE 2).

The two panels were first recorded at Ferrara in the collection of Francesco Containi (1717–78).<sup>3</sup> Martin Davies, in 1961, noticed a possible connection between them and two folding *anconette* described in 'an Este inventory of 1493'.<sup>4</sup> In 1992, Joseph Manca quoted the two entries and pointed out that the inventory was a list of the possessions of Eleonora of Aragon, Duchess of Ferrara, who had died in October 1493. He proposed that the two panels might have been one of Eleonora's diptychs.<sup>5</sup> The inventory has since been republished. The two consecutive entries are:

*Una anchoneta che se assera, cum uno presepio da un lato et uno Christo nel sepolchro da l'altro lato;*

*Una anchoneta che se asserra a modo de libro coperto de veluto morello, cum broche et azulli de argento dorati; da un lato il presepio et da l'altro un Christo nel sepolchro.*<sup>6</sup>

Eleonora may have owned two similar diptychs; or the compiler of the inventory may have made a mistake and included two differing descriptions of the same object. The second entry may be translated: 'a little "altarpiece" which closes like a book covered in

*morello* velvet, with silver-gilt bosses and clasps; on one side the Nativity and on the other a Christ in the tomb.'<sup>7</sup>

Since the reverses of the National Gallery panels are covered in purple velvet, the diptych could be likened to 'a book covered in *morello* velvet'.<sup>8</sup> In order to substantiate the theory that the two panels could indeed be Eleonora's diptych, the velvets and the backs of the panels have been studied: first to establish whether the velvets are of the appropriate manufacture for a fifteenth-century date; and secondly to discover whether there are any traces of the metal fittings described in the inventory.

## The weave of the velvet

The fabric glued to the back of the panels is a solid cut-pile silk velvet on a five-shaft satin ground, with a striped effect formed by a variation in colour in the pile warps (PLATE 3). A velvet is a pile fabric whose tufts are held in place by a supporting structure known as the *ground weave*. The ground weave is formed by one set of warps (*main warps*) which tie a set of wefts (*ground wefts*). A supplementary warp, the *pile warp*, forms the velvet tufts. These tufts are formed by the insertion of fine grooved metal rods beneath the pile warps on the face of the cloth during weaving (FIG. 1). The warp forms a loop over the rod, which is secured between two wefts passed in the same shed. To create a cut pile, a blade is passed across the groove in the rod, which is then withdrawn leaving a row of pile tufts across the width of the cloth. The ground weave of a velvet can be formed of *tabby* (a simple one-over/one-under interlace) or *twill*, in which the warp passes over more than one weft at a time, or *satin*, a broken twill, with staggered binding points,<sup>9</sup> in which the warp passes over four or more wefts at a time.

The velvet covers of two Books of Hours (PLATES 4 and 5), dating from about 1450 and about 1533, have also been studied to compare with the velvet on the National Gallery panels. The first is an illuminated manuscript on vellum in Latin and French, use

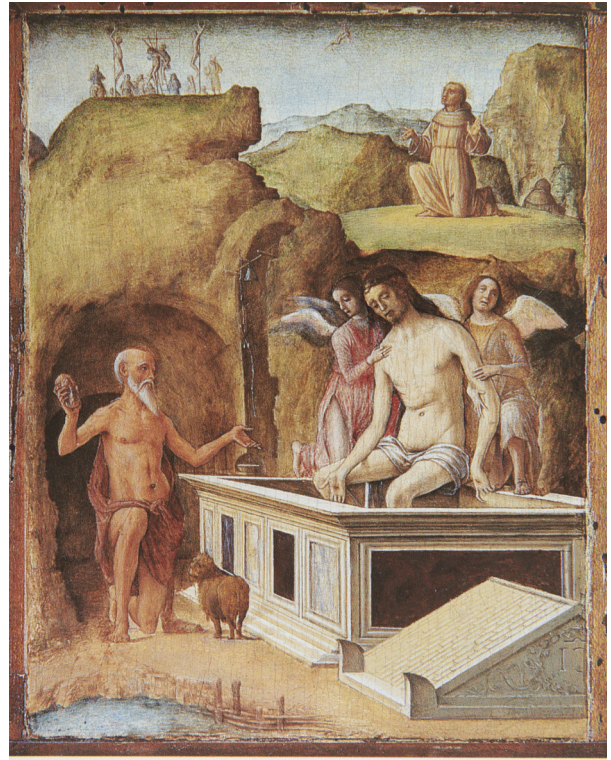


PLATE 1 Ercole de' Roberti, *The Adoration of the Shepherds* (NG 1411.1), left, and *The Dead Christ* (NG 1411.2), right, c.1490. Panel, 18.9 × 14.5 cm, painted surface 17.8 × 13.6 cm (left); and 18.8 × 14.7 cm, painted surface 17.8 × 13.7 cm (right).



PLATE 2 The diptych as seen from the back: left, *The Dead Christ* (NG 1411.2), reverse; right *The Adoration of the Shepherds* (NG 1411.1), reverse.



PLATE 3 Detail of velvet on the reverse of *The Dead Christ* (NG 1411.2), showing striated effect.

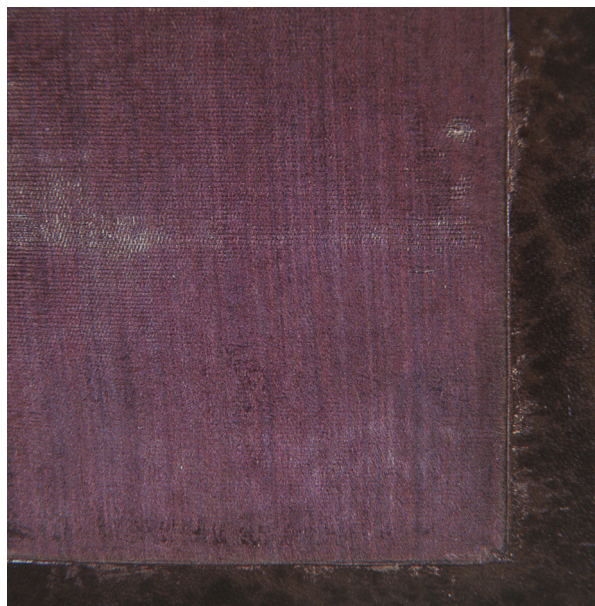


PLATE 4 Book of Hours in Latin and French, use of Troyes, mid-15th century. Christie's sale, London, 11 July 2000, Lot 41, from the library of William Foyle. Detail of velvet cover, showing striated effect; a nail hole, perhaps from a clasp now missing, can be seen. The leather edging is not original.

of Troyes, the second is a printed volume in Latin and English, use of Sarum;<sup>10</sup> both were in the library of William Foyle, recently auctioned at Christie's, London.<sup>11</sup> Both volumes have covers of purple velvet with a striped effect in the warp. These two velvets and that of the National Gallery panels are strikingly similar in appearance, but although all three are solid cut-pile velvets they differ in the details of their structure. Unlike the satin ground of the velvet adhering to the National Gallery's panels, the velvets covering the two Books of Hours each have a ground based on two different variations of a 3/1 twill. (Compare FIGS. 1–4, showing the weave of the velvet on the Ercole panels and on the Book of Hours, use of Troyes; see Appendix for textile analyses. It was, unfortunately, not possible to produce an accurate weave diagram of the velvet cover of the second Book of Hours.)

The ground of the velvet on the National Gallery panels is a *five-shaft satin*: each ground warp passes over four and under one ground wefts (FIGS. 1 and 2).<sup>12</sup> This weave is typical of the fifteenth century, although it can be found in later velvets. The main warps of the velvet have an S-twist (FIG. 3). This is characteristic of Italian figured velvets after the first quarter of the fifteenth century, and may, by extension, be a clue to the dating of plain velvets. Both the weave structure and thread twist of the velvet adhering to the two panels are consistent with a date after



PLATE 5 Book of Hours in Latin and English, use of Sarum, c. 1533. Christie's sale, London, 12–13 July 2000, Lot 367, from the library of William Foyle, showing decorated velvet binding.

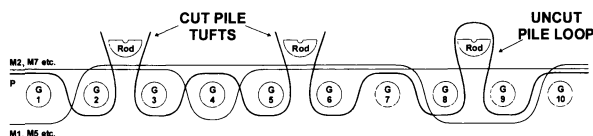


FIG. 1 Velvet on the reverse of the panels: cross-section of the velvet weave in the warp direction, rods in place, showing two tufts of velvet that have been cut and one pile loop before it has been cut.

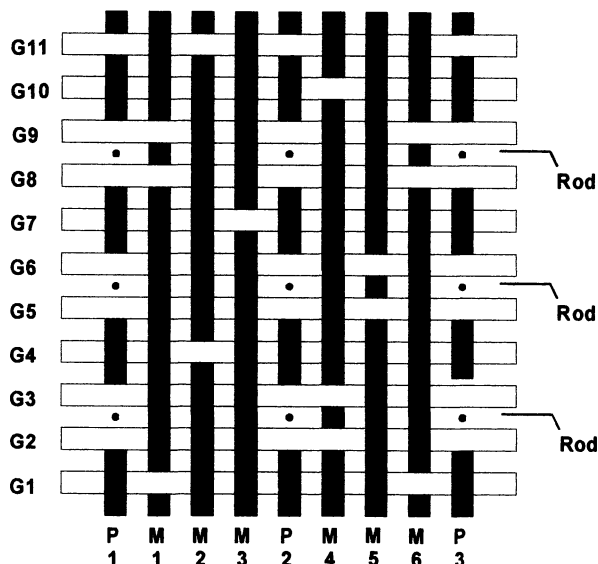


FIG. 2 Velvet on the reverse of the panels: diagram to show the weave, right side up, position of the rods to create the velvet pile indicated. M: main warp; P: pile warp; G: ground weft; Rod: grooved rod for creating velvet tuft.

the second quarter of the fifteenth century, meaning that they could have formed the original backing for these panels.

### The dyeing of the velvet

The striated appearance of the velvet is given by very narrow, darker, bluish-purple stripes and slightly broader reddish-purple stripes, closely and slightly irregularly spaced (see PLATE 3). Microscopic examination of a pile warp ('tuft') from a darker stripe shows that most of the threads are purple or bluish-purple in colour, with a few pale orange strands (PLATE 6); the pile warps in the redder stripes consist largely of bluish-crimson or pink threads (PLATE 7). If the red colorant is extracted from each of the two differently coloured pile warps, most of the residual silk fibres from the darker purple pile can be seen to have been dyed blue with a dyestuff almost insoluble in the reagent used, 4% boron trifluoride/methanol;

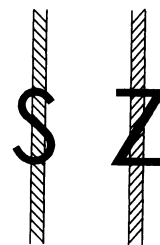


FIG. 3 Threads twisted in 'S' and 'Z' directions.

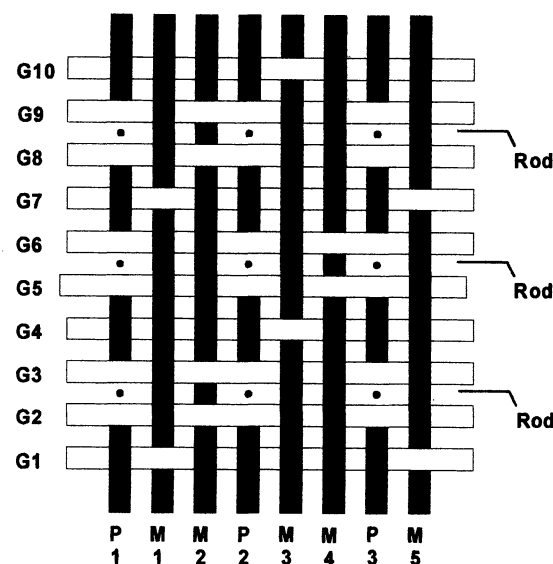


FIG. 4 Book of Hours in Latin and French, use of Troyes, mid-15th century. Christie's sale, London, 11 July 2000, Lot 41, from the library of William Foyle: weave of the velvet cover. M: main warp; P: pile warp; G: ground weft; Rod: grooved rod for creating velvet tuft.

this dyestuff is discussed below.<sup>13</sup> In the case of the redder purple the residual threads are largely colourless. Analysis of both extracts by high performance liquid chromatography (HPLC: see Appendix) reveals that, in each case, the principal constituent of the red dyestuff is carminic acid; a minor, but still substantial, amount of kermesic acid is also present. Traces of alizarin were also identified, suggesting the presence of a very tiny proportion of madder dyestuff (from *Rubia tinctorum* L.), probably used to dye the orange fibres.

The pattern and relative proportions of carminic and kermesic acids present appear to be consistent with those found in the dyestuff produced by Polish cochineal, *Porphyrophora polonica* L., an Old World cochineal insect.<sup>14</sup> Other scale insects known to contain carminic acid as the principal constituent of their colouring matter, such as the Mexican cochineal insect (*Dactylopius coccus* Costa) and another Old World species, Armenian or Ararat

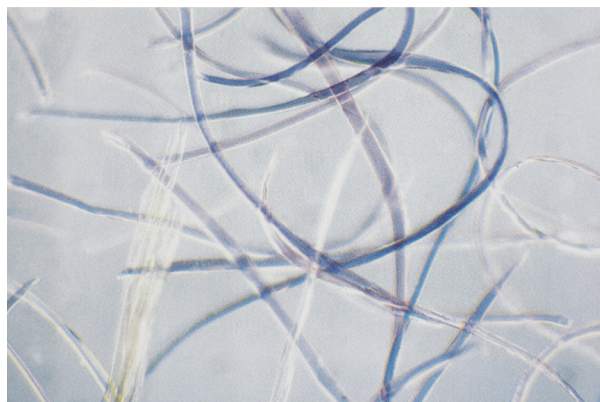


PLATE 6 Detail of a deeper purple pile warp taken from the velvet on the reverse of *The Dead Christ*, showing purple threads, dispersed in odourless kerosene. Photomicrograph, photographed at a magnification of 137.5×, actual magnification 85×.

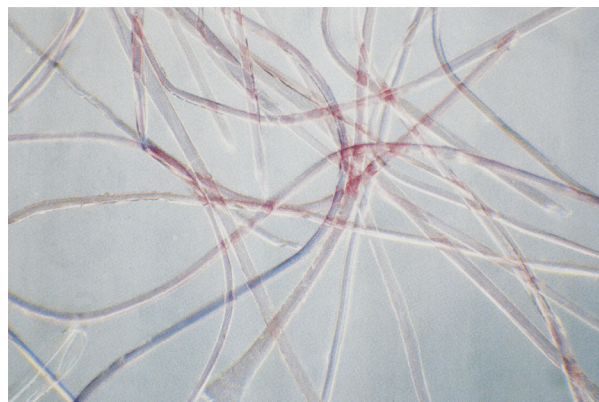


PLATE 7 Detail of a reddish-purple pile warp taken from the velvet on the reverse of *The Dead Christ*, showing pale bluish-crimson threads, dispersed in odourless kerosene. Photomicrograph, photographed at a magnification of 137.5×, actual magnification 85×.

cochineal (*Porphyrophora hameli* Brandt), contain hardly any kermesic acid. However, a similar pattern of constituents would be given if the velvet had been dyed with a mixture consisting of one or other of these latter insects and some kermes (*Kermes vermilio* Planchon); kermesic acid is the principal constituent of the kermes dyestuff. If Mexican cochineal had been used, the textile could not predate 1493, the date of the inventory, as this dyestuff was not available in Europe until the following century. To confirm the identification of Polish cochineal as the source of the colorant a quantitative examination was necessary to estimate the relative amounts of carminic and kermesic acids present and to establish the presence or absence of certain minor components of the dyestuffs.<sup>15</sup> Quantitative HPLC examination of a sample of the pile, carried out at the Koninklijk Instituut voor het Kunstpatrimonium (Institut Royal du Patrimoine Artistique), Brussels, where the results could be compared with those obtained from textiles, confirmed not only that the source of the dye was indeed the Polish cochineal insect, but also that the scale insect dyestuff was the principal colouring matter present.<sup>16</sup>

Ellagic acid was also identified in both dark and light purple areas, suggesting that the silk threads were treated with some tanning agent during the dyeing process. Ellagic acid-containing tannins are found in many species of shrubs and trees and it is impossible to characterise the source further. Presumably the aim of the treatment was to improve the take-up of the dye, or to modify the colour: for example, the fifteenth-century Florentine *Trattato dell'Arte della Seta* includes recipes for dyeing silk using *grana* – kermes – in which the silk was treated

with galls (a source of tannins) during the procedure. This was not done when dyeing the same colours with *chermisi* (an Old World cochineal).<sup>17</sup> The dyestuff from this insect source must have given a deep enough colour on its own.

The blue dye present on the deeper purple threads was identified as indigo by HPLC analysis, mass spectrometric analysis and by microspectrophotometric examination of a blue-dyed thread after extraction of the red dye.<sup>18</sup> The source of indigo could have been woad, *Isatis tinctoria* L., or, indeed, imported indigo itself – it is not possible to determine the actual origin, as the end product, the colouring matter, is the same whatever the plant source. It is worth noting that madder could be used as a fermenting agent in indigo vats and, although the madder dye detected probably derived largely from the orange thread, it is conceivable that the plant could also have been so used here.<sup>19</sup> The silk thread used for the darker purple pile warps was thus dyed in two stages: first, in an indigo vat, then the blue thread obtained was mordant-dyed with Polish cochineal dyestuff to give a bluish purple.

Varieties of insects known under names signifying 'crimson' – *chermisi*, *cremexin* and other spellings – were imported into Italy from the fourteenth century onwards. Initially all would have been Old World insects; the New World cochineal insect was imported by way of Spain early in the 1540s.<sup>20</sup> Some varieties of the Old World insect were imported directly by, for example, Venetian merchants trading in Constantinople and other eastern markets. Polish cochineal also reached Venice and other Italian cities, including Genoa and Florence, by way of German (and Polish) exporters.<sup>21</sup>

Polish cochineal was employed over a long period, even after the Mexican species became available.<sup>22</sup> The presence of its dyestuff on the velvet on Ercole de' Roberti's two little panels cannot therefore confirm a fifteenth-century dating; however, it is entirely appropriate for that date. The use of Polish cochineal dyestuff alone for the redder purple stripes is comparable with recipes in both the *Trattato dell'Arte della Seta* and a later Venetian manual of dyeing, the *Plictho*, written by Gioanventura Rosetti in 1548: according to the instructions given for dyeing *pagonazzo*, in the first case, and *morello*, in the second, only scale insect dyes were required.<sup>23</sup> Obtaining a purple colour by using a scale insect dye over silk previously dyed blue with indigo is not described in either source, nor is it mentioned in an earlier, fifteenth-century, Venetian dyeing manual. However, in a series of recipes for dyeing with *cremexin*, this treatise mentions the addition of a little indigo in the last red dye-bath, to '*pavonizar el lavor*'.<sup>24</sup> Venetian regulations approved in 1454 ruled that, to make purple shades, the crimson dyestuff from Old World cochineals could only be combined with indigo, so this combination may have been fairly common.<sup>25</sup>

#### **Morello, paonazzo and the sources of 'crimson'**

In the Este inventory of 1493, the velvet on the back of Eleonora's '*anchoneta*' is described as '*morello*'. During the fifteenth century, the word 'purple' (*purpura* in Latin, *porpore* in Italian) was not generally used to denote colour in a fabric, perhaps because it was still associated with a type of cloth rather than its colour.<sup>26</sup> Instead, terms such as '*morello*' or '*violetto*' or '*paonazzo*' (also spelt *paghonazzo*, *pavonazzo*, and other variants) were used to denote various shades of purple. '*Morello*' – derived from the Latin *morum*, mulberry, and meaning, literally, 'mulberry-coloured' – is defined in written sources of the fourteenth and fifteenth centuries as 'violet'.

The term *morello* was not new in the fifteenth century, and it was applied equally to wool or silk. In England, *morello* was translated as '*murrey*' and in France, '*more*' (variously spelt). In an order for two pieces of the woollen cloth known as 'scarlet' for the Duchess of Burgundy, in 1335, one is described as '*vermoille*' (vermilion) and the other as '*paonace qui se traie aussi comme sur morey, c'est a dire qu'elle ait colour [sic] de droite violete*'.<sup>27</sup> *Morello* and *paonazzo* were thus clearly similar shades. This is confirmed by descriptions of the colours in written sources such as Tomaso Garzoni's *La piazza universale di tutte le*

*professioni del mondo* (Venice 1585): in his discourse on painters, *morello* is described as mulberry-coloured and *pavonazzo* as a dark *morello*.<sup>28</sup>

In 1457 the Venetians had introduced striping in their selvages to indicate the dyestuffs used for particular colours of silks; a similar practice was introduced in Genoa in 1466, following statutes of 1432 establishing the colours of the selvages for cloths dyed with particular dyestuffs. In the 1466 Genoese regulations, the colour of the *morello* silks is described as '*morello sive violeto*'. These regulations distinguish between the use of two red insect dyes: *chremisi* and *grana*. Fabrics made from silk dyed *morello* with *chremisi* were to have yellow selvages; those from silk dyed *morello* with *grana* were to have selvages with a green stripe.<sup>29</sup> It is not easy to identify fifteenth- or sixteenth-century colouring matters – all called *grana* or *chremisi* (or some variant), and further characterised according to the region from which they came – with any species of scale insect known today. This is partly because species like Polish cochineal, and possibly other, now little-known, insects, that produced substantial harvests then are very scarce now. The scanty description of two types of *chermisi* – *minuto* and *grosso* – given in the *Trattato dell'Arte della Seta* suggests that the *minuto* variety may be identified with Polish cochineal. This is reinforced by a recipe in the *Plictho* for dyeing silk a 'perfect crimson colour', '*in color chremesino perfetto*', which required the use of 'crimson minute and German', '*chremesino menuto e todescho*', the name by which the scale insects imported from the regions around Eastern Germany and Poland were known in Italy.<sup>30</sup>

One might expect contemporary authors with an antiquarian, biological or medical interest in sources of dye to be able to clarify matters; in practice their descriptions are ambiguous. In his commentary on the works of Dioscorides, published in 1548, Pietro Andrea Mattioli mentioned *cremesino* in the context of 'grains' found on the roots of '*pimpinella*' (pimpernel). Polish cochineal usually occurs on the roots of the perennial knawel, *Scleranthus perennis* L., but several species have been recorded as hosts to the insect in different areas of its habitat, which at this time extended from north-eastern Germany through Silesia, Poland and neighbouring countries to Bavaria.<sup>31</sup> Possibly Mattioli had no first-hand knowledge of the insects for, in a later edition, he mentioned the variety of '*grana*' [*sic*] collected in Poland, but did not link it to any insect found on plant roots. However, even in 1548 he drew attention to the new, and widely used, variety of *cremesino* imported into



Italy by way of Spain: in other words, Mexican cochineal. This insect, like the Old World varieties, contains carminic acid, a dyestuff that gives a bluer crimson than the kermesic acid present in kermes. The fact that the colour from all types of *cremesino* tended towards purple was also noted at that time.<sup>32</sup>

### The original appearance of the velvet covering and the structure of the diptych

The velvet on the reverse of the two panels was not a cheap fabric: the high pile warp count and the purple colouring, incorporating a costly insect dyestuff, are both indicative of expense. Moreover, there is evidence that the reverses were once richly ornamented. Where the velvet is still present circular patches of disturbed pile can be seen towards the corners and at the centre of each half of the diptych (see PLATE 2). (The roughened pile at the centre of the upper edge of each panel is the result of later fittings used to fix the panels in their modern frames.) In each of the circles there are three small holes, slightly smaller and less rounded in cross-section than the woodworm exit holes scattered randomly across the panels. The same distribution of holes, always in the formation of similarly sized isosceles triangles, can be seen at the corners of the panels in the areas of wood exposed by the removal of the velvet. Three of the holes contain shafts of pins (PLATE 8), made of a white metal and apparently rather soft, for occasionally only two instead of the expected three holes are present, suggesting that sometimes the pins may have become bent and failed to penetrate both velvet and panel. These pins must have been used to attach the bosses, or *broche*, of silver-gilt. At the centres of the outer edges of the two panels, that is, the left edge of *The Dead Christ* and the right edge of *The Adoration of the Shepherds* when they are viewed from behind in their correct relationship, a nail hole and the remains of a pin indicate that two more fixtures were applied. The other nails, probably also arranged in an isosceles triangle, are likely to have been in the wood now lost through the trimming of the edge. These nails would have held the clasps, or *azulli*, which closed the diptych.

The closed diptych would have looked very like a book, bound in purple velvet, something like that illustrated in PLATE 5. There are no traces of marks on the 'hinge' side of either panel. Although it is possible that the panels were trimmed slightly more along this edge than on what would have been the 'clasp' side, the continuation of the rocks of Saint Jerome's cave into the Nativity landscape, and the

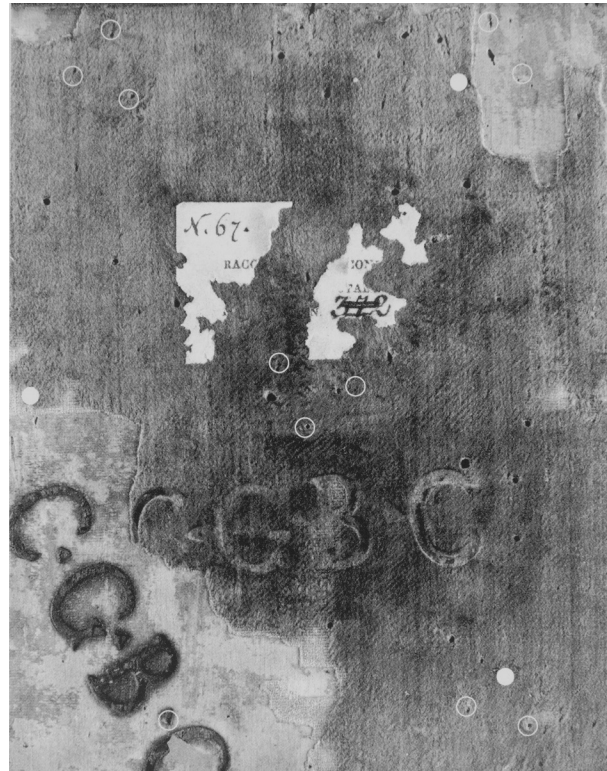


FIG. 5 Reverse of *The Dead Christ*, showing positions of nail holes from the fixtures originally present. Solid circles indicate that the remains of the nails are still present.



PLATE 8 Detail of the reverse of *The Dead Christ* showing metal pin originally attaching the boss in the lower right corner.

extension of the more distant bluish mountain in the latter into the former, work only when the images are separated by no more than about two cm. Therefore it seems unlikely that the width of wood removed was sufficient to allow the presence of hinges attached to it and no hinges are mentioned in the inventory. Instead the panels may have been joined by their velvet binding. On both panels it can be seen that the velvet has been glued with the warp threads, evinced by the stripes, at the same slight angle to the



PLATE 9 Detail of the right-hand edge of *The Adoration of the Shepherds* showing *barbe* and line of blue paint defining inner edge of frame. Photomacrograph.



PLATE 10 Detail from the top left of *The Dead Christ*, showing the Descent from the Cross. Photomacrograph.

longer sides. This would suggest that a single piece of velvet was laid across both the reverses and that the cloth in the space between the two panels served to hinge them together, just as the spine of a book joins its covers. The central strip of velvet along the spine could have been reinforced, with a heavier fabric, leather or card.

To prevent the painted surfaces from rubbing against one another when the diptych was closed some form of frame must have been applied. A splinter of wood found along one edge confirms that the mouldings, evidently relatively narrow and probably shallow in profile, were of wood. Examination of the edges and *barbes* of the painted surfaces shows that mouldings were in place when the grounds were applied, but that the frames were gilded after the pictures had been completed. Blue lines (under magnification the pigment has the appearance of azurite) were painted, in two layers, to define the inside edges of the frames (PLATE 9). Since it is highly unlikely that the expensive velvet binding was applied before the panels were painted, it seems possible that the mouldings present when the panels were prepared

with gesso (and these may always have been temporary) were subsequently removed so that the edges of the velvet could be glued round the sides and onto the front edges of the panels, exactly as in a book binding. The mouldings could then be re-attached, covering the raw edges of the fabric. The blue lines might also have helped to disguise the cracks in the gesso likely to have been caused by this operation.

The paintings are attributed to Ercole, Eleonora's court painter. Because their history is incomplete, absolute proof is lacking but it seems established beyond reasonable doubt that the two National Gallery panels are indeed Eleonora of Aragon's *anchoneta* 'which closes like a book covered in *morello* velvet'. An inventory of Eleonora's library was also made in 1493, soon after her death in October of that year.<sup>33</sup> It shows that she took great delight in beautiful and costly bindings. Many of her books were bound in black, crimson, blue or green velvet; several were in purple silk; a great number had bosses and clasps of silver or silver gilt. Her large breviary, bound in purple silk, had a cover of purple cloth of gold lined with crimson silk and clasps of

enamelled gold;<sup>34</sup> the little breviary 'which she used every day' was covered in blue silk and had two silver clasps and a cover of purple velvet lined with blue damask and tied with a little golden cord.<sup>35</sup> Eleonora's *anchoneta* would have looked very like her books.

The elaborate covering complemented perfectly Ercole's two paintings, painted with a desaturated palette and minuteness of technique that emulate manuscript illuminations (PLATES 10 and 11). Many details were delicately touched with shell gold. This is now difficult to see, but traces of gilding survive on the haloes, the glories of light around the Child and the angel who makes his announcement to the shepherds, the rays which stigmatise Saint Francis, and even on the Virgin's mantle. This is now inappropriately drab, most probably as a result of the fading of a once deep red lake pigment applied in the thinnest and most translucent of layers.<sup>36</sup> Although the original richness of both painting and binding has been lost, it is still possible to imagine how the diptych would have looked: closed, it was like a book, and open, it could have been used in much the same way as a devotional manuscript. It must have been an exquisite object to delight the refined tastes of the pious duchess.

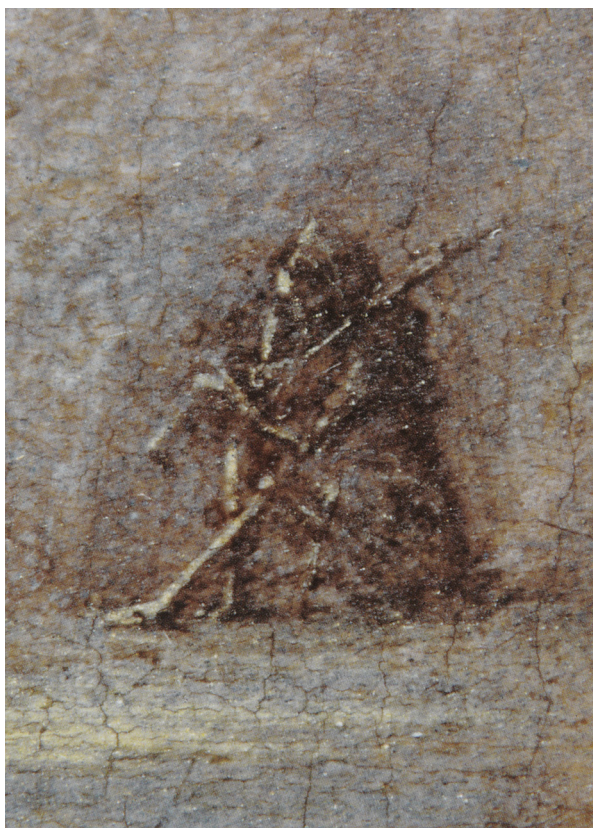


PLATE 11 Detail of a shepherd in the background of *The Adoration of the Shepherds*. Photomacrograph.

## Appendix

### Weave analysis of the textiles

#### 1. Ercole de' Roberti, *The Adoration of the Shepherds* and *The Dead Christ*

Panels measuring 18.9 × 14.5 cm and 18.8 × 14.7 cm respectively, thickness 9 mm. Glued to the reverse surfaces of the panels are two pieces of solid cut-pile purple silk velvet with a striped effect in the warp direction.

STATE: faded, discoloured, balding in places. In the bald parts, many of the main warps are torn.

WEAVE: solid cut-pile velvet, on a ground of regular five-shaft satin (counting the two wefts which secure the pile tuft in one shed as one), interruption 2.

#### MATERIALS:

Warps: Main warps: silk, ivory, slim threads, light S-twist  
 Pile warps: i) silk, purple, without visible twist  
 ii) silk, more reddish purple, without visible twist  
 Wefts: silk, cream, without visible twist, slightly thicker thread than the main warps

#### PROPORTIONS:

3 main warp threads to each pile warp thread  
 3 main weft threads to each rod

#### THREAD COUNT:

Main warps per cm 84–90  
 Pile warps per cm 28–30  
 Ground wefts per cm 45  
 Rods per cm 15

#### 2. Book of Hours in Latin and French, use of Troyes, mid-fifteenth century (Christie's sale, 11 July 2000, the Library of William Foyle, Lot 41)

Text illuminated on vellum; cover of contemporary silk velvet, over pasteboard, rebacked and edged with brown leather in the nineteenth century.

The velvet has a solid cut silk pile on a ground of extended 3/1 twill. The colour is a striated purple with pinkish tones.

STATE: worn, balding in places and faded.

WEAVE: solid cut-pile velvet, on a ground of extended 3/1 Z-twill (counting the two wefts securing the pile tuft (the 'vice shed') as one).

#### MATERIALS:

Warps: Main warps: S-twist, slender threads, pale and darker fibres combined to give a greyish appearance.

- Pile warps: Silk, without visible twist, purple. (It is likely that the pile warp threads were composed of slightly different coloured silk yarns to create the striated effect, but it was not possible to make a sufficient analysis to determine this.)
- Wefts: Silk, without visible twist, pale and dark fibres, bluish tinge

PROPORTIONS:

- 2 main warps to each pile warp  
3 ground wefts to each rod

THREAD COUNT:

- Main warps per cm 54/56  
Pile warps per cm 27/28  
Ground wefts per cm 45  
Rods per cm 15

Analysis of the dyestuff

Analysis was carried out using Hewlett-Packard (now Agilent) HP1100 series binary pumps and vacuum degasser, modified for use with a capillary microbore column by the incorporation of an LC Packings Acurate™ microflow processor between the pumps and the injector; this mixes the eluents and splits off a calibrated proportion of the solvent stream, appropriate to the internal diameter of the column. The Cheminert™ injector was fitted with a 5 µL sample loop. A 25 cm 800 µm i.d. Zorbax ODS (C18) column, with 5 µm packing, was used, necessitating 20 % of the solvent stream to be split off; a flow rate of 100 µL min<sup>-1</sup> at the pump is thus reduced to 20 µL min<sup>-1</sup> at the injector. The eluents used were (A) 99.9% water/ 0.1% trifluoroacetic acid; (B) 99.9% acetonitrile/ 0.1% trifluoroacetic acid. The gradient programme was as follows: initial concentration of B 30%, held for 10 minutes at a flow rate of 20 µL min<sup>-1</sup>; increased to 45% B in 15 minutes; flow rate reduced to 12 µL min<sup>-1</sup> at 45% B in 5 minutes; 45–52% B in 50 minutes; 52–65% B in 182 minutes, increasing the flow rate to 20 µL min<sup>-1</sup> at 57–8 minutes; 65–75% B in 10 minutes; held at 75% for 20 minutes; 75–95% in 10 minutes, held at 95% for 18 minutes, 95–30% in 10 minutes; post-run equilibration time 15 minutes. Detection was performed using the HP1100 diode array detector, monitoring signals at 254, 275, 330, 491 and 540 nm. A flow cell of path length 10 mm and volume 0.5 µL was used; the slit width was 4 nm. HP Chemstation software was used to process the data. The column was supplied by Presearch; the HPLC equipment (including the microflow processor), computer and software have been most generously lent to the National Gallery Scientific Department by Hewlett-Packard Ltd.

Note

Lisa Monnas is an independent textile historian.

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Notes and references

- 1 M. Davies, *National Gallery Catalogues, The Earlier Italian Schools*, revised edn., London 1961, p. 462 (as 'Ascribed to Ercole de' Roberti'); J. Manca, *The Art of Ercole de' Roberti*, Cambridge 1992, pp. 143–5; catalogue of the exhibition *Ercole de' Roberti, The Renaissance in Ferrara*, The J. Paul Getty Museum, Los Angeles 1999 (also published as a supplement to the *Burlington Magazine*, CXLI, April 1999), pp. xxxvi–xxxvii (No. IX). See also L. Syson, 'Ercole de' Roberti: the making of a court artist' in the same catalogue, pp. v–xiv.
- 2 Costabili was created a count in 1809 but was made a marchese in 1836: see E. Mattaliano, G. Agostini, L. Majoli, O. Orsi and B. Fiorelli, *La Collezione Costabili*, Ferrara 1998, p. 17.
- 3 In the inventory taken after his death they were described as 'due quadreti dipinti sopra il legno, con cornice all'antica a vernice d'oro, l'uno rappresentante la natività del Salvatore e l'altro la Resurrezione dal sepolcro' (Mattaliano et al. 1998, cited in note 2, pp. 18, 50). They passed with the rest of Containi's collection to his nephew, Giovanni Battista or Giambattista Costabili (1756–1841), and in a manuscript catalogue of his pictures dated 1835 they were described as '373, Un presepio con bella Architettura. Piccolissimo ed eccellente quadretto in tavola in piedi pure di Lorenzo Costa. Era in Casa', and '372, Nostro Signore morto sostenuto da due Angeli sopra il sepolcro con S. Girolamo in ginocchioni. Piccolissima ed eccellente tavola in piedi del Costa. Era in Casa' (ibid., pp. 50–1). The number 372, deleted, appears on a paper stuck to the reverse of *The Dead Christ*. The corresponding label on the reverse of *The Adoration of the Shepherds* is torn and the area where the number

- would have appeared has been lost. In Laderchi's printed catalogue of the Costabili pictures published in 1838, the National Gallery panels were Nos. 59 and 60. On 26 October 1858 Sir Charles Eastlake offered to buy the two panels – by then renumbered 66 and 67 – from Costabili's nephew and heir, the Marchese Giovanni Costabili. On 6 November 1858 the Marchese refused Eastlake's offer (ibid., p. 23); but Eastlake eventually, possibly by 1860 and certainly before his death in 1865, succeeded in acquiring them. They were bought for the National Gallery at Lady Eastlake's sale at Christie's on 2 June 1894 (Lot 71).
- 4 Davies 1961, cited in note 1, p. 462. He referred to the 'Estratto dell'inventario di guardaroba estense' (1493) published by G. Campori, *Raccolta di cataloghi ed inventari inediti ...*, Modena 1870, pp. 1–3, the relevant entries being on p. 2.
  - 5 Manca 1992, cited in note 1, p. 144.
  - 6 A. Franceschini, *Artisti a Ferrara in età umanistica e rinascimentale, Testimonianze archivistiche*, II, ii, *Dal 1493 al 1516*, Ferrara 1997, p. 37.
  - 7 'Broche' and 'azulli' were terms used in book-binding. *Broche* were *borchie* or bosses; *azulli* was an Emilian word for clasps (G. Bertoni, *La Biblioteca Estense e la coltura ferrarese ai tempi del duca Ercole I (1471–1505)*, Turin 1903, pp. 270–1; G. Fumagalli, *L'arte della legatura alla corte degli Estensi, a Ferrara e a Modena, dal sec. XV al XIX. Col catalogo delle legature pregevoli della Biblioteca Estense di Modena*, Florence 1913, p. xi).
  - 8 The possible significance of the velvet went unnoticed until it was pointed out to the authors of the Getty exhibition catalogue cited in note 1. There the textiles are mistakenly described as 'faded remains of the red velvet' (p. xiii) and as 'traces of red velvet' (p. xxxvi).
  - 9 A binding point is the point of intersection between a warp and a weft.
  - 10 J. Plummer, "Use" and "Beyond Use", in R.S. Wieck, *The Book of Hours in Medieval Art and Life*, London 1988, pp. 149–52.
  - 11 *The Library of William Foyle, Part I: Medieval and Renaissance manuscripts*, catalogue of sale held at Christie's, London, 11 July 2000, Lot 41, pp. 122–5; and *Part III: English Literature and Travel Books*, Christie's, London, 12–13 July 2000, Lot 367, pp. 70–2. We are indebted to Kay Sutton and Susannah Morris for kindly allowing us to study and photograph these covers.
  - 12 In a velvet, the two wefts passed through the same shed to secure the tuft are counted as one.
  - 13 This reagent breaks up the polymerised paint film by transmethylation, also dissolving out the dyestuff from the lake pigment: see J. Kirby and R. White, 'The Identification of Red Lake Pigment Dyestuffs and a Discussion of their Use', *National Gallery Technical Bulletin*, 17, 1996, pp. 56–80, esp. p. 60.
  - 14 D. Cardon, *Les 'vers' du rouge: insectes tinctoriaux (Homoptera: Coccoidea) utilisés dans l'Ancien Monde au Moyen-Age*, Paris 1990 (Cahiers d'Histoire et de Philosophie des Sciences, n.s. no. 28), pp. 55–75. See also D. Cardon and G. du Chatenet, *Guide des teintures naturelles: plantes, lichens, champignons, mollusques et insectes*, Neuchâtel 1990, pp. 370–4; A. Verhecken and J. Wouters, 'The Coccid Insect Dyes: Historical, Geographical and Technical Data', *Bulletin de l'Institut Royal du Patrimoine Artistique*, XXII, 1988/89, pp. 207–39.
  - 15 J. Wouters and A. Verhecken, 'The scale insect dyes (Homoptera: Coccoidea). Species recognition by HPLC and diode-array analysis of the dyestuffs', *Annales de la Société Entomologique de France*, (N.S.) 25, 4, 1989, pp. 393–410, esp. pp. 406–7; J. Wouters and A. Verhecken, 'The coccid insect dyes: HPLC and computerized diode-array analysis of dyed yarns', *Studies in Conservation*, 34, 4, 1989, pp. 189–200, esp. pp. 195–8.
  - 16 The National Gallery collection contains no other example of a dyed textile, thus analytical results had to be compared with those obtained from pigments. Extraction of the dyestuff using a methylating agent is not ideal for textile samples: dissolution may be slow to go to completion and a quantitative examination of the dyestuff components is rendered more difficult due to the possible presence of methylated derivatives as well as the original, unmethylated, forms. The method generally used for extraction of red and yellow dyes from textiles is acid hydrolysis: see, for example, J. Wouters, 'High performance liquid chromatography of anthraquinones: analysis of plant and insect extracts and dyed textiles', *Studies in Conservation*, 30, 1985, pp. 119–28. We are most grateful to Dr Jan Wouters for the confirmatory analysis and interpretation. The sample sent consisted of pile attached to fragments of old paper backing tape removed from the reverse of one of the panels. It was not possible to separate the darker and lighter purple stripes. The equipment used consisted of a Waters model 616 pump and controller model 600S; a Rheodyne 7725i injector with a 20 µL sample loop; a Waters model 996 PDA detector. A Merck 125 mm Lichrosorb cartridge column, internal diameter 4 mm, packing particle size 5 µm, was used for the analysis. Running conditions are discussed in the references cited above and in note 14.
  - 17 G. Gargioli, *L'Arte della seta in Firenze; trattato del secolo XV*, Florence 1868, pp. 31–7, 48–50. The text (based on Gargioli's edition) has also been published in M. Bussagli, *La seta in Italia*, Rome 1986, pp. 241–94, see pp. 259–61, 266, 269, 280. For a discussion of the treatise and its manuscript versions see R. Schorta, 'Il trattato dell'Arte della Seta: A Florentine 15th century treatise on silk manufacturing', *Bulletin de Liason du Centre International d'Etude des Textiles Anciens*, 69, 1991, pp. 57–83. See also G. Rosetti, [*Plictho de larte de tentori*] *The Plictho of Gioaventura Rosetti*, trans. S.M. Edelstein and H.C. Borghetty, Cambridge, Mass., and London 1969 (includes facsimile of 1st edn., Venice 1548), pp. 45, 136, for a reference to galling silk to 'take the colour inside – piglia il color drento'; confusingly this instruction also occurs in a recipe for dyeing with *grana*, kermes, although it seems to refer to dyeing black.
  - 18 The solubility of indigo in 4% boron trifluoride/methanol is extremely low, but sufficient reacted for it to be identified during the HPLC examination of the red dyestuff carried out at the National Gallery. The presence of indigo

- was confirmed by mass spectrometry using a programmable heated direct insertion probe, carried out by Raymond White, and microspectrophotometric examination of the blue threads by Emily Gore. The dyestuff was also identified by HPLC analysis carried out at the Koninklijk Instituut voor het Kunstpatrimonium.
- 19 Gargioli 1868, pp. 66–7; Bussagli 1986, p. 279, both cited in note 17.
  - 20 For a historical background to the use of scale insect dyes from the late fourteenth to the late sixteenth centuries, largely derived from Venetian archival sources, see L. Molà, *The Silk Industry of Renaissance Venice*, Baltimore and London 2000, pp. 107–37. Molà has used the translation ‘grain’ for *grana* (i.e. probably *Kermes vermilio* Planchon) and ‘kermes’ for *cremisi* and its variants (the cochineals).
  - 21 U. Dorini and T. Bertelè, *Il libro dei conti di Giacomo Badoer (Constantinopoli 1436–1440)*, Rome 1956, pp. 182–3, 296–7, 472–3, 550–4, 602–3, 648–9 for *cremexe rosesco*, *cremexe di vini* and *cremexe savaxi* bought by Badoer and sent to Venice between 1437 and 1439; H. Simonsfeld, *Der Fondaco dei Tedeschi in Venedig und die deutsch-venetianischen Handelsbeziehung*, 2 vols., Stuttgart 1887, Vol. I, p. 227 (a complaint, dated 26 February 1437, was lodged by the Nuremberg authorities on behalf of a local trader that *cremessyn* bought in Breslau (now Wrocław) was found, when it reached Venice, to be of poor quality); K.O. Müller, *Welthandelsbräuche (1480–1540)*, Wiesbaden 1962 (first published Stuttgart 1934; Deutsche Handelsakten des Mittelalters und der Neuzeit, Vol. V), pp. 36–7, 41–2, 54, 150 (no. 54), 179 (no. 121). This book publishes notebooks of trading records of the Paumgartner family; trade in Polish cochineal (named *schirwitz* or *scherwitz*, from its Polish name *czewiec*) to Genoa and Florence is recorded.
  - 22 For example, both types were available at the Fondaco dei Tedeschi in Venice in 1572: see Simonsfeld 1887, cited in note 21, Vol. II, pp. 197–8; *Tariffa oder Uncostbüchlein von allen Wahren in Venedig so auss und ein geführt mögen werden durch Teutsche und andere Nationen* [by S.V.], Nuremberg 1572, pp. 20<sup>r</sup>, 32<sup>v</sup>–33, 219<sup>v</sup>–221<sup>v</sup>. See also Molà 2000, cited in note 20, pp. 120–31.
  - 23 Gargioli 1868, pp. 48–50; Bussagli 1986, pp. 266, 269; Rosetti 1969, pp. 34, 125, all cited in note 17.
  - 24 G. Reborà, *Un manuale di tintoria del Quattrocento*, Milan 1970, pp. 77–9, esp. p. 78 (MS. 4.4.1, Civica Biblioteca di Como). It is unclear what effect this may have had: see Verhecken and Wouters 1988/89, cited in note 14, p. 227. Subsequently the cloth was treated with the purple lichen dye orchil (*orizelo*).
  - 25 Molà 2000, cited in note 20, p. 114. Rosetti does include recipes for obtaining *morello* by dyeing with the less blue-toned madder or brazil wood dyes over blue: Rosetti 1969, cited in note 17, pp. 31–3, 121–3; see also pp. 146–7.
  - 26 ‘Purpura’ was a fabric more typically produced during the Middle Ages, and would have been regarded as quite old-fashioned by the late fifteenth century in Italy. For references to medieval ‘purple’ fabrics, see F. Michel, *Recherches sur les étoffes de soie et d’or et d’argent ... pendant le Moyen Age*, Paris 1852, Vol. I, p. 188: a ‘purpura quae vulgariter dicitur samyt, vel baldekin’ (1278). See also R. Barsotti, *Gli antichi inventari di Pisa*, Pisa 1959, p. 47: ‘palium unum de purpura venetica multorum colorum cum rotis et papagallis magnis’ (1369). By the early sixteenth century, ‘purple’ was coming back into use as a term to describe the colour of a fabric, and it was certainly used in this way in England, see, for example, the lists of purple-coloured textiles in *The Inventory of Henry VIII*, Vol. I, ed. D. Starkey, London 1998, items 9967–9979, 10027–10035, 10180–1, 10192.
  - 27 C.C.A. Dehaisnes, ed., *Documents et extraits divers concernant l’histoire de l’art dans la Flandre, l’Artois et le Hainaut avant le XV<sup>e</sup> siècle*, Lille 1886, Vol. 1, pp. 300–1: ‘paonace, which is treated the same as for murrey, that is to say it has the colour of true violet.’ For *paonazzo*, see also S.M. Newton, *The Dress of the Venetians, 1495–1525*, Aldershot and Vermont 1988, pp. 18–24.
  - 28 T. Garzoni, *La piazza universale di tutte le professioni del mondo*, ed. G.B. Bronzini, 2 vols., Florence 1996 (based on the edn. of 1587; first published Venice 1585), Vol. 2, no. XC, *De pittori e miniatori et lavatori di mosaico*, pp. 812–21, esp. p. 815: ‘del morello dalle more, del pavonazzo che’è morello scuro.’
  - 29 Molà 2000, cited in note 20, pp. 112–17; L. Monnas, ‘Loom widths and selvages prescribed by Italian silk weaving statutes 1265–1512: a preliminary investigation,’ *Bulletin de Liason du Centre International d’Etude des Textiles Anciens*, 66, 1988, pp. 35–44, esp. p. 40. The velvet cover of the volume forming Lot 367 from the Library of William Foyle (see note 11 above) does present a selvedge that is yellow with a green stripe. Unfortunately, it was not possible to examine the dyestuffs present.
  - 30 Gargioli 1868, pp. 31–2; Bussagli 1986, p. 259; Rosetti 1969, pp. 54, 147, all cited in note 17; see also Reborà 1970, cited in note 24, pp. 77, 108. See also Cardon 1990, pp. 72–3 for a discussion of possible interpretations, and pp. 76–91 for other *Porphyrophora* species; Verhecken and Wouters 1988/89, pp. 226–7, both cited in note 14.
  - 31 P.A. Mattioli, *Il Dioscoride dell’eccellente dottor medico M.P. Andrea Matthioli da Siena, co i suoi discorsi...*, Venice 1548, pp. 535B6; and idem, *I discorsi ... nelli sei libri di Pedacio Dioscoride ...*, Venice 1568, pp. 1084–5: the ‘grains’ are not mentioned in the author’s discussions of ‘pimpinella’. See also Cardon 1990, pp. 67–72, and Verhecken and Wouters 1988/89, p. 224, both cited in note 14.
  - 32 P.M. Caniparius, *De atramentis cujuscunque generis*, Venice 1619 (rep. Rotterdam, 1718), pp. 282–8, esp. pp. 285–6, 288. Drawing upon Classical and recent authors (including Mattioli) Caniparius discussed the insects, including Mexican cochineal, not only in the context of the crimson colour *cremesinus* (*cremesino*), but also as a historically recent equivalent to the Antique (and chemically quite distinct) Tyrian or shellfish purple. This is a reddish purple.
  - 33 Printed by Bertoni 1903, cited in note 7, pp. 229–33.
  - 34 ‘Uno Breviario grande de charta de capreto scripto a penna meniato et instoriato coperto de raso morello et la

sopracoperta de brocato d'oro morello fodrata de raso cremesino. Cum due azuli de oro smaltati': Bertoni 1903, cited in note 7, p. 229 (3).

- 35 'Un altro Breviario picinino de capreto scripto a penna miniato: coperto de raso alexandrino; la sopra-coperta de veludo morello fodrata de dalmasco biretino cum una cordellina de oro intorno: cum dui azuli de argento. Il quale adoperava madama ogni giorno': Bertoni 1903, cited in note 7, p. 229 (5).
- 36 No analysis of the pigment was possible, but microscopic examination of the picture by Ashok Roy suggested that a trace of pink coloration remained in the Virgin's mantle, which would suggest the presence of a red lake pigment, now totally faded. Another hypothetical – if implausible – explanation for the robe's present colour is that a now deteriorated blue colorant extracted from flowers was used; this is said to have been used for manuscript illumination and recipes for the extraction of the blue colouring matter from suitable flowers and berries certainly exist. It should be said at once that the use of a pigment of this type is highly unlikely. The colorant tends to turn reddish as alkaline conditions are required for it to remain blue; it also fades very rapidly. It was not recommended for easel paintings and it is not known ever to have been so used.