

# A preliminary study on Paulus Potter's (1625-1654) painting technique

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## Introduction

Recent treatment of Paulus Potter's *Orpheus Charming the Beasts* (fig. 1) painted in 1650, in the collection of the Rijksmuseum, Amsterdam, provided an excellent opportunity for in-depth examination of the painting.<sup>1</sup> Six other paintings (in the collections of the Rijksmuseum and the Royal Picture Gallery Mauritshuis, The Hague) were also examined to achieve a better understanding of Potter's working practices.<sup>2</sup> It was hoped that this wider technical study might resolve the problem of how the artist was able to produce so many highly-detailed paintings in such a short time.

Paulus Potter was born in Enkhuizen in 1625 and probably received his first training from his father, the painter Pieter Symonsz Potter (1597/1601-1652). The history painter Claes Moeyaert (1590/91-1655) is also mentioned as a possible teacher of the young Potter. We know that Paulus trained with the history painter Jacob de Wet (c1610-1671/1672) in 1642. Paulus' style seems to owe little to his master's; but the Italianates Pieter

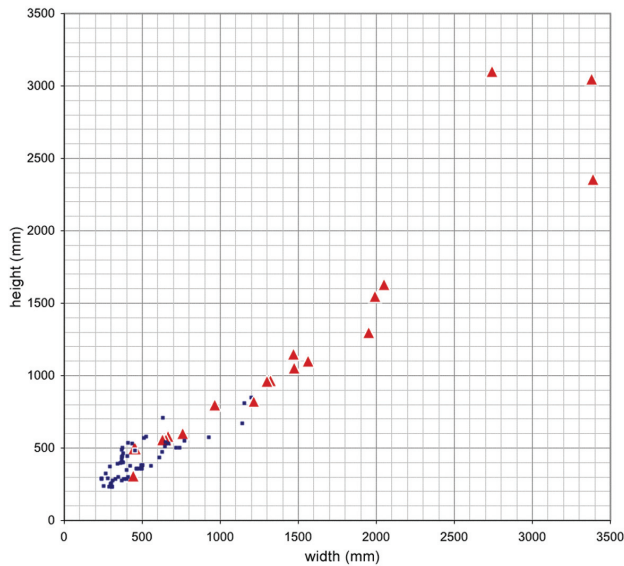
van Laer (1599-after 1642) and Jan Both (c1618-1652) were more influential, though Paulus preferred to place his cattle and figures in Dutch landscapes. Potter entered the Guild of St. Luke at Delft in 1646 and in 1649 was enrolled in the painters' guild of The Hague, where he lived next door to the landscape painter Jan van Goyen. In 1652 Paulus moved to Amsterdam, where in January 1654 he died at the early age of twenty-eight. In spite of his premature death he left an extensive oeuvre of nearly one hundred paintings, depicting - as well as his famous animal portraits - mythological, biblical, hunting and genre scenes.<sup>3</sup> Potter's artistic legacy was handed down in the paintings of Karel du Jardin (1626-1678) and Adriaen van de Velde (1636-1672), though they would never match Potter's meticulous rendering of detail.<sup>4</sup> Attention to detail is characteristic of Potter's paintings. This is visible not only in the artist's intimate cabinet paintings but also in his large scale canvases such as his famous Bull (Mauritshuis, The Hague) painted in 1647. As Paulus signed his earliest work in 1641 at the age of fifteen, he created this large number of highly-detailed paintings in only thirteen years, an output which might suggest the participation of studio assistants/pupils. Walsh suggested that the more opaquely painted and

less detailed *Herdsmen with their Cattle* and *Four Cows in a Meadow*, both painted in 1651, (Rijksmuseum, Amsterdam) might indicate the presence of students in the artist's studio around that time.<sup>5</sup> Walsh rightly calls attention to the fact that although these paintings match the style of Paulus' compositions they are dissimilar in appearance.<sup>6</sup> However, in the case of *Four Cows in a Meadow*, this is not the result of a different technique but is due to the fact that large parts of the original painting are covered by overpaint.<sup>7</sup> Recent investigation of *Herdsmen with their Cattle* revealed that this painting is a copy after an original by Paulus Potter in the collection of the Duke of Bedford at Woburn Abbey<sup>8</sup>, which could explain the similarity in composition and the difference in appearance.<sup>9</sup>

There is, unfortunately, little hard evidence on Potter's life, studio or possible pupils. Our earliest and still most important source is the information gathered by Arnold Houbraken (1660 - 1719); he does not mention any apprentices.<sup>10</sup> The only mention of a pupil of Paulus is a

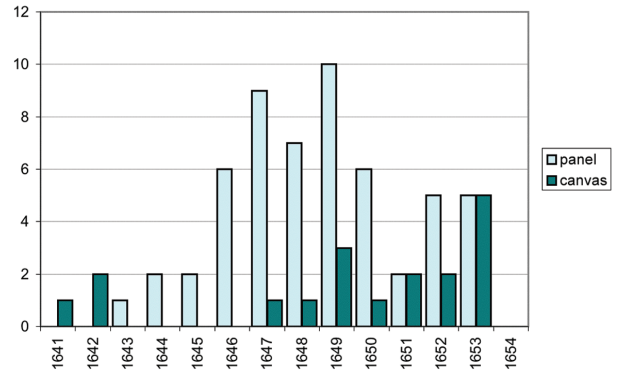
**Fig. 1** Paulus Potter, *Orpheus Charming the Beasts*, signed and dated 'Paulus. Potter: f 1650.', oil on canvas, 66.5 x 88.5 cm, Rijksmuseum Amsterdam, inv. no. A 317





**Fig. 2** Graphical representation of the dimensions of the supports used by Paulus Potter. Each painting is represented in the graph by one point. The 0-point can be seen as the lower left corner of the support, while a point in the graph represents the upper right corner of the support. Squares stand for panel supports while the triangles represent canvas supports

**Fig. 4** Paulus Potter, *Cows Reflected in the Water*, signed and dated 'Paulus. Potter/ f. 1648', oil on panel, 43.2 x 61.2 cm, Royal Picture Gallery Mauritshuis, The Hague, inv. no. 137



**Fig. 3** Graphical representation of the amount of canvas and panel supports used by Potter per year. Only dated paintings are included.



**Fig. 5** Paulus Potter, *Cattle in a Meadow*, 1652, signed and dated 'Paulus Potter/ f. 1652.'. oil on panel, 35.6 x 46.9 cm, Royal Picture Gallery Mauritshuis, The Hague, inv. no. 138



**Fig. 6** Paulus Potter, *A Herdsman's Hut*, signed and dated 'Paulus Potter f. 1645', oil on panel, 23.3 x 30.7 cm, Rijksmuseum Amsterdam, inv. no. A 315

**Fig. 7** Paulus Potter, *Two Horses near a Gate in a Meadow*, signed and dated 'Paulus/ Potter f 1649', oil on panel, 23.5 x 29.7 cm, Rijksmuseum Amsterdam, inv. no. C 205



casual observation in Van Gool's biography.<sup>11</sup> In the description of the life of Johan Le Ducq (1636?-1676), an obscure painter who specialized in the depiction of dogs, the biographer refers to the artist as a pupil of Paulus Potter. Johan was possibly born in The Hague, and was first mentioned there as a painter in 1655.<sup>12</sup> As Paulus lived in The Hague at least from 1649 until 1652, it is possible that Le Ducq served his apprenticeship with Potter at that time.

There is thus no clear evidence of the participation of pupils, which might have helped to explain Potter's extensive production.

A technical investigation of Potter's painting technique was performed, using Infrared Reflectography (IRR) or near infrared (CCD) imaging, x-radiography, as well as Polarised Light Microscopy (PLM) and Scanning Electron Microscopy/ Energy Dispersive X-ray Spectroscopy (SEM-EDS) on selected paint samples. The results would, it was hoped, shed some light on Potter's studio practice and especially on his ability to create such a significant oeuvre in such a short time.

## A Survey of Potter's Practice

### Supports

Although Potter did use canvas, most of his works (and especially his small-scale works) were painted on panel (see fig. 2).<sup>13</sup> In the group of paintings of average dimensions (c. 50 - 85 (h) x c. 62 - 120 cm (w)), the quantity of canvases and panels is roughly the same. All canvases in this group were painted between 1650 and 1653, while the panels were produced before 1650. For pictures larger than approximately 50 cm in height and 62 cm in width, Potter made more and more use of canvas, while for supports larger than 85 cm in height and 120 cm in width he used only canvas. The artist's preference for canvas over wood toward the end of his career - evident when Potter's supports are plotted against date (see fig 3)<sup>14</sup> - seems to coincide with the general trend amongst Netherlandish painters, who increasingly preferred canvas to panel over the course of the seventeenth century.<sup>15</sup>

### Setting the base: Potter's Preparatory Layers

Investigation of the preparatory layers in the examined paintings (the results are presented in Table 1) reveals that the artist painted on both light (varying from a light pinkish yellow to a light brownish colour) and dark coloured ground layers (grey and a warm dark brown), on canvas as well as on panel. These ground layers filled either the grain of the wood or the interstices of the can-

vas, creating a smooth painting surface that suited the artist's fine and delicate painting style.

Potter employed single as well as double-layered grounds. In *Cows Reflected in the Water* (1648) (fig. 4) and *Cattle in a Meadow* (1652) (fig. 5), both on panel, the ground consists of two layers; a first whitish layer seemed to have been applied to fill the grain of the wood, while the second opaquely pigmented coloured ground or 'imprimatura' layer, provided a different tonal value (a light and a dark brown respectively). In the other panel paintings examined, *A Herdsman's Hut* (1645) (fig. 6) *Two Horses near a Gate* (1649) (fig. 7) and *Four Cows in a Meadow* (1651) (fig. 8), the ground seems to be made up of one layer, though no cross sections were available which could give a clear image of the build-up of the ground. In *Orpheus Charming the Beasts* (1650) and *Cows in a Meadow near a Farm* (1653) (fig. 9), both painted on a canvas support, the artist painted on a single and a double-layered ground respectively.

Potter might use the colour of the ground layer as a coloured underpaint, as he did for instance in the grassy field of *Cows reflected in the Water*. In other cases, the artist left the ground deliberately exposed in the final paint surface, for example in the area in the trees near the sky in *Orpheus Charming the Beasts* (fig. 10), creating an open and airy effect. Both examples show how effectively Potter used the colour of the ground layers in the final paint surface.

It is not known whether Potter prepared his own supports or bought them pre-prepared. As the colour of the upper ground layer plays an important role in the final appearance of Potter's paintings, it seems likely that the artist grounded his own supports, or, if he bought them pre-prepared, would at least apply a second ground layer himself so as to obtain the desired tone.<sup>16</sup> There appears to be no relationship between the colour of the upper preparatory layer and the choice between a canvas or a wooden support. Nor could any relationship be found between the choice of colour, the chronology of Paulus' paintings or the type of image.

### Underdrawing and Preliminary drawings: clues beneath the paint

#### • Underdrawing

Underdrawing could be detected with infrared photography or reflectography (IRR) only on works executed on light-coloured grounds (See Table 1). The fact that no underdrawing could be made visible on *A Herdsman's Hut* dated 1645, *Cattle in a Meadow* painted in 1652 and *Cows in the Meadow near a Farm* from 1653 is probably

related to the dark grounds the artist used in these paintings. Here Potter would probably have chosen a lighter underdrawing material which might not be detected using IRR.<sup>17</sup> Considering the fluid character of the detected underdrawing in *Orpheus Charming the Beasts* (1650), *Cows reflected in the Water* (1648) and *Two Horses near a Gate* (1649), it was most likely executed in a carbon-containing ink or thin paint.

Infrared investigation of Paulus Potter's paintings also revealed unexpected information concerning his painting methods. In *Orpheus Charming the Beasts*, an extensive preliminary drawing was observed which in many areas was not followed in the final paint layers. IRR made clear, for instance, that behind the large deer in the foreground on the right, the painter initially planned another deer (fig. 11), and between the legs of the unicorn, an unidentifiable resting animal was sketched. Behind the sheep and goats at the left of the composition, the artist at first arranged another group of animals, and the outlines of a sheep are easily recognisable above the completed goat (fig. 12). One of the most remarkable elements, indicated in the preliminary drawing but not executed in the final painting, is the urinating cow in the centre of the composition (fig. 13).<sup>18</sup>

In 1649, a year before the creation of *Orpheus Charming the Beasts*, Potter used the motif of the urinating cow in *The Great Farm*.<sup>19</sup> This must be the painting Houbraken referred to as 'a bustling and crowded work for the old Princes Emilia van Solms'. According to Houbraken, this work was dismissed by Amalia van Solms after she was told the urinating cow depicted on this painting was a 'a too dirty an object for your Heighness to contemplate daily'.<sup>20</sup> Was this event as recorded by Houbraken the reason Potter eventually decided not to depict the urinating cow in *Orpheus Charming the Beasts*? Although a tempting thought, this does not seem likely, as the artist continued to use the same motif after 1649. It was also the subject of one of the eight etchings in the so-called *Bullenboekje*, Paulus Potter's first print series, of cattle in different positions, dated 1650.<sup>21</sup> In 1651 the painter would use the motif again in *A Landscape with Farm Animals*, now in the collection of the National Gallery, London.<sup>22</sup> It is more likely that, in *Orpheus Charming the Beasts*, it was omitted by Potter in the final painting to keep the composition open and to create a more gradual transition towards the background.

The underdrawing of the urinating cow in *Orpheus Charming the Beasts* shows a more elaborate and developed drawing than that of the other animals omitted

from the final paint layers. Not only did the artist indicate the contours of the cow, he also modelled areas and marked the shadow of the animal on the ground with washes of a thin paint. This elaborate and more detailed preliminary sketch could imply that Paulus Potter's decision not to include the cow was only taken at a late stage. It might also imply that, after the artist set up the initial composition in sketchy line, he worked up the composition in more detail by indicating light and dark, thereby beginning the modelling stage in the painting process. As it is difficult to make Potter's preliminary drawing visible with IR(R), unless he deviated from the sketch in the final paint layers, it is equally difficult to make a clear statement on Potter's degree of modelling at this preliminary stage.

Apart from the significant compositional changes Potter made between his preliminary drawing and the final painted surface of *Orpheus Charming the Beasts*, the artist also made several minor modifications, such as slight changes to the animals (fig. 14) and the trunks and branches of trees and bushes. Infrared study of *Cows reflected in the Water* painted in 1648 and *Two Horses near a Gate* dated 1649 showed similar alterations.

Although *Four Cows in a Meadow* (1651) is executed on a light coloured ground, no underdrawing could be made visible. However, in the examined works on light coloured grounds, an underdrawing could only be made visible when the preliminary sketch differs from the final painting; hence the apparent absence of underdrawing in the *Four Cows in a Meadow* may simply indicate that in this case the artist closely followed his preliminary drawings.<sup>23</sup>

#### • Compositional games

In viewing Paulus Potter's paintings, the rather awkwardly disproportionate scale of the different animals often attracts attention. The rabbit in the foreground of *Orpheus Charming the Beasts*, for example, is enormous compared to the goat painted next to it. As more or less similar animals or groups of animals often recur in different works by Potter, it is likely that the artist assembled his compositions from a number of individual studies. It seems that, when combining these, Paulus lost control over the proportions of the different elements.<sup>24</sup> The fact that almost no preparatory sketches showing complete compositions exist lends weight to the contention that the artist, rather than fully working-out his compositions beforehand, developed them during the painting process. Of all the paintings in this study, a partial compositional sketch exists only for *Cows in the Meadow near a Farm* (1653); it shows some of the



Fig. 8 Paulus Potter, *Four Cows in a Meadow*, signed and dated 'Paulus Potter f. 1651', oil on panel, 25 x 30 cm, Rijksmuseum Amsterdam, inv. no. C 206



Fig. 9 Paulus Potter, *Cows in a Meadow near a Farm*, signed and dated 'Paulus Potter. f. 1653', oil on canvas, 58 x 66.5 cm, Rijksmuseum Amsterdam, inv. no. A 711

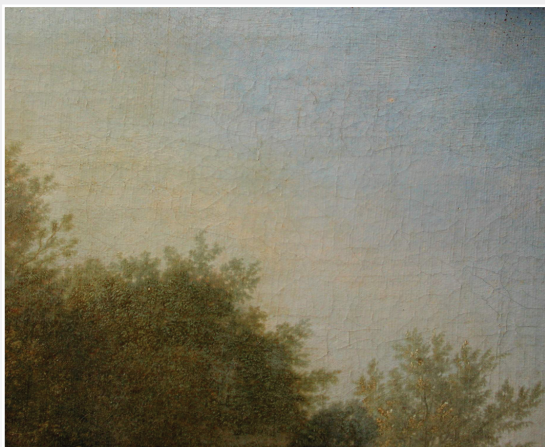


Fig. 10 Detail of the trees in the sky of *Orpheus Charming the Beasts*. The light brownish colour of the ground is left uncovered in the trees

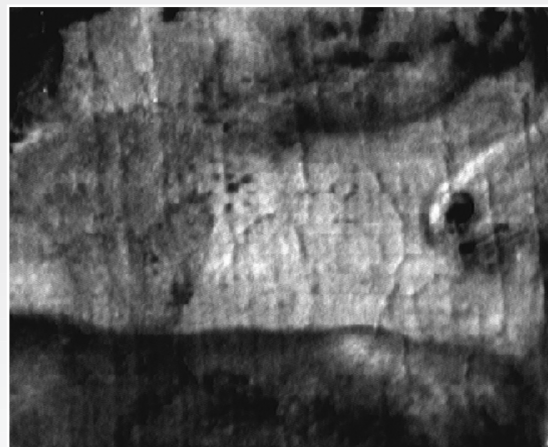


Fig. 11 IRR detail of the head of one of the deers not executed in the final paint layers of *Orpheus Charming the Beasts*

cows and sheep in the meadow, with the trees in the background.<sup>25</sup>

Some studies which the artist must have used for his paintings still exist. These often show animals sketched quickly and confidently from life. The dimensions of these sketches are approximately 9-10 cm in height and 13.5-15 cm in width. The source of these papers could be a small sketchbook, a so-called 'tafelboekje' [small table book].<sup>26</sup> Houbraken mentions that whenever Paulus wandered the countryside, he always carried a 'tafelboekje' in hand 'so that if he saw something animated that could serve him, he could sketch it.'<sup>27</sup> A study from such a sketchbook that has survived is *A Sow and her Farrow* (c. 1652), which Paulus used for the group of pigs in the *Mauritshuis Cattle in a Meadow* of 1652.<sup>28</sup>

#### • Method of transfer

Potter often re-used the same motifs in his works and sometimes their dimensions in different paintings are similar.<sup>29</sup> For instance, the little deer in *Orpheus Charming the Beasts* depicted behind the figure of Orpheus is painted in the same position and size as in *Swine and Deer in a Landscape* dated 1650.<sup>30</sup> In some cases similar motifs appear in different paintings in mirror image: the large deer depicted in *Orpheus* is depicted with the same dimensions but mirrored in *The Life of the Hunter*.<sup>31</sup> Furthermore, we find the urinating cow in the underdrawing of *Orpheus* depicted in a similar position and size but in mirror image in *The Great Farm* (1649), on an etching by Potter dated 1650, and in the 1651-dated *A Landscape with Farm Animals*.

However, the dimensions of similar elements do not always match. For instance, the motif of the resting cow in *Orpheus* appears larger in *Cattle and Sheep in a Stormy Landscape* (1650), while the tree trunk in *Orpheus* reappears on a much smaller scale in *Cows reflected in the Water* (1648).<sup>32</sup> Again, small changes to position and proportions may be noticed in similar motifs in different paintings.

The changes in size of recurring elements is an indication that the artist did not reproduce his motifs with a direct transferring technique such as ‘tracing’ or ‘pouncing’. In the technique of tracing, the back of the drawing, or an intermediate sheet of paper, would be blackened with charcoal or a black chalk and, after putting it on the prepared painting support, the sketch would be transferred by following the outlines with a stylus. The method of pouncing involved pricking the outlines of the drawing and, after placing it on the prepared painting support, dusting charcoal or dark pigment through the holes. These stippled lines would then be linked to make a clear preliminary drawing. Although the artist would usually brush away the little dots, they can sometimes be detected in IR(R).<sup>33</sup> None of the paintings by Potter examined revealed any of these dots. Had the artist used tracing as a technique to transfer his sketches, the transmitted drawing would have consisted of a ‘dry’ material and appeared in IR(R) as rather coarse, gritty lines. As the preliminary drawings show smooth, fluid lines, the use of tracing by Potter seems unlikely. However, it is possible that the artist, after transferring his separate sketches with the use of a dry material, followed the lines again with a more fluid material.

Fig. 12 IRR detail of a not in the final paint layers executed sheep in *Orpheus Charming the Beasts*



Looking at Potter’s paintings and the repetition of often small elements, one might think that it would be easier to believe that such a skilled and experienced draughtsman as Potter would have been capable of transferring his studies to his prepared painting supports freehand. Clearly, this would explain why similar elements show discrepancies in dimensions and proportions. Could this freehand reproduction of motifs also explain Potter’s motifs in mirror image? While examining some of Potter’s sketches in the Print room of the Rijksmuseum in Amsterdam, it was observed that the paper support of these drawings was often so thin that one could easily see the drawing from the back, especially when holding up the paper against the light. Possibly the artist reproduced motifs in mirror image freehand by holding his examples against the light. The reproduction of similar motifs in mirror image could also involve the use of prints as examples. In the case of the motif of the ‘urinating cow’, there is indeed a print from 1650. However, the urinating cow in the print faces in the same direction as the cow painted a year earlier in *The Great Farm*. Nevertheless the hypothesis given here remains a possibility. Although further investigation is needed, it seems clear that Potter had a set collection of motifs, which he re-used economically in different arrangements. The artist was able to create new compositions efficiently from the same elements. Furthermore, the inventive character of Potter’s economical re-use and re-assembling of elements is evident: direct repetitions of complete compositions are almost non-existent in his painted oeuvre.<sup>34</sup>

Fig. 13 IRR composite of the urinating cow not executed in the final paint layers of *Orpheus Charming the Beasts*





Fig. 14 IRR detail of in the underdrawing indicated, but not in the final paintsurface executed antlers of the little deer in the background of *Orpheus Charming the Beasts*

Fig. 15 X-radiograph showing the not in the final paintlayers executed couple and dog on the right side of the tree in *Cows Reflected in the Water*. The now resting cow on the left side was originally planned standing up

## The painting process

### Trial and error

The additive character of Paulus Potter's compositions might explain the large amount of pentimenti in his paintings. It seems the artist was only capable of judging the overall result of his composed paintings during the actual painting process and therefore made numerous changes, both while painting and in the underdrawing stage. Although IR(R) was not always successful in the detection of underdrawing, the technique proved a useful tool in showing changes made during the actual painting process. These changes are often partially visible to the naked eye.<sup>35</sup>

For instance, in *Orpheus Charming the Beasts*, Potter made the bluish tree behind the elephant smaller in the final

paint layers by painting the warm yellow sky over the leaves. The elephant was enlarged in the final stage by painting its behind over the leaves of the green/blue tree. The red cape of Orpheus was made smaller and partially overpainted with the green of the grass. In the branches of the trees, Potter repeatedly made small alterations during the painting process: several branches of the tree in the upper left corner, for instance, were completely painted-out with the light blue paint of the sky.

In every painting examined, small changes made by the artist during the actual painting process, such as those in *Orpheus*, could be found. The number of changes seems to relate to the complexity of the composition. In the relatively straightforward paintings of *Two Horses near a Gate in a Meadow* and *Four Cows in a Meadow*, the artist made only a few alterations. In the more complex composition of *A Herdsman's Hut*, Potter made more important modifications, originally including, for instance, another figure next to the resting herdsman. From lines visible next to the shed, it appears that the artist may originally have intended a hay store, as shown in the similar composition of *Landscape with Pigs Sheltering from a Storm* painted in 1646.<sup>36</sup> Also, in *Cattle in a Meadow* (1652), a mature work with a slightly more involved composition, Potter made several significant changes. He apparently decided to introduce the cow lying in the background at a late stage as (unlike the other animals) the cow is painted over the grass. Next to the cow a small animal is visible in infrared, which was not executed in the final paint layers. In *Cows reflected in the Water*, as well as many small changes, the artist made several significant modifications, as visible in the x-radiograph of the painting (fig. 15). At first, in the background next to the tree, Potter painted two people walking and a dog. At a late stage of the painting, he must have decided to conceal the couple with bushes, as evidenced by their shadows, which are still visible on the painted grass.<sup>37</sup> The x-radiograph also reveals that the cow lying beside the large tree was originally shown standing. Though *Cows in the Meadow near a Farm* is a rather elaborate composition, only minor changes were made by the artist during the actual painting process. If the artist made less use of individual studies and relied instead on a compositional sketch for at least part of the painting, this anomaly could be explained.<sup>38</sup>

### Building the paint layers: from colour field to highlight

After Potter set up his compositional sketch, he applied the first layer of colours, general monochrome areas of paint. In *Orpheus Charming the Beasts*, Paulus used a

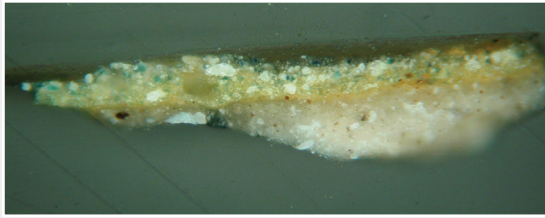


bright yellow layer of ochre in the foreground (figs. 16-17).<sup>39</sup> This underlayer was applied over the whole foreground as a more or less uniform layer beneath the animals, up to the horizon. The translucent character of the thin layer must have left the dark underdrawing visible, providing the artist with a guideline for the following paint stages. In some parts, Potter left the warm yellow underlayer uncovered in the final paint layers, creating the illusion of a fresh and spacious meadow. The trees, hilly landscape and bushes were all underpainted with a greenish brown colour. This paint consisted of a yellow transparent layer, possibly a yellow lake, with some verdigris, a red iron-containing pigment, and some fine lead white pigment particles.<sup>40</sup> In both cross sections made from samples taken from the tree on the right and the tree in the centre of the painting, this layer is clearly visible (figs. 18-21). In contrast to the more or less uniform yellow preparatory layer of the foreground, this layer seems to have a certain amount of modelling. As such, the paint is applied more thinly at the edges of the leaves of the trees than in the more thickly applied centre of the foliage, creating a certain volume in the leaves of the tree. As with the yellow underlayer which Potter utilised in the foreground, the brownish layer is deliberately left exposed in the final paint surface. In the sky the artist used an even blue layer built up of smalt and lead white (figs. 22-23) as underpaint.<sup>41</sup> The use of the cheaper (though more difficult to control) pigment smalt as an underlayer is described in the De Mayerne treatise (1620) in a recipe by the painter Paulus van Somer (1576-1621), who indicates that the addition of lead white facilitates the handling of smalt.<sup>42</sup> The preparation for the actual paint layers in monochrome coloured sections was observed in all paintings examined.<sup>43</sup> In some cases, similar preparatory layers with similar paint mixtures could be observed. The sky of *Cows reflected in the Water* for instance, shows a similar underpaint of a smalt layer mixed with lead white as used in *Orpheus*.<sup>44</sup> In other cases, the preparatory paints used by the artist seem to be adjusted according to the colour of the ground. In *Cows in a Meadow near a Farm* (1653), a brownish layer similar to that used in *Orpheus* can be discerned with the naked eye, as an underlayer for the trees. Here too a certain amount of modelling is applied within the layer, and is left open intentionally at certain places in the paint surface. A sample taken from the foliage of one of the trees from the painting shows a similar composition of the brown preparatory layer, although the greenish/bluish verdigris pigment particle concentration is much smaller than in the painting of *Orpheus*.<sup>45</sup> The fact that the layers are differ-

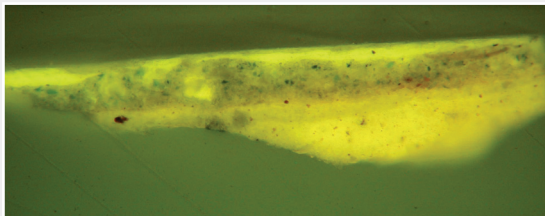
ent in composition, but appear similar to the naked eye is the result of the different colours (a light brown versus a cool greyish ground) of the ground layers. This implies that the artist adjusted the colour of the underpaint according to the colour of the ground.

### **The application of the final paint layers**

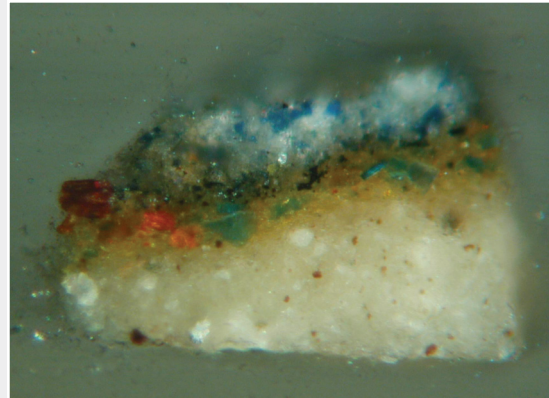
In the examined cross sections of the works in this study, it can be observed that the first paint layer is distinct from subsequently applied layers, indicating that the underpaint had time to dry before the final layers were added. Later layers are far more difficult to distinguish from one another in the cross sections, suggesting a wet-in-wet painting technique. Above the underpaint layers, Potter applied his paint thinly and relatively smoothly. Only in some leaves of the trees, bushes and plants and in the fur of animals can some impasto be observed. Sometimes, in Potter's skies, rather coarse brushwork can be detected, possibly related to the use of smalt as an underlayer.<sup>46</sup> In the final stage of the *Orpheus* painting, Potter applied a thin layer of ultramarine mixed with a white pigment, most likely lead white, on top of the smalt layer, thereby creating a deep blue sky (figs. 22-23).<sup>47</sup> A cross section of the sky of *Cows reflected in the Water* shows a similar build-up.<sup>48</sup> In *Orpheus*, the warmer areas of the sky, near the horizon, appear to be glazed with a yellow translucent paint, probably a yellow lake. To create his warm and sunlit landscapes Potter seems to have made extensive use of yellow lakes. This assumption is based on a remarkable phenomenon noted in all the examined works by Potter: small fibre-like material was observed, predominantly in warm yellow and green paint layers (fig. 24). Morphological research of this fibre-like material revealed that the small threads were residues of the weld plant (*Reseda Luteola* L.), a common source for the production of yellow lakes. Analysis of one of the yellow leaves of the large tree in *Orpheus* confirmed the presence of this particular yellow colorant.<sup>49</sup> The foliage of the trees was painted in one or two thinly applied layers. A sample taken from the tree in the centre of the composition (figs. 18-19) provides a clear image of the artist's fast and efficient build-up of paint layers. On top of the brownish underpaint of the tree, the artist applied a dark greenish paint (consisting of a yellow and a black pigment) to paint the darker leaves seen in shadow. Lighter green leaves (made up of a yellow lake, smalt, lead white and ultramarine) were applied locally adjacent to these dark leaves, partially directly on top of the brownish underlayer.<sup>50</sup> With one or two paint layers on top of the brownish underpaint, the artist created



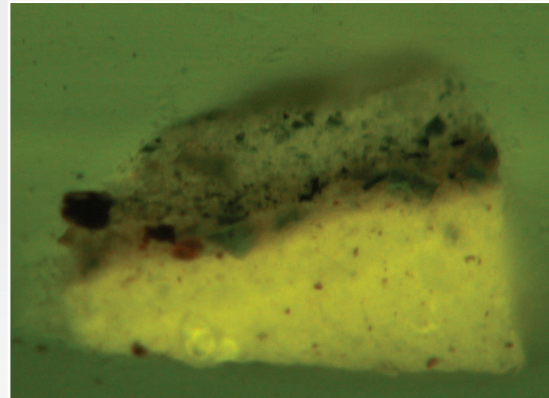
**Fig. 16** Cross section taken in olive green foreground of the lower right side of *Orpheus Charming the Beasts*. 1 and 2: Ground (applied wet-in wet) containing chalk, leadwhite, organic red and organic black. 3: Thin bright yellow ochre. Layers 4,5 and 6 are difficult to distinguish and probably applied wet-in-wet. 4: Yellow lake mixed with white and small quantities of blue and earth pigments. Left in this layer a glassy, translucent particle, possibly a leadsoap (clearly fluoresces in UV). 5: Similar layer as 4 with a larger quantity of blue pigment particles. On the right side of the sample a fibre is visible in this layer. 6: Thin bluish layer with fine white and dark blue pigment particles



**Fig. 17** Cross section taken in olive green foreground of the lower right side of *Orpheus Charming the Beasts* in UV (fig. 16)



**Fig. 18** Cross section taken in tree in the centre of *Orpheus Charming the Beasts*. 1 and 2: Ground (applied wet-in-wet). 3: Brownish underlayer containing yellow lake, verdigris, orange iron oxide particles and small leadwhite particles. 4: dark greenish layer of yellow lake and black particles. 5: greenish paintlayer containing yellow lake, smalt, lead white and ultramarine

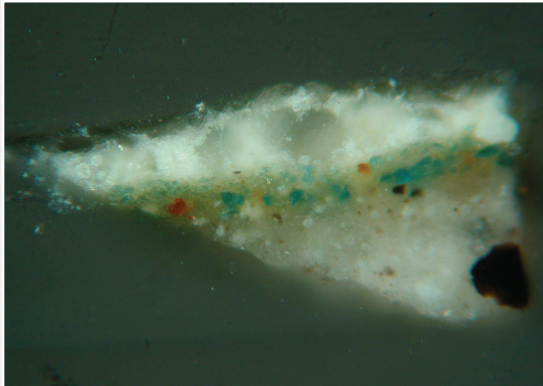


**Fig. 19** Cross section taken in tree in the centre of *Orpheus Charming the Beasts* in UV (fig 18)

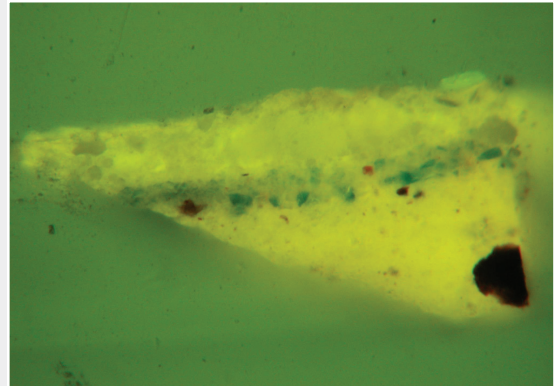
convincing foliage with volume, yet light and graceful as if each leaf was indicated separately. In the more defined tree on the right, the artist modelled a thin bluish layer over the brown underpaint. The distinct leaves were painted individually on top of this layer (figs. 20-21). A sharply defined tree was produced, creating a contrast with other trees given character by colour rather than line, so contributing to the overall illusion of depth. The spacious airy effect of the trees was further reinforced by the artist's application of small dabs of the blue paint of the sky on top of and in between the leaves, generating the illusion of open and light foliage.

Potter seems to have painted Orpheus from background

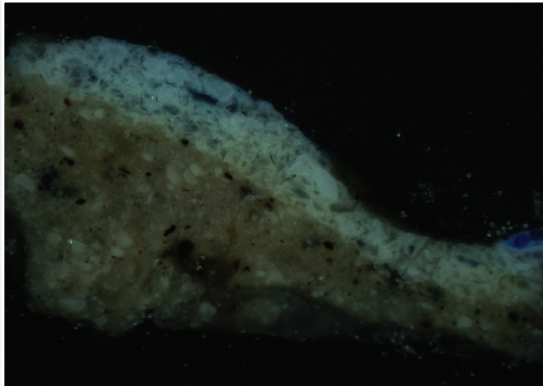
to foreground, returning to add small details such as leaves or animal fur over the previously-applied sky or grass. The meadow was painted in thin layers partly applied wet-in-wet, leaving the underlayer locally uncovered and creating a luminous field of fresh grass. The yellow tone of the underpaint of the foreground shines through the middle tone of some of the animals, while the lighter and darker areas are painted more opaquely. While the larger animals were not covered by the 'meadow-grass' paint layer, smaller animals, such as the frog, and the unnaturally-moving snake in the centre, were painted on top of the grass. In a final stage, Paulus created a tangible texture in the fur of the animals by painting fine details with a small brush on the



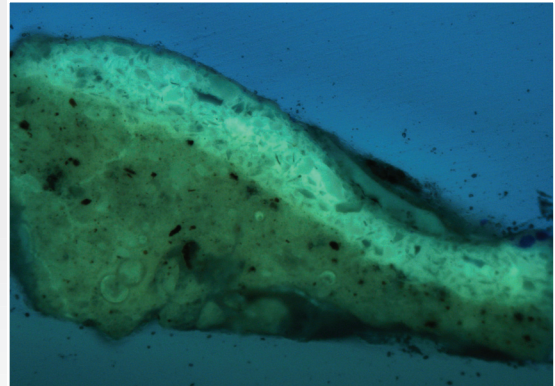
**Fig. 20** Cross section taken in yellow leaf of large tree on the right of *Orpheus Charming the Beasts*. 1 and 2: Ground (applied wet-in-wet). 3: Brownish underlayer containing yellow lake, verdigris, orange iron oxide particles and small leadwhite particles. 4: Thin bluish layer of fine blue pigment particles. 5: Thick whitish layer containing large glassy particles (possibly leadsoaps) 6: Thin layer of yellow lake



**Fig. 21** Cross section taken in yellow leaf of large tree on the right of *Orpheus Charming the Beasts* in UV



**Fig. 22** Cross section taken in sky of *Orpheus Charming the Beasts*. 1 and 2: Ground (applied wet-in-wet). 3: Underlayer containing leadwhite and smalt. 4: Thin blue top layer containing ultramarine and leadwhite (most clearly visible at right side of sample)



**Fig. 23** Cross section taken in sky of *Orpheus Charming the Beasts* in UV



**Fig. 24** Fiber material in yellow sky near horizon of *Orpheus Charming the Beasts*. Part of the greenish original paint of one of the trees is applied over the fiber

Table 1 Supports and grounds

DATE	TITLE	SUPPORT (p)anel/ (c)anvas	COLOUR GROUND (to naked eye)	GROUND COMPOSITION	UNDERDRAWING (N)ot visible/ (V)isible with IR(R)
1645	A Herdsman's Hut	p	grey	—	N
1648	Cows Reflected in the Water	p	light brown	Double ground: first layer; white (leadwhite and or chalk?). Upper layer: leadwhite, earth pigments, black (Conservation report Royal Picture Gallery Mauritshuis).	V
1649	Two Horses near a Gate in a Meadow	p	pinkish yellow	—	V
1650	Orpheus Charming the Beasts	c	light brown	Single ground: two similar layers wet-in-wet applied; chalk, leadwhite, small organic red particles, some larger black carbon containing particles. (Conservation Report Rijksmuseum Amsterdam)	V
1651	Four Cows in a Meadow	p	pinkish yellow	—	N
1652	Cattle in a Meadow	p	dark brown	Double ground: first layer; white (leadwhite and or chalk?). Upper layer: small white, red, orange and black particles. (Conservation report Royal Picture Gallery Mauritshuis).	N
1653	Cows in the Meadow near a Farm	c	grey	Double ground: first layer; fine orange ironoxide particles, some leadwhite particles, carbon containing black particles. Upperlayer (two wet-in-wet applied layers); leadwhite, ochre, carbon containing black. (Conservation report Rijksmuseum Amsterdam)	N

modelled animals. With this accuracy of detail, Paulus Potter produced an almost perfect illusion of the sheep's stiff curls of fur, next to the soft and shiny longer hairs of the goat. It is this careful and accurate, almost palpable, rendering of texture that characterises Potter's paintings.

### Conclusion

In all examined works, a build-up of paint layers similar to those in *Orpheus* could be observed. The foliage of the trees was habitually built up in one or two paint layers over a brownish underpaint. In the meadows, Potter left the paint of the preparatory layer or ground partly uncovered, or shining through wet-in-wet applications of thin translucent layers, imitating a lively structure of fresh grass around the spaces reserved for the larger animals. With the addition of animal hairs over the previously painted grass, Potter convincingly integrated the animals into their surroundings. With the same intention, the artist painted blades of grass over the animals and, as mentioned earlier, applied small dots of blue sky in the foliage of the trees.

The most distinctive quality of Paulus' work, however, is his attention to detail applied in the final paint stages, above all noticeable in his accurate depictions of mosses, poppy flowers, plants, frogs and insects. This detailed brushwork is apparent in all of Potter's paintings, but the degree to which this detail was applied seems to fluctuate from painting to painting. In the examined works, *Cows reflected in the Water* and *Orpheus Charming the Beasts* show very fine detailing, while for instance

*Cattle in a Meadow* and *Cows in a Meadow near a Farm* show less detail. Even less is visible in *Two Horses near a Gate in a Meadow*, *A Herdsman's Hut* and particularly in *Four Cattle in a Meadow*. A possible explanation for this varying attention to detail could be that the paintings with less detailed brushwork were intended for a different market.<sup>51</sup>

Research on Paulus Potter's painting technique revealed an economical and inventive use of image material, in which the artist was repeatedly able to achieve fresh compositions by using standard motifs, every time re-assembling them in different arrangements. A systematic and routine build-up of paint layers culminated in the addition of the fine detailing typical of Potter. Contrary to what the detailed character of Potter's paintings might suggest, the artist does not seem to have begun with a clear idea of his final composition, but worked out the composition during the actual painting process; this explains the large amount of pentimenti characteristic of Paulus Potter's paintings. On the basis of this preliminary research on Potter's technique, it does indeed seem possible that the artist painted his substantial oeuvre without the participation of assistants.

## Acknowledgments

This article is an adapted version of my graduation work for the Limburg Conservation Institute (SRAL, Maastricht). I thank the staff of the SRAL for their help, particularly René Hoppenbrouwers, H el ene Dubois and Anne van Grevenstein. The conservation treatment of Paulus Potter's *Orpheus Charming the Beasts* was carried out during an internship at the Rijksmuseum Amsterdam. For this possibility I am grateful to Manja Zeldenrust, head of paintings conservation, Rijksmuseum Amsterdam. The treatment took place under the inspiring supervision of senior conservator Gwen Tauber. I am grateful for her constructive help in the treatment and her valuable comments on this article. I thank Arie Wallert, Scientific Curator, Rijksmuseum Amsterdam, for his enthusiastic participation and help in the interpretation of the analytical material. I am indebted to the conservators of the paintings conservation department of the Mauritshuis, especially Sabrina Meloni, for sharing their conservation dossiers (especially helpful were the reports written by Maartje Witlox) and their assistance in the examination of the paintings. Finally I am grateful to paintings conservator Erika Metz who generously shared her technical notes on Paulus' painting technique with me and who was always prepared to discuss various topics related to Potter's painting technique.

## Notes

**1** The conservation treatment of *Orpheus Charming the Beasts*, signed and dated 'Paulus. Potter: f 1650.', oil on canvas, 66.5 x 88.5 cm, Rijksmuseum Amsterdam, inv. no. A 317, was carried out by the author during an internship at the Rijksmuseum, Amsterdam. The restoration was supervised by Gwen Tauber, senior restorer at the paintings conservation department.  
**2** All paintings were examined in ordinary, raking and ultra-violet light and with the microscope, using magnifications up to 50x. The Rijksmuseum paintings were examined with infra-red reflectography using an infra-red vidicon (Find-R-scope with a response up to 2200 nm). Reflectograms were made using Apple

Videoplayer (Apple Macintosh Power PC). The paintings in the Mauritshuis were examined with near infra-red (CCD) using the Artist camera, mounted with a CCD progressive scan image sensor (1360 x 1036 pixels) and a Schneider Kreuznach Xenoplan 1.4/23 mm CCTV-lens in near Infrared 2 with a long wave pass filter 1000 nm. Images were captured using Artist Software (release 1.2) and assembled with PanaVue Image Assembler. Several paintings were examined with x-radiography. New x-radiographs were made of *Orpheus Charming the Beasts*. Existing x-radiographs of *Cows Reflected in the Water and Cows in the Meadow near a Farm* were re-examined. Small paint samples were removed from the edges of the painting or the edges of lacunae of *Orpheus Charming the Beasts*. Samples were embedded in polyester resin (Polypol) and ground in water. The surface was dry polished with Micromesh. Existing paint cross sections of *Cows Reflected in the Water, Cattle in a Meadow and Cows in the Meadow near a Farm* were studied. The paintings examined were those accessible in Dutch public collections. It was decided not to include large scale works such as the Bull (signed and dated 'Paulus. Potter./ f. 1647.', oil on canvas, 235.5 x 339 cm, Royal Picture Gallery Mauritshuis, The Hague, inv. no. 136) and the Bear Hunt (signed and dated 'Paulus/ Potter f./ 1649', oil on canvas, 305 x 338 cm, Rijksmuseum Amsterdam, inv. no. A 316). It is likely that the paintings which Potter created on such large format are executed differently. For a chronological list of the works examined see Table 1. See also figs. 1, 4-9.  
**3** There is still no comprehensive overview of Paulus Potter's oeuvre. As indicated by Walsh in A. L. Walsh, E. Buijsen, B. Broos, Paulus Potter. *Schilderijen, Tekeningen en Etsen*, [exh. cat., Royal Picture Gallery Mauritshuis, The Hague] (Zwolle, 1994), note 1, 37. This is probably partly due to the existence of numerous copies and imitations of Potter's work. Hofstede de Groot attributed the unlikely amount of over 170 paintings to Potter.  
**4** The Hague 1994, 10-37  
**5** *Herdsmen with their Cattle*, signed and dated 'Paulus Potter f. 1651',

oil on canvas, 81 x 97.5 cm, Rijksmuseum Amsterdam, inv. no. A 318.

**6** A. Walsh, *Paulus Potter: His Works and their Meaning*, [Unpublished dissertation] (Columbia University, 1985), 244-246.

**7** Clearly visible under magnification. The sky is extensively over-painted. The paint partly covers the contours of the cows and parts of the original translucent area around the animals. Local broad retouches are applied in the cows and in the meadow.

**8** *Herdsmen with their Cattle*, signed and dated 'Paulus Potter f. 1651', oil on canvas, 79.9 x 96.5 cm.

**9** Research executed by T. Dibbits, head of paintings, Rijksmuseum Amsterdam, A. Wallert, Scientific Curator, Rijksmuseum Amsterdam and the author. Results will be published in the *Rijksmuseum Bulletin*.

**10** A. Houbraken, *De groote schouburgh der Nederlantsche konst-schilders en schilderessen*, (Amsterdam, 1718-1721), vol. II, 125-130.

**11** J. van Gool, *De Nieuwe Schouburg der Nederlantsche Kunstschilders en schilderessen*, (Den Haag, 1750), vol. 1, 65, (Edition Soest 1971).

**12** E. Buijsen et al., *Haagse schilders in de Gouden Eeuw. Het Hoogsteder Lexicon van alle schilders werkzaam in Den Haag 1600-1700*, (The Hague, 1998), 301-302.

**13** Exceptions are *Two Pigs in a Stable*, 1649, oil on canvas, 31 x 44 cm, Private collection, and the *Piebald Horse*, c. 1653, oil on canvas, 49.5 x 45.0 cm., The J. Paul Getty Museum, Malibu, inv. no. 88. PA. 87. In spite of the small format of the *Piebald Horse*, the canvas support consists of two parts. Buijsen indicated that a piece of canvas was possibly added to change the composition of the work. The Hague 1994, 144, 146.

**14** Of the 79 paintings, which are considered to be authentic paintings by Potter, 20 are painted on canvas.

**15** This might explain why the painter used canvas as a support for *Two Pigs in a Stable* (1649) and the *Piebald Horse* (1653). On increasing use of canvas amongst seventeenth-century painters see: E. Hendriks, 'Johannes Verstronck: The technique of a Seventeenth Century Haarlem Portraitist', in E. Hermens ed., *Looking through Paintings*, Leids

Kunsthistorisch Jaarboek, XI (Baarn/London, 1998), 232.

**16** Further research into the composition of Potter's grounds could answer this question.

**17** D. Bomford ed., *Art in the Making. Underdrawings in Renaissance Painting*, (London, 2002), 35.

**18** At present, this preliminary drawing of the cow is partly visible to the naked eye. Even at the end of the nineteenth century it must have been visible, as Van Westreene noted in 1867: 'Ce tableau pr esente cette particularit e remarquable qu'entre l' l phant et le licorne on aper oit   travers la peinture les contours d'une vache   dos courb e et dont la queue est lev e. Cet animal para t  tre rest    l' tat d' bauche. P. lui-m me a peint le gazon qui le couvre aujourd'hui'. T. van Westreene, *Paulus Potter. Sa Vie et ses Oeuvres*, (Den Haag, 1876), 146.

**19** Oil on panel, 81 x 115.5 cm, signed and dated 'Paulus. Potter. f. 1649', Hermitage St. Petersburg, inv. no. 820.

**20** Houbraken 1718-1721, vol. II, 127: 'woelig en vol werk, voor de oude Princes Emilia van Solms', and 'al te vuil voorwerp voor hage Hoogheid om dagelyks te bespiegelen'.

**21** The Hague 1994, 190-193.

**22** Oil on panel, 57.7 x 52.9 cm. National Gallery London, inv. no. NG. 849.

**23** IRR reflectograms of this painting were difficult to read because of the great amount of overpaint which appeared dark on the reflectograms.

**24** The literature repeatedly mentions this additive and repetitive character in Potter's compositions. See for instance Walsh 1985, 165-166, 205, 244 and The Hague 1994, 28, 45-46, 95, 136.

**25** *Cattle in a Meadow*, drawing, dimensions unknown, Albertina, Vienna. This sketch is above all connected to Potter's painting: *Farm near The Hague*, signed and dated 'Paulus. Potter. f. 1647', oil on panel, 39.7 x 50.2 cm, Eaton Hall, Chester. See The Hague 1994, 80-83. In the entry on *Cows in a Meadow near a Farm in The Hague* 1994, 150, E. Buijsen states that the composition of this painting is in large part a reproduction of *Farm near the Hague*. However, the position of the trees in the Amsterdam painting repeats almost exactly that of the trees in

the above mentioned drawing, rather than the positioning of the trees in *Farm near The Hague*. This indicates that the artist also made use of this drawing for his *Cows in a Meadow near a Farm*. Another known drawing that probably served as a compositional sketch is *Woman Cleaning a Bucket*, drawing, 250 x 227 mm, signed lower left: 'Paulus. Potter', Oxford, Ashmolean Museum, inv. no. 175. This compositional sketch was used by Potter in 1647 for *Woman Cleaning a Bucket*, signed and dated 'Paulus Potter f. 1647', oil on panel, 42 x 37 cm, current location unknown. Printed in *The Hague* 1994, 95 (fig 1).

26 *The Hague* 1994, 45-46.

27 Houbraeken 1718-1721, vol. II, 129: 'om als hy iets zag dat geestig was, en in zyn kraam konde dienen, straks dat voorwerp af te schetsen.'

28 Black chalk on beige antique laid paper, 102 x 149 mm, Fogg Art Museum, Cambridge (MA), Loan from Maida and George Abrams, inv. no. 25.1998.72. See *The Hague* 1994, 183.

29 The comparison of the dimensions was done by evaluating the different motifs, printed on the same scale.

30 Signed and dated 'Paulus. Potter f. / 1650', oil on panel, 28.7 x 28.3 cm, London, Private Collection.

31 Signed at right of the panel of *Huntsman Condemned*, oil on composite panel, 84.5 x 120 cm, Leningrad, The Hermitage, inv. no. 823.

32 Signed and dated 'Paulus. Potter: f. 1647', oil on panel, 46.3 x 37.8 cm, London National Gallery, inv. no. 2583.

33 Bomford 2002, 22-24.

34 The only case in which Potter has reproduced the exact composition seems to be in *A Farmer with his Herd*, signed and dated 'Paulus Potter f. / 1648', oil on panel, 50 x 74 cm, Cassel, Staatliche Kunstsammlungen, inv. no. 369. This painting repeats the composition of *Farmer with his Herd* dated two years earlier (signed and dated 'Paulus Potter f. 1646', oil on panel, 50 x 72 cm, Lyon, Musée des Beaux-Arts, inv. no. 159). The authenticity of the Lyon painting has been questioned. M. Perez et al., *Flandre et Hollande au Siècle d'or: chefs-d'œuvre des musées de Rhône-Alpes*, [exh. cat., Musée des Beaux Arts] (Lyon, 1992), 239. In C. Boschma ed., *Meesterlijk Vee*,

*Nederlandse veeschilders 1600-1900*, [exh. cat., Dordrechts Museum, Fries Museum, Leeuwarden], (*The Hague/Zwolle*, 1988) it is stated that Potter repeatedly reproduced his compositions. Besides the repetition of the Rijksmuseum's *Herdsmen with their Cattle* (1651) in Woburn Abbey, which is no longer presumed authentic (see introduction), two paintings from 1649, and one dated 1647, are mentioned as examples. These last three paintings are referred to as: *Two Pigs in a Stable*, signed and dated 'Paulus Potter f. 1649', oil on panel, 31 x 44 cm, Private Collection; *Two Pigs in a Stable*, signed and dated 'Paulus Potter f. 1649', oil on panel, Milan, Museo Civico and *Two Pigs in a Stable*, signed and dated 'Paulus Potter f. 1647', oil on panel, Brussels, Museum of Fine Arts, inv. no. 3180. The authenticity of the Milan painting has also been questioned (*The Hague* 1994, 105). Although the pigs in the Brussels painting and the painting from the private collection are more or less similar, the animals' surroundings are different. The animals in the Brussels painting are placed beneath a slanting roof, showing part of the sky; while the animals in the private collection painting fill almost the complete image. The pigs painted in the Milan work are depicted even larger and almost no background can be seen. In addition, the supports and dimensions of the three paintings are different. The examples given here are not, as such, direct repetitions of complete compositions, but rather variations on similar themes.

35 Even in photographs of works by Potter these pentimenti are often visible. In the photograph of the *Life of the Hunter* (reproduced in *The Hague* 1994, 129), for instance, it is clear that the artist changed the position of the rider depicted on the centre panel in the lower part of the composition where the artist initially planned an elephant, but decided to paint the animal out in a later stage. These pentimenti were noted by Buijsen, see *The Hague* 1994, 135, note 26. He assumed that these changes occurred during the actual painting process, indicating that the artist had little preparation time for this particular work. Pentimenti are also clearly visible in a reproduction (*The Hague*

1994, 103) of the *Black Spotted Horse in a Meadow*, signed and dated 'Paulus Potter f. 1649', oil on panel, 28.2 x 24 cm, Schwerin, Staatliches Museum, inv. no. 2357. Behind the horse the painter initially planned a cow or bull.

36 Signed and dated 'P. Potter 1646', oil on panel, 29 x 24 cm, England, Aurora Trust.

37 As observed by Maartje Witlox in her conservation report.

38 See note 26.

39 SEM-EDS analysis of the orange particles in this preparatory layer revealed the presence of iron and silicon, indicating the use of an ochre.

40 SEM-EDS analysis of the orange particles showed the presence of iron, with only slight peaks for silicon, indicating an iron oxide instead of an ochre. The blue pigment particles contained copper and were identified with light microscopy as verdigris. Personal communication A. Wallert, Rijksmuseum Amsterdam.

41 SEM-EDS analysis revealed the presence of arsenic, potassium, cobalt and silicon indicating the use of smalt. The little amount of nickel that was detected with SEM-EDS is probably from a cobalt ore. The presence of lead in the white particles indicates the use of lead white. Personal communication A. Wallert, Rijksmuseum Amsterdam.

42 J.A. van de Graaf, *Het De Mayerne manuscript als bron voor de schildertechniek van de barok* (Mijdrecht, 1958), 149.

43 Unfortunately, cross sections of all paintings were not available. However, with the available cross sections and by careful examination of the paintings under magnification, a degree of understanding of the use of Potter's paint layers could be obtained.

44 Conservation Treatment Report, P. Potter, *Cows Reflected in the Water*, 1648, Mauritshuis, The Hague, inv. no. 137. Although the pigments in the paint sample were not analysed using SEM-EDS or polarised light microscopy, the partly colourless and transparent needle-shaped pigment particles visible in the cross section, show characteristic morphological similarities to smalt particles.

45 The layer consists of a yellow lake, verdigris, earth pigments and lead white. Paint sample 96/3 was analysed with polarised light

microscopy by Erika Metz.

Conservation treatment report: Paulus Potter, *Cows in a Meadow near a Farm*, 1653, Rijksmuseum Amsterdam, inv. no. sk-a-711.

46 These coarse brushstrokes in the sky were observed in *Cows Reflected in the Water* (1648), *Two Horses near a Gate in a Meadow* (1649), *Orpheus Charming the Beasts* (1650) and *Cattle in a Meadow* (1652).

47 SEM-EDS analysis revealed the presence of sodium, potassium, aluminium, silicon and sulphur, indicating the presence of ultramarine. Peaks in the spectrum for calcium probably indicate the presence of calcite, a natural pollutant of ultramarine.

48 Conservation treatment report, Royal Picture Gallery Mauritshuis The Hague, inv. no. 137.

49 The results of the analysis of this fibre-like material observed in paintings by Potter was presented at *Dyes in History and Archaeology* 22, Abegg-Stiftung Riggesberg, 23-24 October 2003: I. Verslype, A. Wallert, K. Mensch, and J. Wouters, 'Organic yellows in seventeenth-century paintings' (publication of postprints forthcoming).

50 The yellow paint layer with dark pigment particles was not analysed. SEM-EDS analysis of the top layer showed that this paint film probably consists of ultramarine: peaks for potassium, aluminium, silicon, sulphur and sodium, whereas the peaks for calcium could indicate the presence of calcite, a natural pollutant of ultramarine, and smalt: peaks for arsenic, sodium, cobalt and silicon. The peak for lead must indicate the presence of lead white. Fibre like material (residues of the weld plant) found in the top layer, as mentioned earlier must indicate the presence of yellow lake.

51 I am grateful to Edwijn Buijsen (RKD) who pointed this out to me. Personal communication May 2003.