

Blue and yellow pigments - the hidden colours of light in Cuyp and Vermeer

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Introduction

The pursuit of a particular pigment within a painting can sometimes unearth a different, but equally interesting discovery. Ironically, it was a search for the blue vivianite in a painting attributed to Aelbert Cuyp, *A Winter Scene*, which led to the unexpected finding of orpiment, while a hunt for ultramarine in a work by Johannes Vermeer, the *Young Woman Seated at a Virginal*, led to a chance sighting of vivianite.

The findings of two blues, ultramarine and vivianite, used in different ways in the lighted interior wall of a small painting, recently re-attributed to Vermeer, as well as the discovery of orpiment scattered in a part-shaded wall in a winter scene attributed to Cuyp, have raised the questions both of purpose and usage. What was the intention of both artists and the exact function of these pigments placed in specific locations? And were such practices especially characteristic of these disparate masters of light, or do they represent more widespread techniques?

The way these pigments were employed is described below in the anticipation that similar usage has been observed elsewhere on paintings or noted in documents.

Fig. 1 Aelbert Cuyp, *A Winter Scene*, oil on panel, mid 1650s (?)



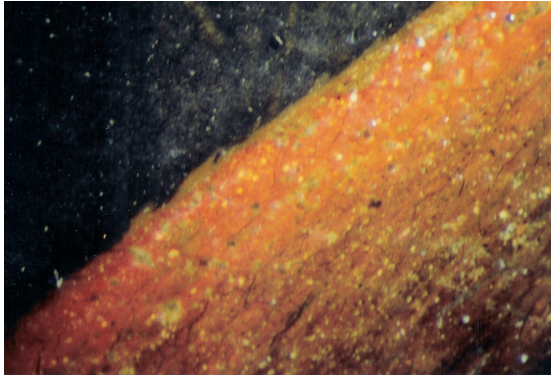


Fig. 2 Detail of orpiment scattered into the red jacket

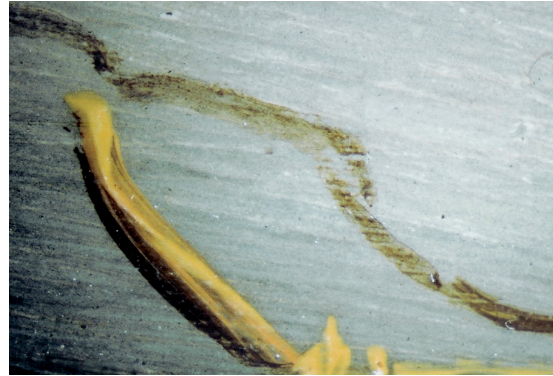


Fig. 3 Detail of the highlight of the reed in the ice

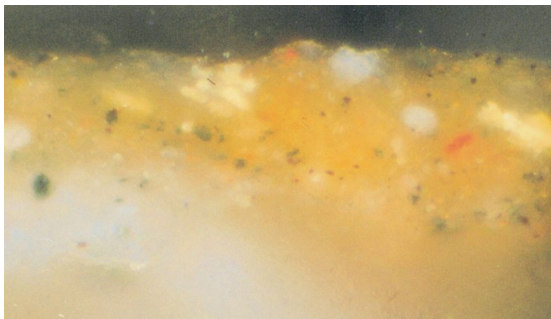


Fig. 4 Cross-section showing orpiment particles in the paint of the tower

Cuyp's colours

Analysis of the techniques and materials was carried out on *A Winter Scene* (oil on panel, 69.8 x 90.5 cm, Private collection) to see if it was possible to establish a link with other paintings firmly attributed to Aelbert Cuyp (fig. 1).¹

A search for a specific pigment, vivianite, or blue ochre, had been initiated by Marika Spring's research on eleven paintings by Cuyp in the National Gallery, London. She identified vivianite on eight out of the eleven paintings examined and, at the time, this appeared to be a characteristic which might be peculiar to Cuyp alone.² Since then many more sightings of vivianite have been observed in paintings well beyond the area of Dordrecht from whose peat bogs one source of the blue ochre seems to have been derived.³

The blues that were identified in *A Winter Scene* were discovered to be those common to innumerable Dutch paintings of the seventeenth century: smalt formed the blue of the sky; indigo was identified in the strongest blue of the trousers of the foreground costume; and charcoal black and white formed the optical blue of costumes of the middle ground figures. Cross-sections of the blue-green ice showed no sign of including any particles of

vivianite, but only yellow ochre, bone black, green earth and lead white.⁴

What was found under this close analytical survey, however, was an unexpected use of yellow orpiment, only noted in one other painting by Cuyp, and not remarked on in landscape paintings of his circle.⁵ The painting depicts a skating scene just outside Dordrecht, with skaters, horses, carts and tents gathered around the foot of ruins of the Huis te Merwede. The light, of course, is that to be expected of a low winter sun, catching the clothing of some of the figures, the side of the tent and a reed protruding through the thick ice, and giving them a touch of yellowish highlight. Under the microscope, the distinctive crystalline particles of orpiment could be seen to be forming most of these lights – as a fine line of yellow over lead-tin yellow and ochre underlay on the reed in the ice (fig. 2), or scattered into the red jacket of a foreground skater (fig. 3).

However, these techniques of highlighting have been used by many other artists: the final touch of orpiment as a light on the side of a copper vessel, in an interior scene by Hendrick Martensz Sorgh, noted by this author, is typical. Such highlighting was not an uncommon

practice amongst European portrait artists, especially when working in Italy, where orpiment would have been more readily available in the late sixteenth and probably the early seventeenth century.⁶ Van Dyck's advice about how to use orpiment was noted by De Mayerne: 'it should be applied by itself; the drapery (for which alone it is fit) having been prepared with other yellows. Upon these, when dry, the lights should be painted with orpiment: your work will then be in the highest degree beautiful.'⁷ By applying it in this manner, the artist isolated the often incompatible orpiment from other pigments. However, we can see that the orpiment on the costume of Cuyp's skater in *A Winter Scene* has not been laid on in a scumble, or a final touch, but seems to be well integrated with the paint, and is set firmly into the vermilion of the red jacket.

'Breaking' the shadows

A much less usual handling was seen in the half-shadowed parts of the ruin's walls, where orpiment had been mixed into the warm browns - a technique not seen in other landscape paintings examined.⁸ The particles are only identifiable with a reasonable degree of certainty at approximately x80 magnification (fig. 2). Orpiment is an awkward and dangerous pigment to use: it is toxic, smelly, it dries slowly and it is incompatible with other pigments. Recent research has also found it to be unstable enough to increase greatly in translucency in some circumstances.⁹ What was the artist's purpose in such an addition, which is invisible to the naked eye?

The evidence of contemporary documents indicates that the intention might be to bring a subtle luminosity to the shadows. Cornelius Jansen, after warning of orpiment's threat to other colours - 'he kills them all' - nevertheless advised the painter that it could be usefully mixed with 'yellow ochre or such like culler to break it for the shadows.'¹⁰ This effect of alleviating the shadows seems to be the case in the tower wall, where it is mixed into the yellow ochre, and, rather dangerously, lead white. A further suggestion comes from the nineteenth century historian of artists' techniques, Charles Eastlake, who attributed to Rubens 'the practice of occasionally mixing a warm transparent yellow with various pigments...to correct the redness of some of the darker browns.'¹¹ There is no implication that Rubens might have used orpiment for this purpose, but the function of the added warm and translucent yellow may echo what Cuyp and others in seventeenth-century Holland were trying to achieve - an overall harmony of light. Subtle additions of the same yellow colour to the shadows as

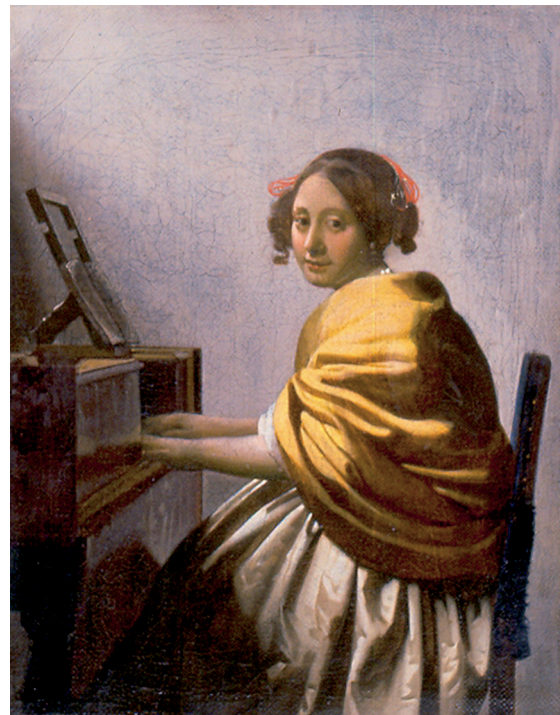
those which can be seen on the highlights, would increase the sense of general balance and desirable synchronisation of light and colour which might be described as *houding*.¹²

In addition, however, we must consider the possible effect of some of the large particles of yellow where they are on the surface. A sparkling surface texture, where Cuyp has depicted the sunlight touching the costumes of the figures and the side of the tent, which would have been created by the angular orpiment crystals at the surface, is surely a deliberate technique. A similar effect might have been intended in mixing the same pigment into the paint of the tower wall, not only to break the colour, but to scatter the light at the surface. Such an effect might not be actually visible to the naked eye, but might be perceived by the viewer without awareness.

Cool light of Vermeer - perception without awareness

Perception without awareness, to convey the effects of a certain type of light, was the consequence which Vermeer relied upon in his paintings a couple of decades later, when he was employing natural ultramarine in the background walls of his pictures. In contrast to Cuyp, he

Fig. 5 Johannes Vermeer, *Young Woman Seated at a Virginal*, seen before cleaning and restoration



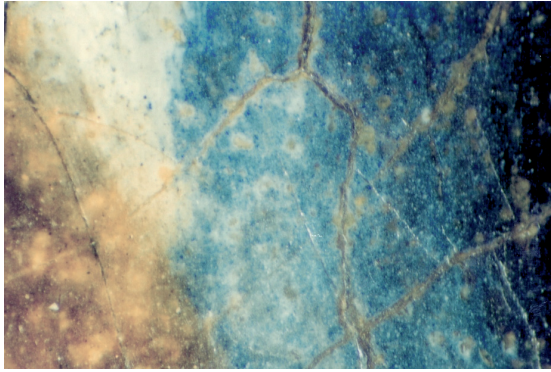


Fig. 6 Details of ultramarine on chair

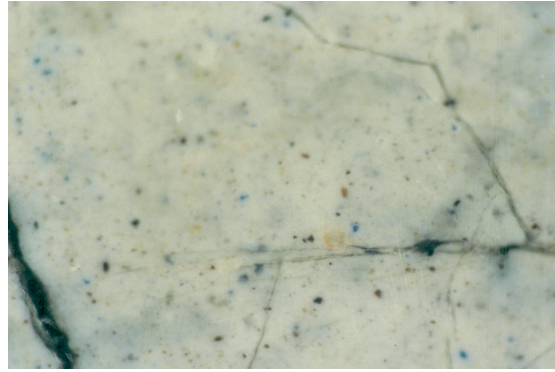


Fig. 7 Detail of wall to left of face with particles of ultramarine

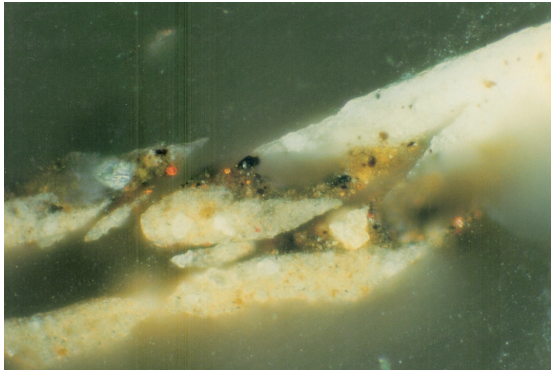


Fig. 8 Cross-section of wall, upper right in *Young Woman at a Virginal*, showing particles of vivianite in the underlayer

was aiming to represent a cool, Northern light coming in through an unseen window, lighting the whitewashed interior wall behind the warm female form. The unusually profligate use of the costly ultramarine blue by Vermeer has long been discussed by scholars, so that its finding in a little 17th century painting *Young Woman Seated at a Virginal* (oil on canvas, 24.7 x 19.3 cm, Private collection, USA, fig. 5) for the blue of a chair back (fig. 6), and in the highlights of the flesh, helped to indicate that Vermeer might be its author. However, even more convincing was the technique which others have noted in Vermeer's paintings, of mixing a little of this precious blue into the whitish grey of the wall (fig. 7). In *Young Woman with a Water Pitcher* (Metropolitan Museum, New York), Vermeer added ultramarine in a rather more generous and obvious way, so that the blueness of the wall is clear to even a casual viewer. Hubert Von Sonnenburg confirmed that the blue pigment in the background wall of the latter work had been identified as ultramarine, and has suggested that Vermeer was seeking the exact colour of light which came from an overcast sky.¹³ Vermeer's contemporaries, looking for a similarly cool effect, have used blue pigments other than ultramarine -

smalt, azurite, indigo or charcoal blue-black - to depict cold northern light on objects.¹⁴ In the little painting under examination, *Young Woman Seated at a Virginal*, the ultramarine was invisible to the naked eye, and could only be seen under magnification.

Vivianite in the underlayer

In a recent search for evidence of how extensive the ultramarine blue might have been within the paint of the wall (and in the absence of the painting itself), several samples were re-examined from the upper right corner of the painting. The most evident particles of ultramarine had been seen scattered into the pale paint of the wall just to the left of the young woman's face (fig. 7) - an obvious juxtaposition to help the recession of the cooler wall and prominence of the warm flesh of the face. In the samples from the outer edges of the painting, no ultramarine was found, but another blue was uncovered after a re-polishing of the samples.

In the cross-sections of paint from the wall, several blue particles were discovered in the local, dark underpaint (fig. 8). The large, angular, well-defined particles were of

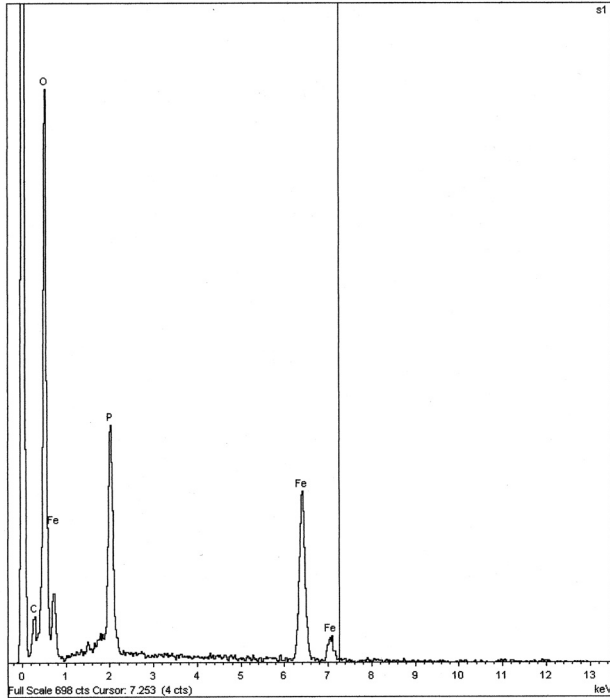


Fig. 9 SEM-EDX spectrum showing the elemental composition of the blue particle found in the cross-section (fig.8) to be phosphorus and iron

a greenish-blue colour, resembling rather pale azurite. However SEM-EDX analysis showed they contained both phosphorus and iron, and could be identified as vivianite (fig. 9).¹⁵

Vivianite has been the subject of much recent research, examining both use of the pigment and its condition and deterioration. Interestingly, in a paper accompanying the Dresden exhibition of Vermeer's *The Procuress*, Heike Stege et al. have shown that in this painting vivianite was used by the artist, not in the underlayers, but as surface paint in a carpet, a finding which at least confirms that vivianite was on Vermeer's palette.¹⁶

In *Young Woman at a Virginal*, the presence of this blue ochre in the coloured underlayer to the wall area is curious. Vermeer's concern, both to capture the exact colour of light on the wall, and to achieve spatial recession, shows not only in the surface paint, but seems to have extended to the underlayers of this painting. The underlayer of the wall is a cool, dark mixture, appearing almost black in the wear on the surface (see fig. 5), and in cross-section can be seen to consist of black, a little white lead, traces of red ochre and other minor constituents. The

particles of vivianite in this mixture were larger than the biggest of the black particles, but since they were only found in one of the four samples examined, the possibility must be aired of their being an accidental inclusion. However, Vermeer's well-recognised interest in optics, would imply that the addition of blue was deliberate. In the same painting he applied a pinkish brown layer underneath the dark brown of the virginal, and similar careful manipulation of coloured underlayers by Vermeer has often been observed.¹⁷ Only three particles of vivianite have been noted so far, but it does seem likely that it was added as a definite colourant to enhance the overall cool tone and colour of the upper layers.

Conclusion

The identification of pigments on these two paintings by Vermeer and Cuyp suggest that every part in the physical make-up of the pictures, whether an apparently unimportant element of the composition, or an unseen underlayer, was given the same rigorous attention in terms of choosing the exact constituents. The subtlety with which both Vermeer and Cuyp have employed these blue and yellow pigments emphasises the care they took to capture the right sort of light.

Notes

1 The attribution to Aelbert Cuypp had been challenged by Alan Chong, who suggested it resembled the work of Cuypp's follower Calraet.

2 M. Spring, 'Pigments and Color Change in the Paintings of Aelbert Cuypp', in *Aelbert Cuypp*, A. Wheelock ed., [exhib. cat., National Gallery of Art, Washington D.C./National Gallery, London/ Rijksmuseum, Amsterdam] (London, 2001), 65-73.

3 See M. Richter, 'Shedding some new light on the blue pigment 'vivianite' in technical documentary sources of northern Europe', *ArtMatters*, 4 (2007), 37-53.

4 The finding of phosphate and iron (the components of vivianite) in an EDX analytical scan of the paint in cross-section caused some excitement, but backscatter images showed that the phosphate belonged to black particles, and the iron to yellow iron oxide.

5 M. Palmer has noted orpiment being present in green foliage on *Lady and Gentleman on Horseback*

c.1655, by Cuypp in the National Gallery of Washington [personal communication, M. Gifford].

6 E. West Fitzhugh, 'Orpiment and Realgar', in E. West Fitzhugh ed., *Artists' Pigments*, Vol. 3,

(Washington D.C. and Oxford, 1997), 47-80, see 'Occurrences', 73.

7 De Mayerne quoted in C.L. Eastlake, *Methods & Materials of Paintings of the Great Schools & Masters*, (Dover Edition, 1960), 534 [translation by Eastlake from De Mayerne, Ms p.153].

A painting by Van Dyck, *Portrait of Tomaso Raggio*, a Genoese nobleman, was found to have orpiment highlighting of the type described, on the gentleman's armour [unpublished analysis report, C1599, Sheldon, UCL, 2001].

8 The only other cases of a similar employment of orpiment encountered by the author are in the brown backgrounds of still-life paintings attributed to the 18th century French painter Chardin. In these, the orpiment identified was scattered into the surface

paint of dull brown backgrounds: the yellow was only visible under relatively high magnification.

9 A. Wallert, L. Sheldon, Poster 14th Triennial Conference ICOM-CC, The Hague, 2005.

10 Cornelius Janson, quoted by M. Kirby Talley, *Portrait Painting in England: Studies in the Technical Literature before 1700*, (Paul Mellon Centre for Studies in British Art, 1981), 140.

11 C. L. Eastlake, *Methods and Materials of Painting of the Great Schools and Masters*, Vol.1, 446.

12 P. Taylor 'The Concept of Houding in Dutch Art Theory', *Journal of the Warburg and Courtauld Institutes*, 55 (1992), 210-232; and M. van Eikema Hommes, 'Pieter de Grebber and the Oranjezaal in Huis ten Bosch', *Art Matters*, 3 (2005), 20-37.

13 The late Von Sonnenburg. Personal communication, 2001. J. Wadum has noted similar occurrences. Personal communication 2002. Von Sonnenburg's suggestion of an overcast sky is found in

'Technical Comments', *Metropolitan Museum of Art Bulletin*, (1973), 220-225, 221.

14 Unpublished research conducted by N. Costaras and L. Sheldon 2002-3.

15 EDX analysis was carried out in the Geology Department, Birkbeck College, London.

16 H. Stege, C. Tilenschi, A. Unger, 'Bekanntes und Unbekanntes - neue Untersuchungen zur Palette Vermeers in der 'Kupplerin'', in *Jan Vermeer - Bei der Kupplerin*, U. Neidhardt, M. Giebe, eds., [exhib. cat., Gemäldegalerie Alte Meister Dresden] (Dresden, 2004), 77-82.

17 J. Wadum 'An Interview with Jørgen Wadum' <http://essentialvermeer.20m.com/index.html>, 2003; Viola Pemberton Piggott's examination of *The Music Lesson* while inspecting its condition, showed the use of similar coloured underlayers. Verbal communication.