Identifying the Blockx paints fingerprint in Théo Van Rysselberghe's *Portrait de Madame Charles Maus* (1890)

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Introduction

Blockx, a Belgian paint manufacturer, is at the heart of a project led by the European Centre for Archaeometry (CEA), which aims to study the documentary and material archives collected by Blockx since its founding in 1865. These archives contain numerous orders from artists, notably those of Théo Van Rysselberghe (1862-1926), a major figure in Belgian Neo-Impressionism. As part of the CEA's Face to Face project, a corpus of nine of the artist's paintings was studied using an analytical protocol consisting of imaging methods and non-invasive, complementary analysis techniques carried out in situ.

Fig. 1 Théophile Van Rysselberghe, *Portrait de Madame Charles Maus*, 1890, oil on canvas, 56 x 47 cm, MRBAB inv.6384.

Portrait de Madame Charles Maus (1890)

This study aims to accurately identify the use of Blockx paints. The *Portrait of Madame Charles Maus* (Fig.1), part of the collection of the Royal Museums of Fine Arts of Belgium (RMFAB), was selected as the subject of this research. It is one of the artist's earliest pointillist works [3]. Pointillism, typically executed with pure or minimally mixed colors and, in this case, without varnish.

Fig. 2 a Blockx color chart named "drop" (ca_1909), Emile Claus' boards : **b** (1912), **c** and **d** (1909)

Experimental

In order to collect information on the paints used in the pictorial layer of this portrait, the painting was studied using an analytical protocol composed of imaging methods (high-resolution photography, infrared reflectography, X-ray radiography and digital microscopy) and analysis techniques (X-ray fluorescence spectroscopy (MA-XRF), Raman spectroscopy (RS) and hyperspectral imaging (HSI)).

Comparison

The pigments identified through this process were then compared with those found in reference materials: a drop color chart (Fig. 2a) and three paint plates (Fig. 2b, c, d) realised by Émile Claus (1849–1924), a prominent Belgian painter and leading figure of Luminism. These reference materials were analyzed using the same protocol to ensure comparability. The plates include paint samples from Blockx and from Lefranc Bourgeois, a French paint manufacturer founded in 1720. The attribution of the paints used in the portrait to a specific manufacturer was primarily based on the hyperspectral imaging results.

Composite green

Green of the painting is a chromium-based green pigment. In 1890, six chromium-based greens were part of the Blockx oil paint range [1] . The green studied is not comparable to Marie-Collart Green because, unlike the latter, it does not contain manganese. Raman analysis reveals the presence of aureolin yellow (PY40) in the green of the composition. These green is similar to the composite green 2 from the Blockx range (Tab.1). This green, which is very characteristic of the manufacturer, consists of hydrated chrome green (PG18) and aureolin (PY40). However, composite greens 1 and 2 did not yet exist at the time the painting was created. The artist's orders from that period mention composite green. It is therefore likely that the composite green of 1890 corresponds to what became Composite Green 2 in 1909.

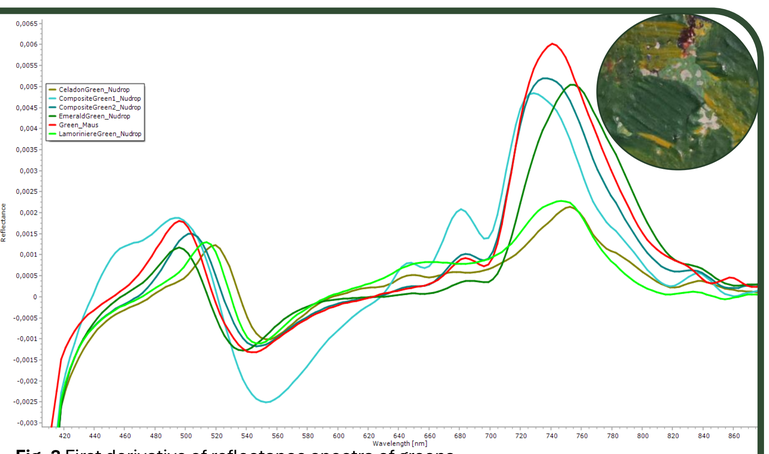
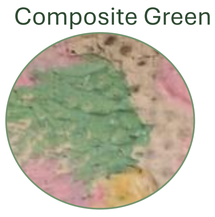


Fig. 3 First derivative of reflectance spectra of greens



Spectra Name		Description	Pearson	Cosine
CeladonGreen_Nudrop	Fig.2a	Celadon Green	78,19%	75,88%
CompositeGreen1_Nudrop	Fig.2a	Composite Green 1	87,95%	87,56%
CompositeGreen2_Nudrop	Fig.2a	Composite Green 2	91,98%	91,3%
EmeraldGreen_Nudrop	Fig.2a	Emerald Green	90,1%	89,31%
LamorinioreGreen_Nudrop	Fig.2a	Lamoriniere Green	83,2%	81,23%

Tab. 1 Pearson and Cosine similarity rates with the green spectrum of the composition, position of the main inflection point.

The light green of the composition cannot correspond to composite green 1, as the latter did not exist at the time the painting was created. It is possible that it is the same color as the dark green, lightened by the addition of white.

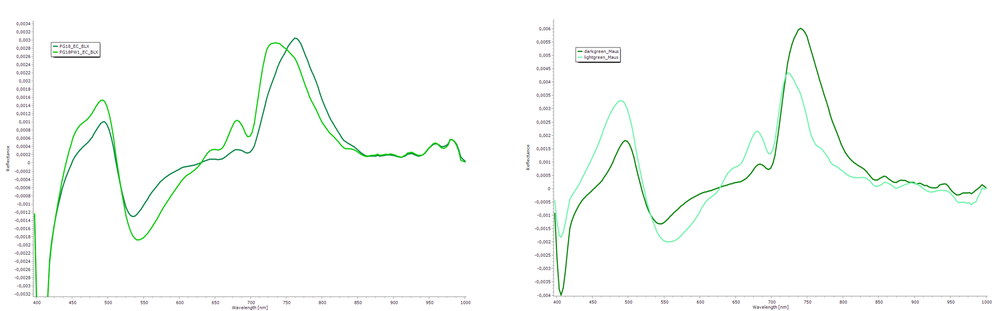


Fig. 4 First derivatives of reflectance spectra: (left) Blockx emerald green with and without white from the first panel of Emile Claus (Fig. 2c); (right) light and dark greens from the painting

Fig. 4 illustrates the effect of adding a white pigment to a green color on the first derivative of the reflectance spectra. On the left, the controlled example: Blockx emerald green alone, and mixed with white. On the right, the case of the light and dark greens from the painting. Our hypothesis of the addition of a white pigment is therefore tenable.

Pale pink madder lake

Spectra Name		Description	Pearson	Cosine	Main I.P.
PaleLake_Nudrop	Fig.2a	Pale pink madder lake	86,31%	87,05%	572,1nm
PaleLake_EC_BLX	Fig.2d	Pale pink madder lake	85,02%	85,26%	575,8nm
PaleLake_EC_LF	Fig.2d	Pale pink madder lake	80,39%	81,1%	571,7nm

Tab. 3 Pearson and Cosine similarity rates with the pink madder lake spectrum of the composition, position of the main inflection point.

The pink of the composition has a higher similarity whith Blockx pale pink madder lake (Tab.3). In addition, the reflectance spectrum of the composition has, between 425 and 550nm, the more pronounced curves characteristic of Bockx pale pink madder lake (Fig.6).

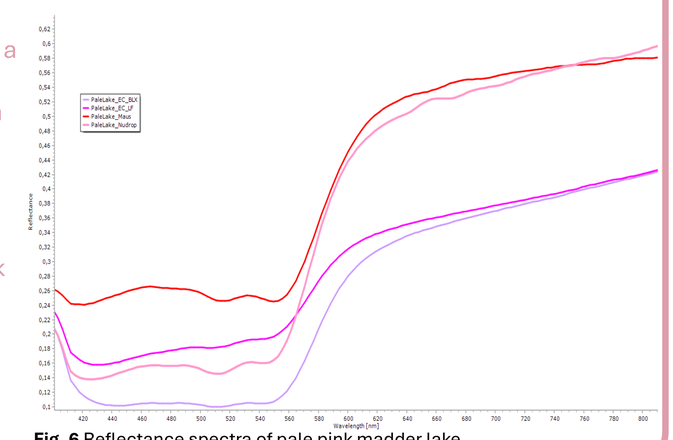


Fig. 6 Reflectance spectra of pale pink madder lake.

Cadmium orange

Spectra Name		Description	Pearson	Cosine	Main I.P.
PO20_Nudrop	Fig.2a	Cadmium Orange	97,73%	97,79%	556,2nm
PO20_EC_BLX	Fig.2d	Cadmium Orange	95,62%	95,7%	544,2nm
PO20_EC_LF	Fig.2d	Cadmium Orange	96,83%	96,9%	553,4nm

Tab. 4 Pearson and Cosine similarity rates with the cadmium orange spectrum of the composition and position of the main inflection point.

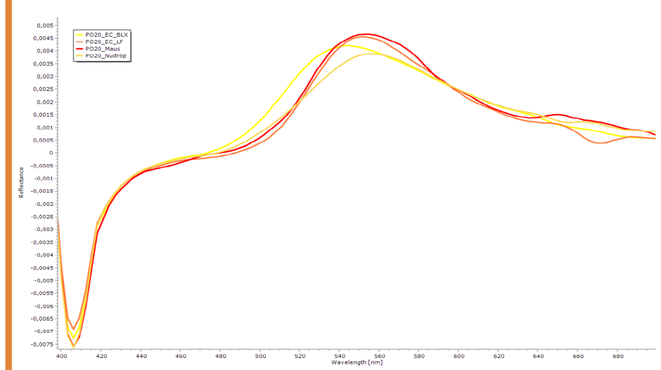


Fig. 7 Reflectance spectra of cadmium oranges.

All three similarity scores are high for this color (Tab.4). Although Cadmium Orange from the drop chart achieves the highest score, the position of the main inflection point in the composition's spectrum matches perfectly with that of Le Franc's color. These findings do not allow us to definitively identify the manufacturer of this color.

Nevertheless, according to Théo Van Rysselberghe's orders from Blockx, we know that he frequently ordered dark cadmium around the time this painting was created. The similarity rates between the composition orange and dark cadmium are 95.96% and 96.1%. Further studies of the Blockx material archives are still needed to assess whether the names of these colors changed over time and thus determine whether the dark cadmium of 1890 eventually became the cadmium orange of 1909.

Cobalt blue (PB28)

Spectra Name		Description	Pearson	Cosine	Main I.P.	Stat. Error
PB28_Nudrop	Fig.2a	Cobalt blue	92,37%	92,49%	681,5nm	$2,41^{E}$-04nm
PB28_EC_BLX	Fig.2c	Cobalt blue	88,85%	88,87%	680,8nm	$2,17^{E}$-04nm
PB28_EC_LF	Fig.2c	Dark cobalt blue	94,45%	94,23%	684,5nm	$8,13^{E}$-05nm

Tab. 2 Pearson and Cosine similarity rates with the cobalt blue spectrum of the composition, position of the main inflection point and statistical error for this position.

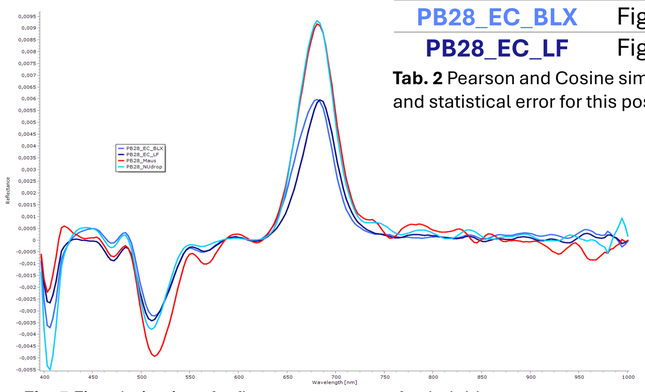
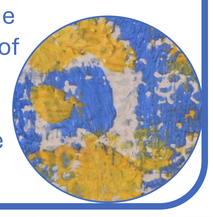


Fig. 5 First derivative of reflectance spectra of cobalt blues

In Tab.2, the color from Le Franc obtains the best similarity rate. However, the two blues from the Emile Claus plate are similar at 97,25% (Pearson) and 97,23% (Cosine). Indeed, these rates alone cannot determine one manufacturer. The position of the main inflection points of the Blockx colors are located around 681nm and for Le Franc at 684,5 nm. For the composition, it is located at 681,5 nm, this is the detail that tends to say that the blue is manufactured by Blockx.



Conclusion

At the end of this study, we were able to identify these colors from the manufacturer Blockx in the pictorial layer of the studied painting : cobalt blue, ultramarine blue, composite green, cadmium yellow light, dark pink madder lake and pale pink madder lake. The paint layer is also composed of cadmium orange, pale cadmium yellow and cobalt arsenate purple. These colors are presumed to be manufactured by Blockx, a hypothesis that remains to be confirmed by additional scientific analyses.

These results are consistent with the colour orders by Theophile Van Rysselberghe taken to Blockx between september 1888 and october 1890 : vermilion, permanent madder carmine, aureolin, transparent yellow, yellow ochre, light cadmium yellow, dark cadmium yellow, brown ochre, emerald green, composite green, cobalt blue, ultramarine blue, cobalt violet, pale rose madder lake, and deep rose madder lake. This correspondence reinforces the identification of the materials used by the artist and highlights the importance of the Blockx archives for the study of his paintings.

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