An 18th-century British Portrait's Technical Analysis

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Introduction

An 18th-century oil on canvas portrait received preliminary attribution by the National Gallery of Canada to the English painter John Vanderbank (d. 1739). A technical analysis of the portrait was undertaken and was compared with literature and technical reports discussing the artist's materials typical of works from this period. To substantiate the attribution, this information was compared to known Vanderbank works and other prominent artists from this period.

Experimental

1. Imaging: normal light, raking light, ultraviolet fluorescence (UVF), *Nikon D810;* infrared reflectography, *Apollo Infrared Reflectography Camera*; X-radiography.
2. Elemental analysis: X-ray Fluorescence (XRF), *Bruker M6 Jetstream scanning X-Ray Fluorescence spectrophotometer;* Reflectance FTIR (R-FTIR), *Nicolet iS5 FTIR spectrometer with iD7 diamond ATR accessory;* Scanning Electron Microscopy Energy Dispersive X-ray Spectroscopy (SEM-EDS), *Thermo Fisher Quanta 250 eSEM with EDAX Element EDS detector.*
3. Paint Structure: High resolution Digital Microscope, *Hirox Microscope;* UV Fluorescence Microscopy, *Olympus BX-51 Fluorescence Microscope*.

Fig. 1: *Untitled (Portrait of a Lady),* Oil on canvas, 18th-century.

Results & Discussion

Condition

The painting was in fine condition. It was unlined and on its original strainer, unique for an 18th-century painting. It has minor canvas deformations, cupping paint, and characteristic ageing cracks. It had minimal prior treatment, including a patch and overpaint in the face, sleeve, and near the bottom edge.

Fig. 2: *Detail of cracks on the sitter's neck, partially covered by overpaint. Visible is slight microcissing, the microscopic craters in paint stroke troughs, a trait found in 18th-century British portraits.*

Paint Structure

Samples were retrieved from discreet areas in the painting. Analysis of these cross-sections using normal light, UVF with wide band (WB), and narrow band violet (NV) excitation filter cubes was useful in visualizing the layer structure, artist's painting method, and identifying the multiple preparatory layers. Figure 5B shows four preparatory layers, while 5D shows two. Artists experimented with preparatory layers during this period and cross-sections permitted a comparison of this painting to changing techniques and preferences.

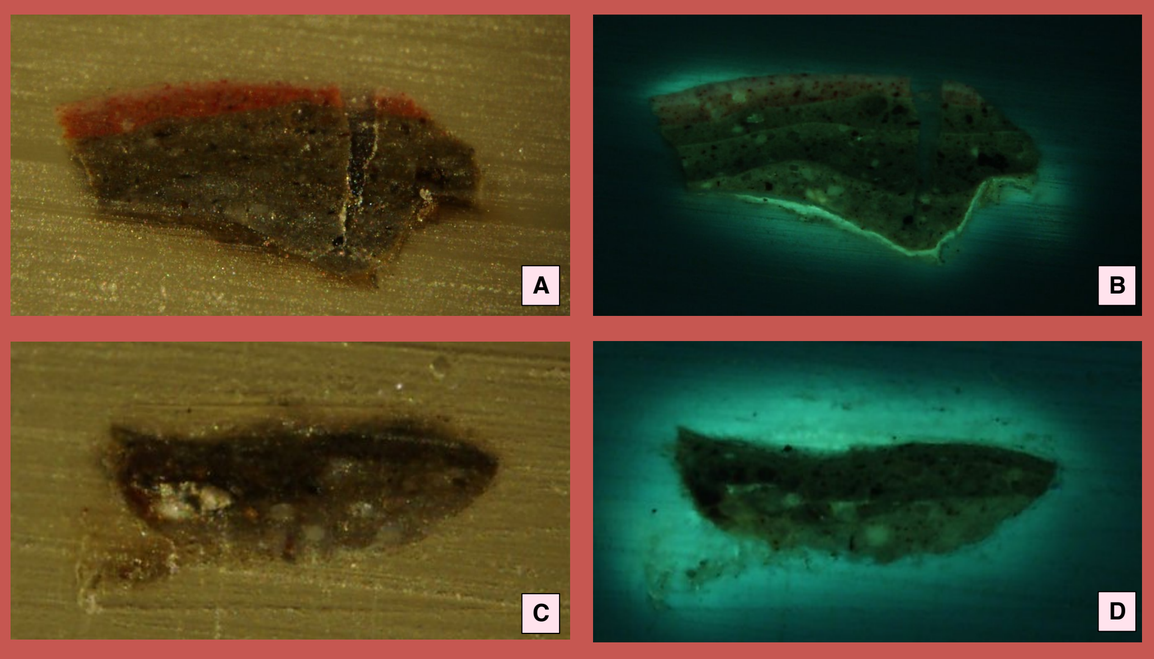

Fig. 5: (A) Cross-section from sitter's left sleeve. (B) Previous cross-section under UVF. The lowest red layer fluoresces and indicates the potential presence of a protein, such as an animal glue. (C) Cross-section from top right corner of background. (D) Previous cross-section under UVF. Note the thin red layer is missing here. All cross-section images were taken at 500µm.

Textile

Identified as linen (flax), based on morphology, notably the presence of nodes under polarized light microscopy and discernable 'S' twist **(Fig. 3)**. Image taken at 200 nm.

Pigment Identification

The artist consistently used a limited palette, evident through visual observation and elemental analysis. Results reflect common historic pigments favoured by artists. Significant amounts of lead were detected, likely from a priming layer and use of lead white in the palette. It was unclear what the original background colour was, if its tone were an optical effect or the result of ageing.

Fig. 6: XRF scan of the painting, showing high levels of lead across the painting. The unusual oval behind the sitter corresponds to the artist possibly adding a priming layer to enhance the palette used for the sitter.

Overpaint

Overpaint from a prior restoration campaign was skillfully integrated into the painting and remains difficult to detect, save for thin glazes near the mouth and on the sitter's neck.

Fig. 4: (A) UVF of the sitter's face. (B) XRF scan of face showing presence of titanium. (C) XRF scan of face showing iron (green) and mercury (red).

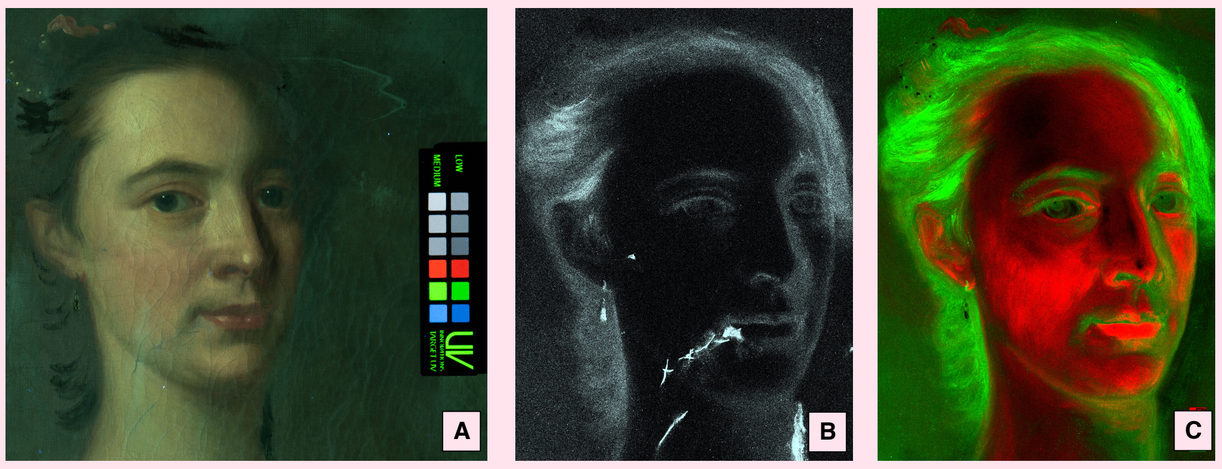

Table 1.: XRF Elemental Analysis Summary

Colour	Elements identified	Possible pigment(s)
Black	Ca	Bone black
Brown	Ca, Fe, Mn	Yellow or brown ochre, brown umber
Green: dress	Ca, Fe, K, Pb	Bone black, brown umber, lead white
Pink: dress	Fe, Hg, Pb	Vermillion, red iron oxide, lead white
Red	Fe, Hg	Vermillion, red iron oxide
White	Pb	Lead white
Overpaint	Fe, Mn, Ti, Zn	Brown umber, titanium white, zinc white

Conclusions

This portrait dates to the first half of the 18th century and is a remarkable example of an historic painting. The painting has likely not been removed from its original structure. The artist's method, pigments, and grounds are common to the period, indicating the artist had access to training and trade. Despite a lack of analytical data for other Vanderbank's, this painting is stylistically and technically comparable to artist's Vanderbank was known to have worked alongside. Further analysis of Vanderbank's are required to enhance this research.

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