

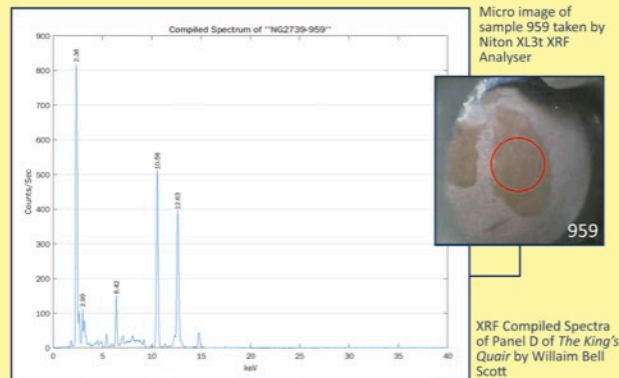
Pigment Identification of Barium-Chromate Yellow found in *The King's Quair* by William Bell Scott

Introduction:

In collaboration with the National Gallery of Scotland in Edinburgh, the focus of this project is to undergo technical examination on the four-leaf folding screen painting, *The King's Quair* (1867) by Scottish artist, William Bell Scott (1811-1890). This painting illustrates the scenes from a fifteenth-century poem in Early Scots, *The King's Quair* ("The King's Book"), which is attributed to James I of Scotland and narrates his eighteen-year period of imprisonment in Windsor Castle and his love for Joan Beaufort. X-Ray fluorescence (XRF) analysis is taken to examine the inorganic elements found in the painting to identify the pigments Scott used to further understand his technique and use in materials.

X-Ray Fluorescence:

X-Ray Fluorescence (XRF) is a non-destructive analytical technique that provides elemental composition and a general sense of the atomic percentages present in a material. When the XRF analyser emits X-ray radiation onto a sample, the energy balance of the atoms gets altered, where electrons are ejected from the inner orbital shells. Electrons from the different outer orbital shells then fill the vacant position and the XRF analyser captures this movement. Each element has its own unique x-ray signature thus a sample can provide qualitative and quantitative compositional information from the x-ray the sample emits.



XRF Analysis Results:

In sample 959, XRF analysis showed peaks of barium and chromium that correlate with each other, indicating a possibility of barium-chromate yellow pigment being used. Small peaks of cobalt were also found, a possibility of cobalt blue was mixed with yellow to create the green colour. High peaks of iron and lead were also found in this sample. The iron being a possibility of either red or yellow ochre, likely used to paint the background sky. Peaks of lead has been seen present in all the samples. This spectrum in particular showed high amounts of lead, a possibility that lead white is applied to the ground layer, as well as to the green colour mixture to make it more lighter.



Portable XRF Analyser used for the examination of panel D of *The King's Quair* by William Bell Scott. 22.Feb.2022

Process:

Portable Niton XL3t XRF Analyser was used for this examination. A total of 23 selected areas were taken; 20 sections from the fourth screen panel D (NG2739-D), and 3 sections from the third screen panel C (NG2739-C) in areas with gilded gold-leaf. XRF analysis detects quantities of elements found in the samples to which help identify the pigments that were used.



Scott, William Bell. Third and Fourth Panel of *The Kings Quair* Screen Painting. 1867. National Gallery of Scotland

Barium-Chromate Yellow:

also known as Lemon Yellow was first described the use of the pigment in 1809, however it was not yet introduced commercially nor mentioned again until after 1860. The name lemon yellow was used for several different yellow chromes and some confusion arose to its identity early in the century. In 1835, George Field stated that he made two pigments from platina; one called platina yellow and another called lemon yellow, a lighter version of the prior. However, in 1869, T.W Salter declared lemon yellow consisted of barium chromate instead of platina.

Conclusion:

Through the XRF analysis, distinct quantities of certain elements found in the examined samples determine the use of the following pigments: red ochre, yellow ochre, lead white, vermillion, barium-chromate yellow and cobalt blue. The analysis of the gilded areas of screen panel C used gold leaf with an addition of copper found in the sample. Results of XRF alone are not conclusive and complete characterization of these pigment composition require further analysis using other technical examinations to further support the confirmation of these findings.

Bibliography:

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