

# Elemental composition of pigments in *Christ Teacheth Humility* by Robert Scott Lauder

National Galleries of Scotland in Edinburgh: Lesley Stevenson ACR, Senior Paintings Conservator. Dr Patricia Allerston, Chief Curator and Deputy Director of the Scottish National Gallery, and University of Glasgow School of Culture and Creative Arts. Technical Art History Department. Dr Caroline Rae MA (Hons), PGDipCons, PhD.

This project was carried out in collaboration with the National Galleries of Scotland in Edinburgh. The focus is the technical examination of one of the first paintings purchased for the national collection in 1848, *Christ Teacheth Humility* by Robert Scott Lauder. Lauder (1803-1869) studied art in Edinburgh and London, and from 1833 to 1838 lived in Rome. His preference for an intense, clean-coloured palette reveals his love for Venetian painting. Identifying inorganic elements with X-ray fluorescence analysis (XRF) will help understand the nature of the pigments he used.

## 1 X-RAY FLUORESCENCE

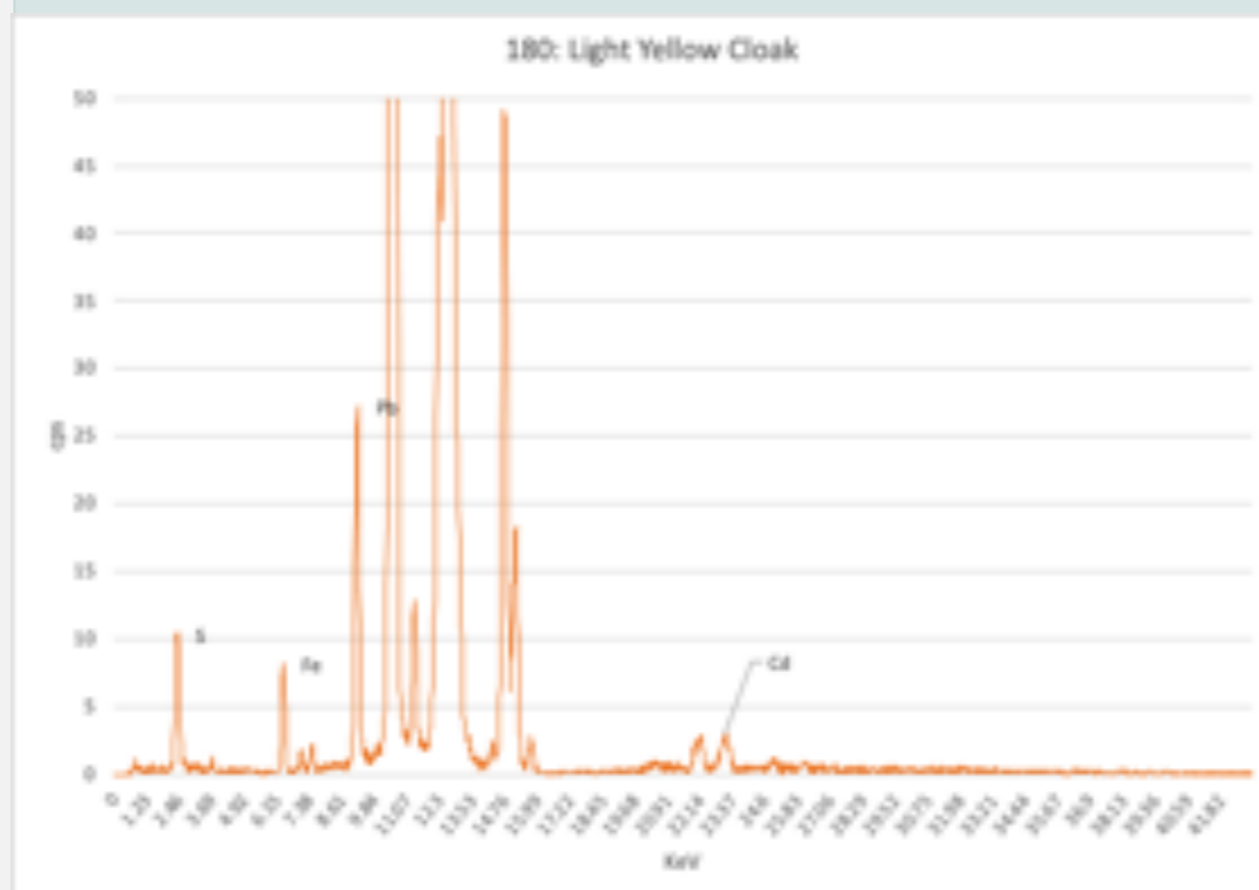
An XRF analyser emits X-ray radiation that alters the energy balance in the atom; subsequently, electrons change position in the shells and release radiation. A detector collects and processes the data.

### SPECTRA

Graphic spectra correlate X-ray energy lines, measured in kilo-electronvolts (keV), and intensity, measured in counts per second (cps). Peaks with higher intensity in a specific energy line indicate the potential presence of an element.

## 2 XRF ANALYSIS RESULTS

Analysis of a **yellow** and a **brown** sample show informative results.



Spectrum. Niton Data Transfer.

## 3 MATERIALS

The support consists of a stretcher and a large linen fabric (H: 238 cm x W: 352 cm) with an off-white ground layer. On the back of the canvas there is a seal from London supplier Thomas Brown. Thin translucent oil paint layers alternate with occasional use of impasto.

*CHRIST TEACHETH HUMILITY* was one of Lauder's most ambitious projects. Presented to the competition for the Houses of Parliament in 1848, it did not win but brought him public recognition.

Friedrich Stromeyer discovered cadmium in 1817. Soon cadmium compounds were commercially available as pigments. The supplier Reeves sold cadmium sulphide as 'radiant yellow.'

Presence of manganese and iron in sample 182 suggests the use of umber, a very antique pigment of natural origin.

CdS

Fe  
Mn

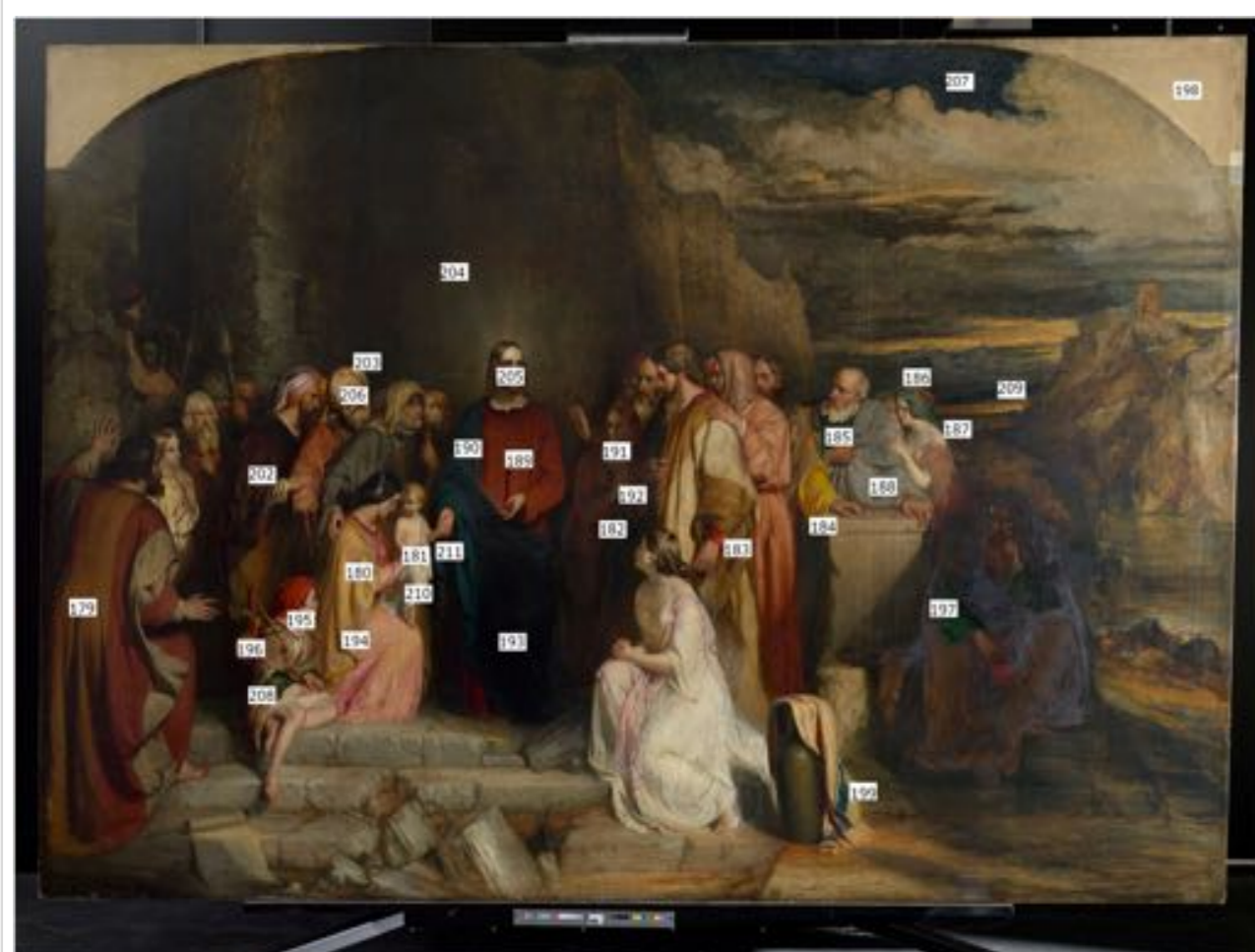
### INTERPRETATION

XRF analysis detects quantities of iron and cadmium in sample 180. Sample 182 shows strong iron peaks and manganese. Lead is present in all samples in varying intensities. It is probably related to some pigments, and also to the ground layers.

## CONCLUSION

Tiziano and the Venetians inspired Robert Scott Lauder's pictorial technique, but his palette proves that he took full advantage of the repertoire of pigments accessible at the time. XRF analysis hints at the probable use of art-historical pigments like vermilion and umber, combined with new colour compounds like chrome and cadmium yellow and green.

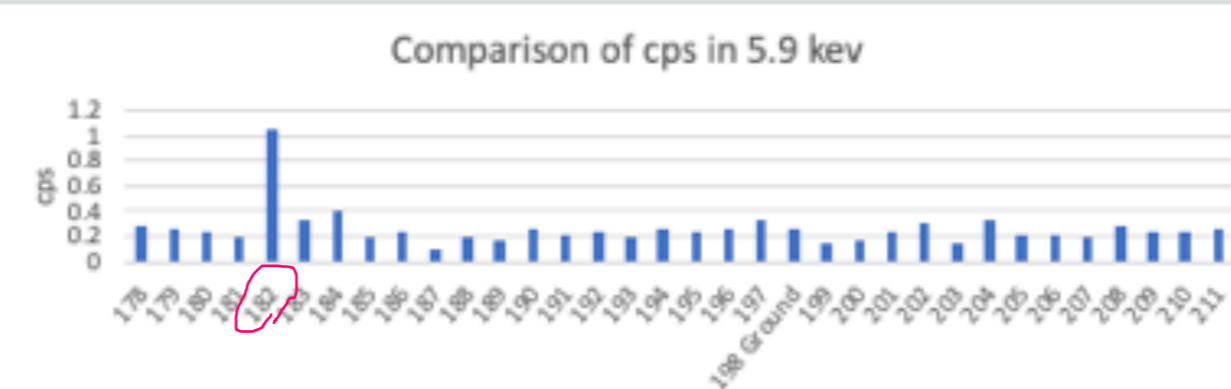
Results of XRF are not conclusive. Complete characterisation of mineral pigments requires further analysis with SEM/EDX, and identification of organic dyes needs the use of separation techniques like GC-MS.



Mapping of the 32 selected sampling areas representing a variety of colours and ground layers.

### EQUIPMENT

The hand-held portable Niton XL3t XRF analyser enables on-site operation.



XRF results for samples show the intensity of manganese  $K_{\alpha}$  peaks in 182 when compared to other spectra.

### METHODOLOGY

Identification of an element is based on the condition that there are at least two lines per element with a deviation of  $\pm 0.05$  keV and ratio of energy levels 1:5 for K lines and 1:1 for L lines.