

Material Analysis of the Panel Depicting St Peter

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ILL. 167 (top left)
St Peter on the left
shutter of the Garden
with Daniel in the
Lions' Den

ILL. 168
Macro X-ray fluo-
rescence scanning
with imaging for
iron (Fe-K α), copper
(Cu-K α), mercury
(Hg-L α) calcium
(Ca-K α), and lead
(Pb-L α) – Garden
with Daniel in the
Lions' Den

The *Enclosed Garden with Daniel in the Lions' Den* (G4) is closed by two small oak shutters, with the inner side of the left shutter depicting St Peter, who is standing on a stone floor against a monochrome background (Ill. 167).¹ The saint is barefoot and is dressed in a wide, dark green cloak over a pale blue undergarment. In his right hand he is holding a key; in his left we see an open book. Over the course of time, this panel has undergone restoration work and has been partially overpainted to camouflage lacunae.

To gain more insight into the panel's original condition and its restoration history, it was analysed prior to conservation using macro X-ray fluorescence (MA-XRF) scanning. This analysis technique was developed quite recently and is not only capable of identifying the chemical elements on and beneath the surface of paintings, documents and so forth, but is also capable of visualising through high-resolution imagery the distribution of those chemical elements across the surface under analysis.²

The images display in black and white the respective distribution of iron, copper, mercury, calcium and lead, where black corresponds to the absence of the element concerned (Ill. 168). This element mapping

makes it possible to identify the pictorial layer. The reddish-brown background against which Peter has been depicted was painted on a chalk preparation using earth pigments and vermilion. Earth pigments were also used to render the shadow on the ground. The saint's apparel lights up in the images showing copper and lead distribution. The presence of copper may point in this case to the use of azurite (for the pale blue undergarment) and a copper-green pigment (for the cloak). The XRF analysis is unable to draw a distinction between the copper-acetate pigment verdigris and the copper-carbonate pigment malachite. White lead was applied for the paler tones of the undergarment and the highlights in the folds of the cloak.

These splendid colours and the finely detailed folds in the clothing, which we can see in the two XRF images, had been wholly invisible to the naked eye prior to conservation treatment.

Element mapping as a result of XRF analysis also illustrates the painting's condition. Dark green overpainting and darkened varnish covered the whole cloak, leaving the meticulously painted folds scarcely visible prior to conservation, if at all. As indicated above, the black 'spots' on the cloak in the images of copper and lead distribution point to lacunae in the layer of paint. This careless overpainting employed synthetic organic pigments, which would indicate a recent intervention (in the nineteenth or twentieth century). This non-destructive analysis has helped researchers and curator-restorers clarify the storage and conservation history of the left panel of the *Enclosed Garden of Daniel in the Lions' Den*.

1 The oak shutters that close the *Enclosed Garden with Daniel in the Lions' Den* (G4) present St Peter on the left side and St Paul on the right. For a general description, please refer to p. 34 in this publication. The dimensions of the panel showing St Peter is 41.8 × 24.6 cm within the open shutter.

2 Research was performed at the laboratories of the Royal Institute for Cultural Heritage (KIK-IRPA). The analysis was conducted using an M6 Jetstream instrument (Bruker) equipped with a rhodium source (600 μ A and 50kV) and has the following measurement capabilities: a 500 μ m spot size, 400 μ m distance between the measurement points and 10 ms per pixel.







III. 169

(pages 258–259)

Detail of bunches of grapes that have faded as a result of light exposure – Garden with St Anne

III. 170

Bunches of grapes, faded owing to light exposure

III. 171

Details of degraded silk – Garden with St Anne



The Colourful Past of the Textiles in the Gardens

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It is thanks to light that we are able to admire works of art in all their glory. However, light is simultaneously one of the most significant factors in causing damage to such works. Light is a form of radiation. A distinction is made between rays visible to the human eye (visible light) and rays of ultraviolet (UV) and infrared (IR) light. Visible light is all we need to be able to see an object. The energy from ultraviolet radiation is higher than that from visible light and as a result is even more damaging. Infrared radiation is chiefly responsible for heating up an object. Heritage items are given as much protection as possible against UV and IR radiation.

A great number of light-sensitive materials were incorporated within the Enclosed Gardens. The most delicate material was that of the textiles used to create the floral and vegetative elements, which lend the Gardens their distinctive appearance.

Thanks to the complete dismantling of the *Enclosed Garden with the Hunt of the Unicorn (G1)*, it was possible to analyse both the front and reverse sides of its small textile fragments. The reverse displays bright colours, which are evidence of the original chromatic splendour of the Enclosed Gardens. Conversely, the front displays significant fading owing to centuries of exposure to the light (Ill. 169, 170 and 171).

During laboratory research, colour measurements were taken of the front and reverse of several bunches of grapes and vine leaves. In addition, dye analysis was performed on a number of the fibres. The blue dye has been identified as the botanical substance indigo or woad (blue). The green colour is a combination of dyer's greenweed (yellow) and indigo or woad. The colour measurement and dye identification results were pooled to determine the colour loss and historic dose of light to which the Gardens had been exposed. This information was used to simulate future colour loss under a variety of lighting scenarios.

Radiation is also responsible for degrading the actual textiles. Silk is the most light-sensitive of all natural fibres. Degraded silk is brittle and weak, appearing yellowish in colour. There is clear evidence of silk's fragility in the Mechelen Enclosed Gardens (Ill. 172).

To keep future colour loss and further light damage to a minimum, the Enclosed Gardens are exhibited at the Museum Hof van Busleyden at a low illuminance of 50 lux, without UV radiation: a compromise between good visibility on the one hand and preventing further damage from light on the other. By completely dimming the lights around the Enclosed Gardens and giving our eyes time to adjust, we can still admire the Gardens even under such low levels of illuminance.

Ill. 172

Light degradation of the textile dyed in woad – Garden with the Hunt of the Unicorn

