4. Panel : 'Goddess Nike adjusting her Sandal'

Cast before conservation

Cast after conservation

4.1 DESCRIPTION OF THE OBJECT

TITLE: Goddess Nike Adjusting her Sandal; copy of Classical Greek marble relief c. 420 BC from the balustrade of the temple of Athena Nike on the Acropolis, Athens.
NUMBER(S): 104, N92 (143)
TYPE OF OBJECT: Relief, plaster cast with a metal structure inside.
MAKER: Possibly Vincent Butler
SIGNATURE/INSCRIPTION: None
DATE: Unknown
OWNER/LOCATION: Edinburgh College of Art, Lauriston Place, Edinburgh, EH3 9DF.
DIMENSIONS/WEIGHT (APPROX): H: 960mm W: 2550mm D: 170mm
Weight (approx):

4.2 BRIEF CONDITION REPORT BEFORE CONSERVATION

STRUCTURAL STABILITY: Good, but crack in between panels by dexter edge.

SURFACE DUST AND DIRT: Severe, 100% coverage.

VISIBLE PAINT LAYERS/UNSIGHTLY MARKINGS: Layer of cream-yellow paint on surface of the cast; small spots of paint splash on surface of the panel; white paint smears by the lower edge of the cast and on sinister edge.

CHIPS AND LOSS: Areas of loss associated with cracks; chip in middle part of the panel by top edge.

ABRASIONS: Not significant

Cracks
Chips, abrasions, missing surfaces
Paint splashes

Ferrous fixings

PREVIOUS REPAIRS: following close examination of the cast some inconsistencies occurred regarding the age of the cast. It was previously thought that this cast was a part of the 'Elgin Gift' and was made around 1827. However, the plaster of this cast, and the metal fixings at the rear, appear to be modern materials. Furthermore, there is detail on the top sinister side of the cast which doesn't exist on the original relief, nor on the copy from the Royal Academy in London.

Detail on side of 'Goddess Nike adjusting her Sandal'.

The tests of the paint layers from the cast (described in detail in next paragraph) shows the use of the modern materials; the pink paint in the sample contains titanium white, kaolin and red ochre. Titanium white was not manufactured until 1916 and was not used in artist's paints until 1921; the grey white layer contains alkyds.

This observation, as well as results of the laboratory tests, prove that cast of 'Goddess Nike Adjusting her Sandal' is a modern cast made possibly by Vincent Butler between 1980-2000.

4.3 ORIGINAL MATERIALS AND TECHNIQUES

The object is a plaster cast with a metal reinforcing structure inside. The surface of the sculpture is cream-yellow. In order to find out the stratigraphy, and to identify the materials of the polychromed layer, samples of the plaster with paint were taken from the cast and sent to the University of Northumbria for analysis.

Investigation of coating samples from ECA Plaster Cast Collection, Edinburgh. Consultant: Brian W Singer.

Panel with 'Goddess Nike adjusting her sandal' – Cross-section

Area of paint sample tested in October 2009

Area of paint sample tested in January 2010

Photograph of the cross-section sample from panel with 'Goddess Nike adjusting her sandal' – sample tested in October 2009

Sample of the cross-section has at the top, as photographed, a black dirt, or blackened lead white layer followed by a grey white layer. Beneath this are a thick white layer and then another greyish layer. The thick white layer showed a pale orange-yellow fluorescence under UV light and this layer was also therefore investigated for shellac.

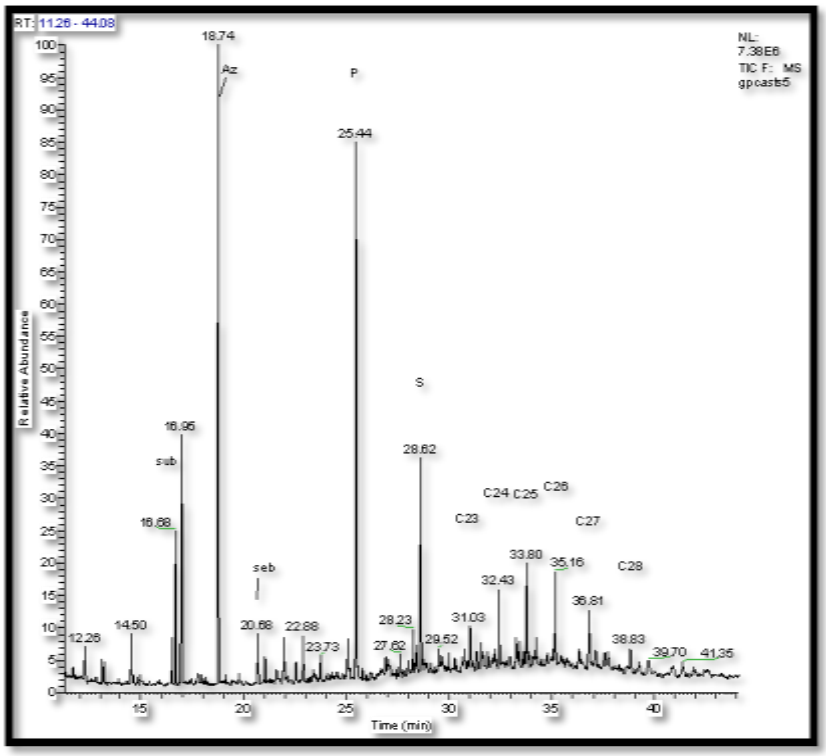
GC-MS Analysis

An aliquot of sample 5 was treated with trifluoromethylphenyl trimethyl ammonium hydroxide (5% in methanol) and the mixture separated by GC-MS the chromatogram (Figure 8) which showed a strong peak for the methyl ester of nonandoic acid (azelic acid) with an azelate to palmitate ratio of 1.05 indicating a drying oil[1]. The ratio of palmitic acid (hexadecanoic acid) to stearic acid (octadecanoic acid) (as their methyl esters) is 2.5, which is just above the range for linseed oil and within the range for walnut oil[1]. The azelate to suberate ratio is 4.2 and the azelate to sebacate ratio is 11.1 which together indicate that the oil has been heat bodied[2]. There is also a fairly strong peak at 16.95 minutes which was recognised by its mass spectrum (Figure 9) as dimethyl phthalate which can be an indication of o-phthalate alkyds. Hence one of the paint layers in this sample may contain an o-phthalate drying alkyd, which may have skewed the palmitate to stearate ratio in the mixture, since some of the oils used to prepare alkyds, eg. soya oil and cotton seed oil, contain fairly high palmitate to stearate ratios.

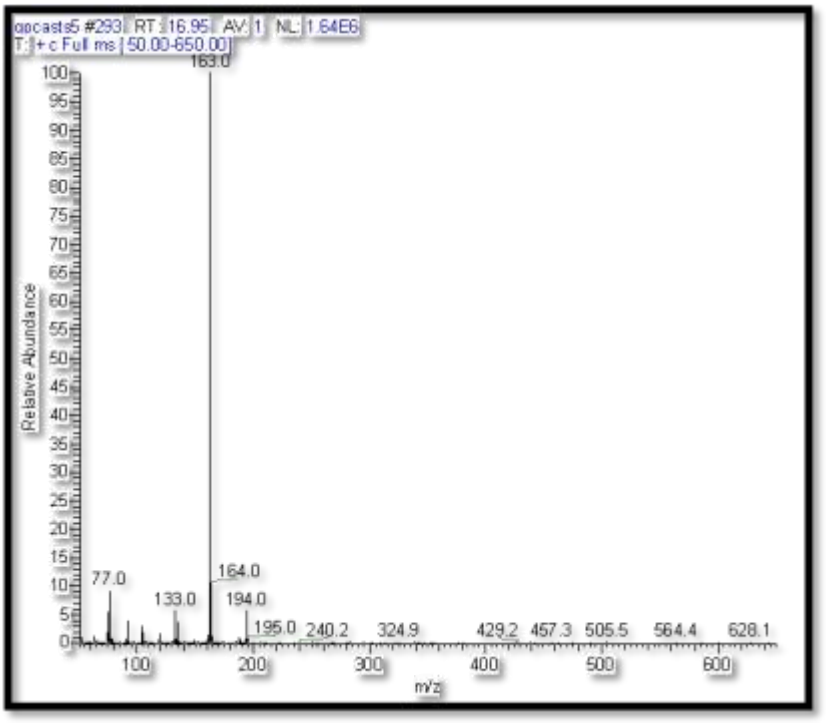
Also present are a series of peaks of alkanes (saturated hydrocarbons) peaking at hexacosane and with odd and even carbon numbers being present in equal importance. This is due to the presence of paraffin wax[4]. The coating therefore contains a raw (non-heat bodied) linseed oil and paraffin wax. The paraffin wax is probably in a different layer to the linseed oil, and maybe due to a wax polish on top of the coating or the burning of paraffin wax candles at some time.

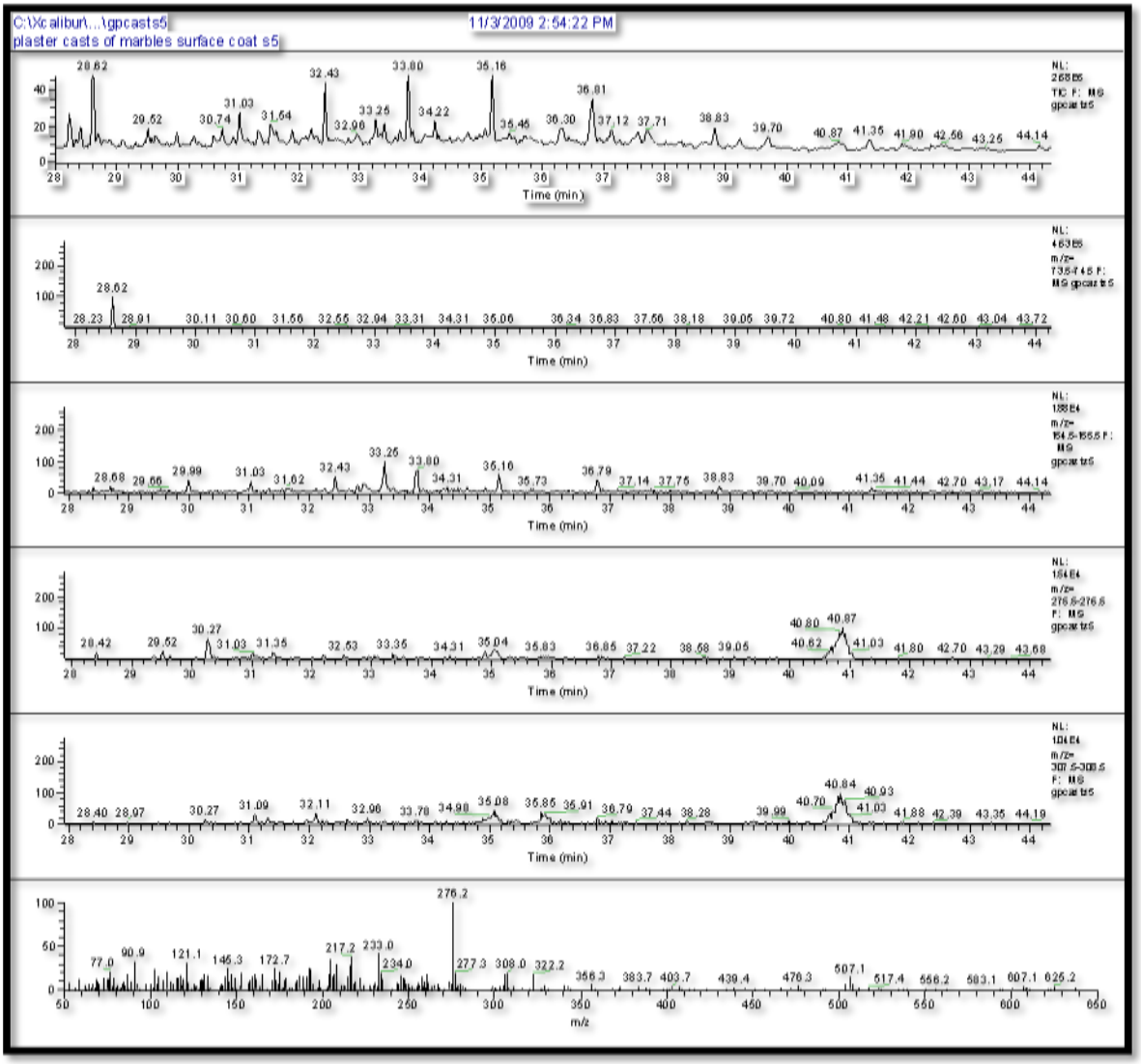
It was also possible to find indicative components for shellac by displaying single ion chromatographs (Figure 10). Sample 5 yielded a peak at 30.27 and a small peak at 31.35 minutes with a mass 276 ion (Figure 10) and also peaks at similar retention times with a mass 308 ion (Figure 10). There are also abundant peaks with a 155 ion count in sample 5 (Figure 10) at similar retention times to our reference sample of shellac. The mass spectrum of the peak at 30.27 minutes (Figure 10 bottom) is identical to that of the main component in our reference sample of shellac.

Thus sample 5 contains shellac, as well as paint layers containing heat bodied walnut oil or linseed oil in one layer and also a drying alkyd in another.



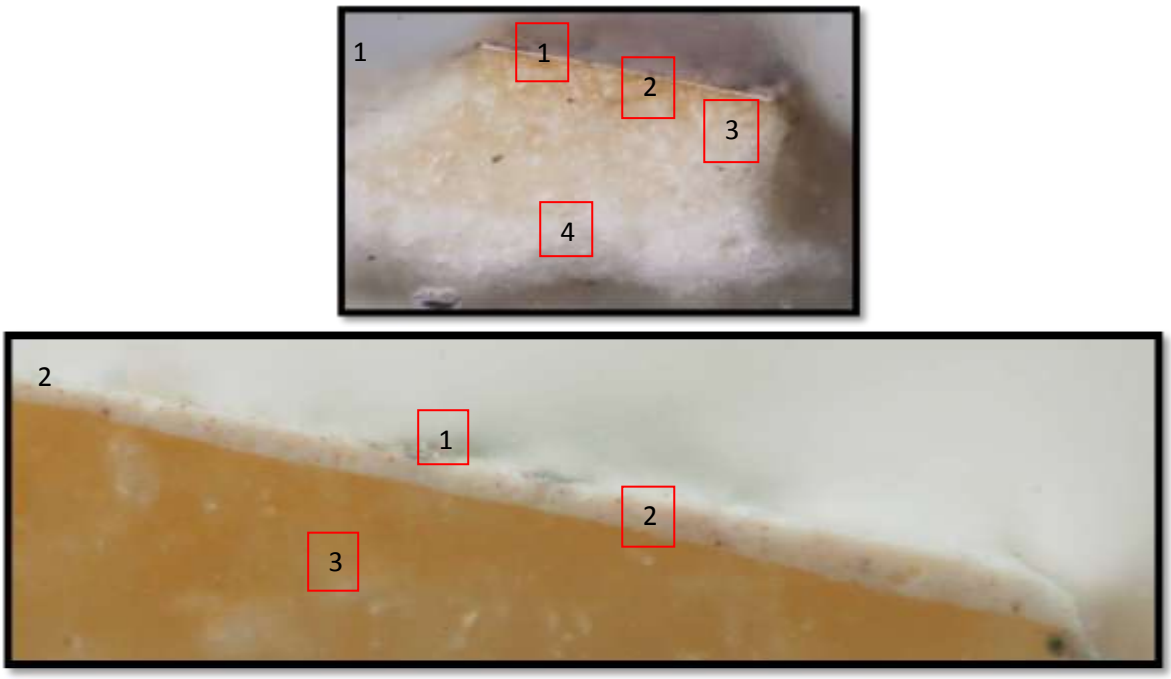
Oil / resin analysis: Seb= dimethyl sebacate, Az = dimethyl azelate, Sub = dimethyl suberate, P = methyl palmitate, S = methyl stearate, C23 = tricosane, C24 = tetracosane, C25 = pentacosane, C26 = hexacosane, C27 = heptacosane, C28 = octacosane.



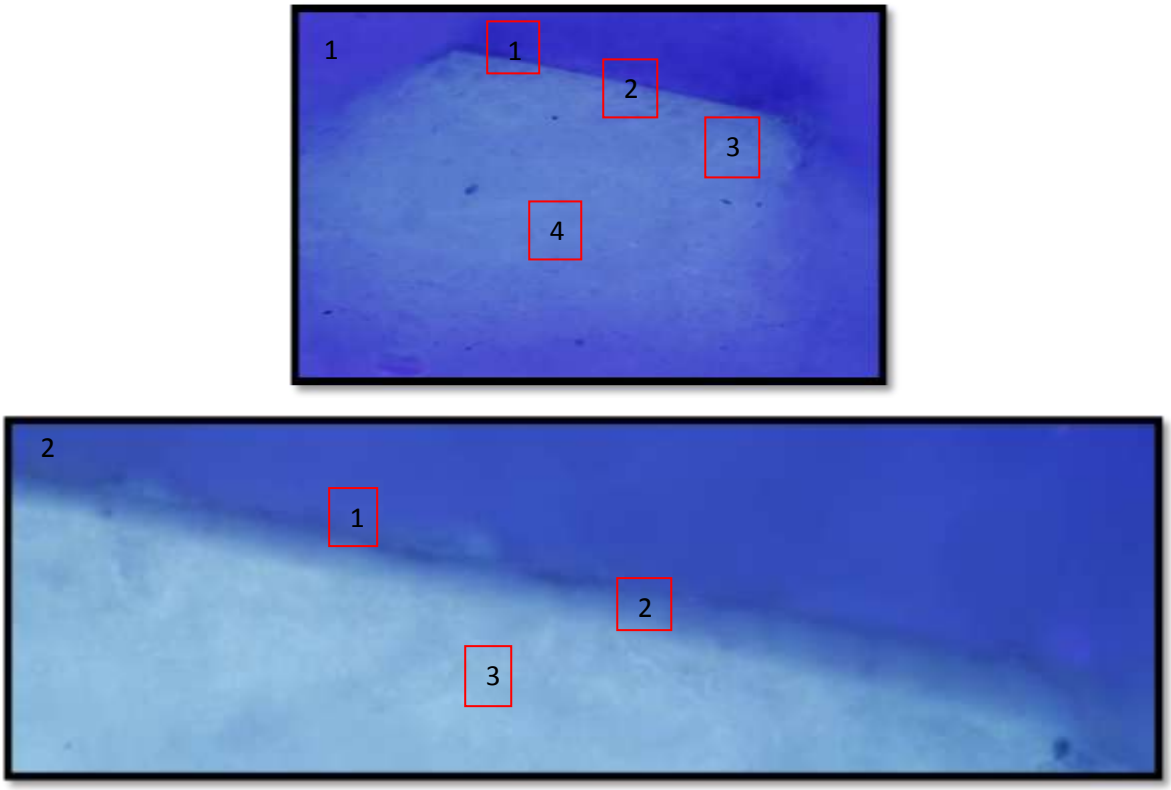


Mass spectrum of peak at 16.95 minutes, identified as dimethyl phthalate.

Total ion Chromatogram (TIC) (top) and single ion chromatographs from sample 5, and mass spectrum of the peak at 30.27 minutes, a recognisable component of shellac.

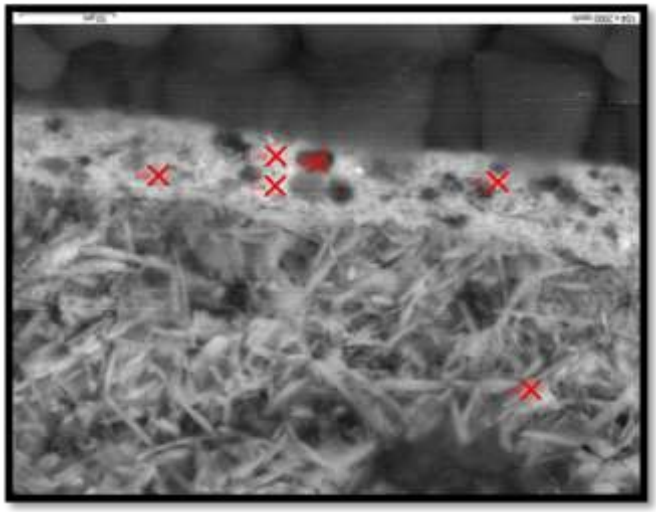


Photograph of the cross-section sample from panel with 'Goddess Nike adjusting her sandal' – sample tested in January 2010. Photograph 2 is approximately 6 times magnification of photograph 1.

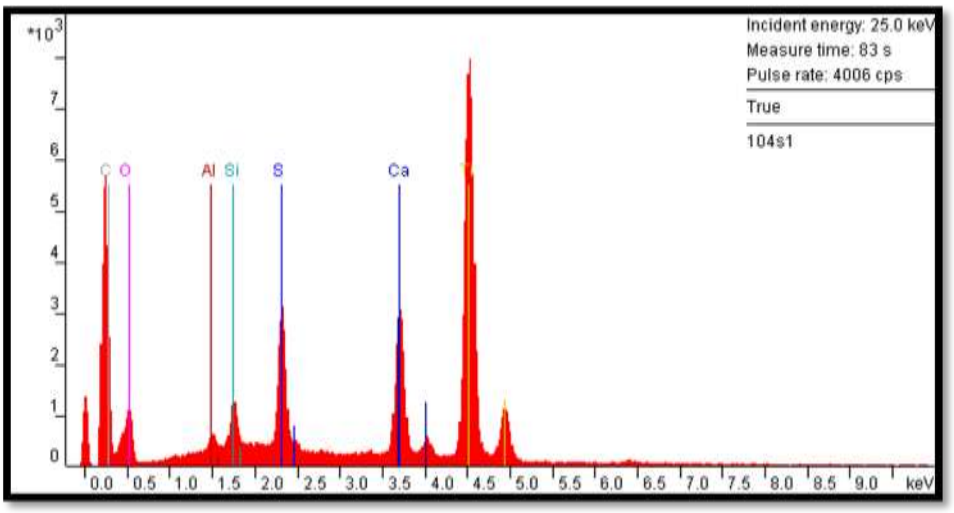


Photograph of the cross-section sample from panel with 'Goddess Nike adjusting her sandal' – in UV light - sample tested in January 2010. Photograph 2 is approximately 6 times magnification of photograph 1.

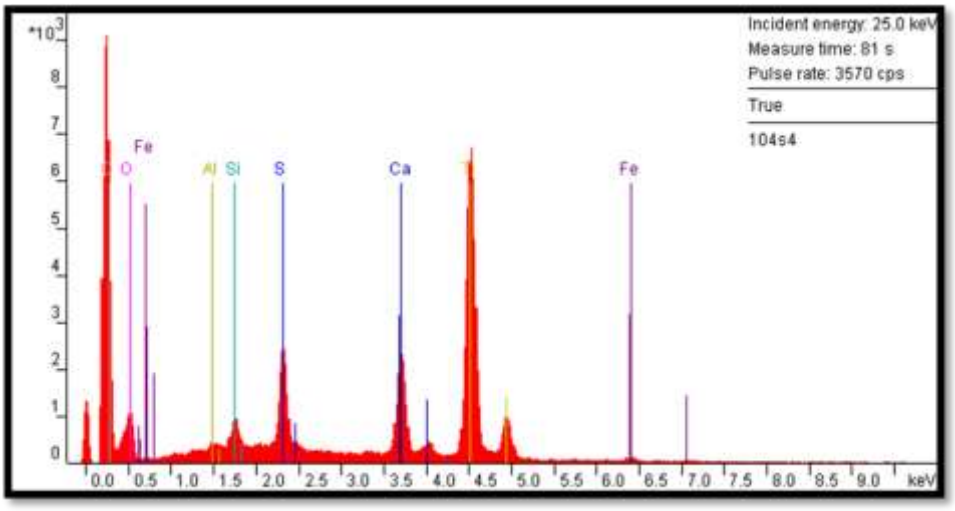
The cross-section of sample from panel with 'Goddess Nike Adjusting Her Sandal' showed at the top, as photographed, a very thin pale grey layer, which may be just dirt on a thin pink/white layer. A thin orange brown layer, possibly of resin or oil/resin, separates this from a white plaster layer into which the orange material has permeated. This layer fluoresced pale orange in UV light and it was suspected that shellac may be present, as investigated in a previous report for a sample from the same object[4].
At higher magnification small red and yellow pigment particles can be seen within the thin layer of 'pink' paint, which mainly contains a white pigment. The low fluorescence of this pigment indicates perhaps titanium white.
Polarised light microscopy showed: opaque white particles which may be titanium white and isotropic coarse red particles which may be red ochre.
The paint layer was examined under the electron microscope where one layer of paint was seen on a plaster which contained needle like crystals, typical of gypsum Energy Dispersive X-ray (EDX) analysis at spot 1 showed the presence of titanium (Spectrum 1) which indicates that the main white pigment is titanium white. Some calcium and sulphur is present, probably from the plaster and some aluminium and silicon are also present perhaps indicating a kaolin extender to the paint. Investigation at a darker looking spot at spot 2 gave a similar spectrum, except that more carbon was present indicating that this is probably just a binder rich spot. Analysis of particles which appeared bright (spots 3, 4 and 5) all gave similar spectra to spot 1 except that each contained a little iron (spectrum 2) which probably confirms the finding of red ochre by polarised light microscopy. Analysis of the plaster at spot 6 (spectrum 3) showed the presence of calcium and sulphur, thus confirming that the plaster is a gypsum plaster. Thus the pink paint on sample ECA 104 contains titanium white, kaolin and red ochre. Titanium white was not manufactured until 1916 and was not used in artists' paints until 1921. This paint must date from 1916 or later and hence was not the original paint to the object which is dated to 1827.



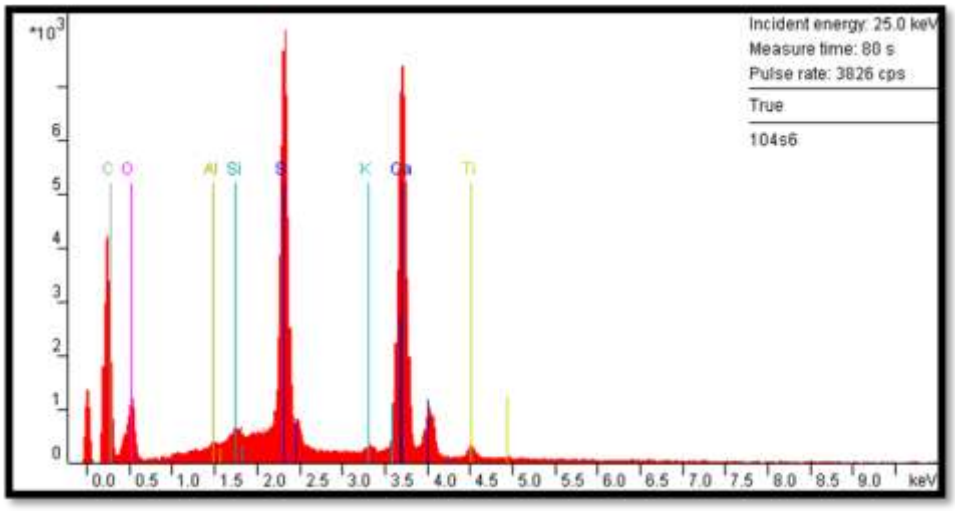
Electron micrograph of sample from panel with 'Goddess Nike Adjusting Her Sandal' showing spots analysed. The picture has been inverted so that the paint layer appears on top of the plaster.



Spectrum 1 spot 1



Spectrum 2 spot 4



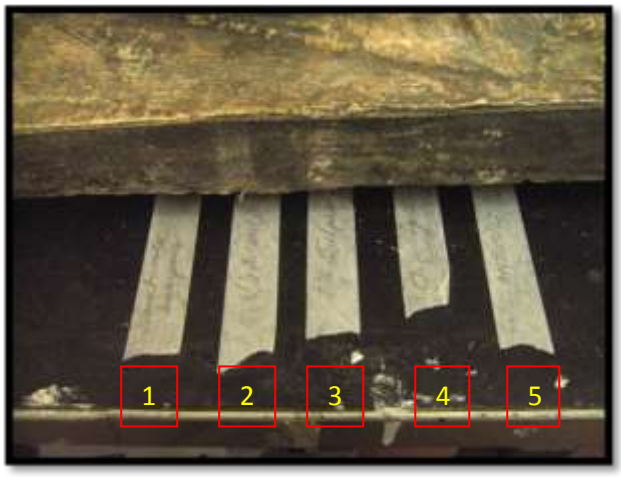
Spectrum 3 spot 6

4.4 TREATMENT REPORT

- Prior to any conservation treatment, the cast was photographed. This photographic documentation was continued throughout all conservation processes.

- Initially, the cast was dry cleaned with soft brushes and Wishab Sponges with a rubber-nozzled vacuum to pick up the loose dust and dirt.

- Following a variety of wet cleaning spot tests, the surface of the panel was cleaned with V&A mix, using cotton wool swabs and with aid of the scalpel.



Cleaning tests with: 1- natural enzymes, 2- V&A mix, 3 – 5% Vulpex in de-ionised water, 4 – white spirit, 5 - Anjusil

Cast during wet cleaning

- All areas of raw plaster were given an application of 10% Paraloid B72 in acetone to provide an isolating layer between the original plaster and the repairs.

- To stabilise the structure of the cast at the lower dexter corner, a layer of muslin saturated with 20% Paraloid B72 in acetone was applied to the plaster. On top of this a layer of fibre glass with polyester resin was applied.

Cast during reinforcing of the structure.

- Areas of loss, open joints and cracks were filled with white micro-balloons mixed with 12% Paraloid B72 in acetone. Larger areas of loss were filled with an inert filler to provide extra strength.

Details of fill repairs

- The entire surface of the cast was repainted with acrylic paints. To isolate the original surface, the cast was, prior to any painting, given an application of 12 % Paraloid B72 in acetone.

Cast during requested patination: 1 – before, 2 – during, 3 – after.

- Finally, the entire cast was given an application of micro-crystalline wax so as to protect the surface. Before application wax was mixed with pigments: black and raw umber.

4.5 MAINTENANCE PROGRAMME

CLEANING

The cleaning programme would involve the trained operatives, wearing the appropriate PPE, (nitrile gloves must be worn to protect the plaster as well as the operative) removing the loose dust using soft brushes and a vacuum cleaner with a rubber nozzle that would have muslin attached to its end. The muslin prevents any potential damage to the plaster from being lost in the vacuum cleaner. Any fragments that are dislodged, and their locations on the cast, should be documented and wrapped carefully in acid free tissue prior to being stored in a safe location. A trained conservator should be contacted immediately in order to repair the damage.

NB At no time should cleaning products or any liquid (including water) be used.