peter martindale conservation

St Michael the Archangel, Mere
Diocese of Salisbury

Preliminary inspection of medieval wall painting in trefoil niche, nave, south wall

St Michael the Archangel, Mere

Contents

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- Kate Symonds: Historian of St Michael's, Mere
- Dan Crooke: Secretary, Salisbury DAC.
- Dr Janet Berry: Head of Conservation, The Church Buildings Council, London.

Acknowledgements

I thank the Parish of St Michael, Mere, for commissioning these practical measures from me. In particular from the Parish, I thank Kate Symonds for her considerable interest and financial support. My thanks are also due to Sherry Jenkins, Jane Hurd (Licenced Lay Minister) and Mike Durkee. I thank Church Care, with support from the Pilgrim Trust, for providing Grant Aid toward the cost of conservation. Finally, I thank Dr Tracey Chaplin for carrying out the paint analysis.

Peter Martindale – 9 October 2023

1. Brief

This report describes the conservation of the medieval painted plaster on the back of the niche to a shine on the south wall of the nave of St Michael, Mere.

2. Introduction

From the Historic England listing, the parish church of St Michael is Grade 1 listed. There are some remnants of fabric from c.1190, the Chancel is C 13, the north and south chantries are C 14, with the aisles rebuilt in the late C 14, and the remainder is C 15. The likely date for the shrine, situated on the south wall of the south aisle is, therefore late C 14.

The poor condition of the painted plaster in the back of the lower niche of the shrine had been known about for some time. The author first inspected it in July 2018. The reason for the deterioration was due to a faulty rainwater downpipe corresponding to the position of the shrine which had been repaired. Photos 1 & 2.

In the spring of 2022, as a result of some unfortunate further damage by a young boy with learning difficulties, a second inspection was made. Photos 3 & 4. The results of that inspection were documented in an illustrated report dated 13 April 2022. That report put forward proposals for the conservation of the painted plaster, and suggested that a paint sample be taken for analysis. Subsequent to the submission of the report, practical measures to conserve the painted plaster were commissioned in two phases, the first in July 2022 and the second in September 2023.

3. Practical conservation measures

Practical measures were carried out in two phases by Peter Martindale,

July 2022

In order to both prevent loss in the shorter term, and allow for the detached painted plaster to be reattached a tissue facing comprising L2 tissue adhered with Tylose[1] water soluble adhesive was applied to the detached painted plaster.

Before that tissue facing could be applied some preliminary consolidation was needed. Instances of paint flaking were secured using a 10% solution of Plextol B500. On the following day a 5% solution of Paraloid B72 was applied to the friable surface of the painted plaster using a soft brush. Time was given for the acetone to evaporated before the tissue facing was applied.

September 2023

The detached painted plaster in the back of the lower niche was secured using a lime grout[2]. The lime grout was administered via syringe following minimal pre-wetting using a mixture of ethanol and water (again via syringe). The detached plaster was gradually eased back into position using gentle pressure, working from areas of least detachment to greatest. Once

[1] Tylose MH 300 is methyl-hydroxyethyl-cellulose. It is a white powder which is dissolved in cold water for use as an adhesive for temporary facings.
[2] PLM-A injection grout. PLM-A is a mixture of neutral lime and selected inert additives and is free from soluble salts.

detached passages were eased back into position, they were held in that position overnight using spring loaded presses[3] whilst the grout set. Photos 5 & 6.

Although detachment was greatest in the centre of the niche, less severely detached plaster extended from the base to the to the top of the trefoiled niche.

Once detached painted plaster had been reattached, the tissue facing was removed with the aid of warm water and a small sponge. As much residual Tylose was removed as possible.

There were numerous cracks in the detached plaster. These were filled with a fine lime mortar. This both supported the painted plaster and improved its appearance.

Previous repair plaster was removed and replaced with lime plaster comprising a base coat and skim coat. The ratio of lime to sand was 3 : 1. Photos 7 & 8.

4. Paint analysis

A small piece of painted plaster, which had fallen from the niche, was sent to Dr Tracey Chaplin for paint analysis in the summer of 2022. For future reference, her paint analysis report is presented in the appendix of this report.

The paint over the underlying plaster is pale yellow-brown, and comprises primarily gypsum and a small amount of yellow-brown ochre. Over this a thin red-orange paint layer containing gypsum and red ochre was then added in isolated areas.

A dark red paint layer was subsequently applied, composed principally of red ochre, with calcium carbonate, although some gypsum and barium sulphate also present. The presence of barium may indicate that it dates from the early C 19. A translucent white layer was later added thinly over the surface containing gypsum

5. Conclusion

This painted shrine is of particular significance because original paint remains not only in the niche, but also on the adjacent carved stonework. Medieval paint both on carved detail and adjacent plaster is not that common, so what remains here is valuable.

To date no clear evidence of figurative painting has been found in the niche, nor is there clear evidence of decorative painting (like stencilled motifs) within the niche. This may mean that the niche is indeed plainly painted, so as to act as a backdrop to a carving (for example a carved and polychromed figure).

6. Long term conservation

It is important to maintain the good condition of the rainwater goods corresponding to the location of the shrine to prevent deterioration in the future.

Parishioners are encouraged to keep an eye on the condition of the shrine, in particular the lower niche. If they have any concerns, they should contact the architect to the church in the first instance.

[3] I thank Mike Durkee for making the wood bracing to use with the spring loaded presses.

The architect is encouraged to comment on the condition of the shrine in future Quinquennial Inspections.

The condition of the painted plaster in the niche should be inspected by a trained and competent wall paintings conservator in ten years, autumn 2033.

1 - Above - The shrine in 2018.

2 - Above - Exterior fabric 2022 with repaired downpipe.

3 - Below - The detached plaster 2022.

4 - Below - Detail from 3 showing the detached painted.

5 - Above - Securing detached plaster, 2023.

6 - Above - Base coat plaster on RHS as well as further securing detached plaster.

7 - Below - The niche following conservation and plaster repair, 2023.

8 - Below - Overall view of the shrine after conservation.

TECHNICAL REPORT: 171.04

Subject: Analysis of a fragment of painted plaster from a trefoiled niche
Location: *St Michael and All Angels* (Mere, Wiltshire)
Client: Peter Martindale Conservation
Date: September 2022

1. INTRODUCTION

A fragment of painted plaster from a trefoiled niche in the church of *St Michael and All Angels* (Mere, Wiltshire) has been provided for analysis in order to establish the layer structure of the decoration and the pigments used therein (Figure 1). The following report provides a summary of the findings, with details of the techniques used to analyse the sample described in Appendix I.

a) 

b) 

Figure 1. Digital images of **a)** the trefoiled niche in *St Michael and All Angels* (Mere, Wiltshire), and **b)** the small painted plaster fragment provided from the niche (courtesy of Peter Martindale Conservation).

2. RESULTS

The layer structure of the painted plaster fragment consists of a series of thin white calcium carbonate[1] (lime) plaster layers added initially to the coarser plaster base. A pale yellow-brown paint layer was then applied which consists primarily of *gypsum*[2] and a small amount of *yellow-brown ochre*[3],

1 Calcium carbonate ($CaCO_3$) forms the basis of a number of natural and synthetic compounds used for pigments, grounds and plasters, notably the rock varieties chalk, limestone and marble, and direct biogenic precipitates (shells & corals) as well as synthetically produced material such as that prepared historically from lime or by chemical precipitation reactions (Gettens, R.J., FitzHugh, E.W. & Feller, R.L. 'Calcium Carbonate Whites' in *Artists' Pigments. A Handbook of their History and Characteristics* 2 (ed: A. Roy) Oxford University Press (1993) 203-226).

2 Gypsum is a form of hydrated calcium sulphate ($CaSO_4.2H_2O$) widely used for grounds, gessos and plasters as well as a bulking agent in fillers and paints; it may also form as a degradation product on calcium carbonate-rich surfaces (Stols-Witlox, M., Ormsby, B. & Gottsegen, M. "Grounds, 1400-1900" in *Conservation of Easel Painting* (eds: J. Hill Stoner & R. Rushfield) Routledge (2012) p161-188; Ashurst, J. & Dimes, F.G. *Conservation of Building and Decorative Stone* Routledge (2011) pp255).

3 Ochres are natural composite materials derived from the weathering of iron-rich rocks and have been extensively used for painting since Palaeolithic times. The principal colourant of yellow ochre is the iron oxide mineral goethite (FeOOH) with the main colourant of red and brown ochres being the red iron oxide haematite (α-Fe_2O_3); in each case these are typically present with quartz, clay, feldspar and calcite grains; other colouring iron oxide minerals may also be present. (Eastaugh, N., Walsh, V., Chaplin, T.D. & Siddall, R. *The Pigment Compendium – A Dictionary of Historical Pigments* Elsevier Science (2004) p279-280).

forming the background to the decoration; a red-orange paint containing *gypsum* and *red ochre* was then added in selected areas possibly providing a patterned effect or outline. A dark red paint layer was subsequently applied which contains *red ochre*, *barium sulphate, gypsum* and *calcium carbonate*, with a thin white surface wash containing *gypsum* later added (Figure 2). Whilst barium sulphate may occur as a minor phase in *ochres*[4] and superficial degradation (salt) deposits[5], it is more commonly encountered in an artistic context as synthetic white pigment from the early 19^{th} century onwards[6]; the quantity present in the darker red paint layer suggests that it has been included as the latter material.

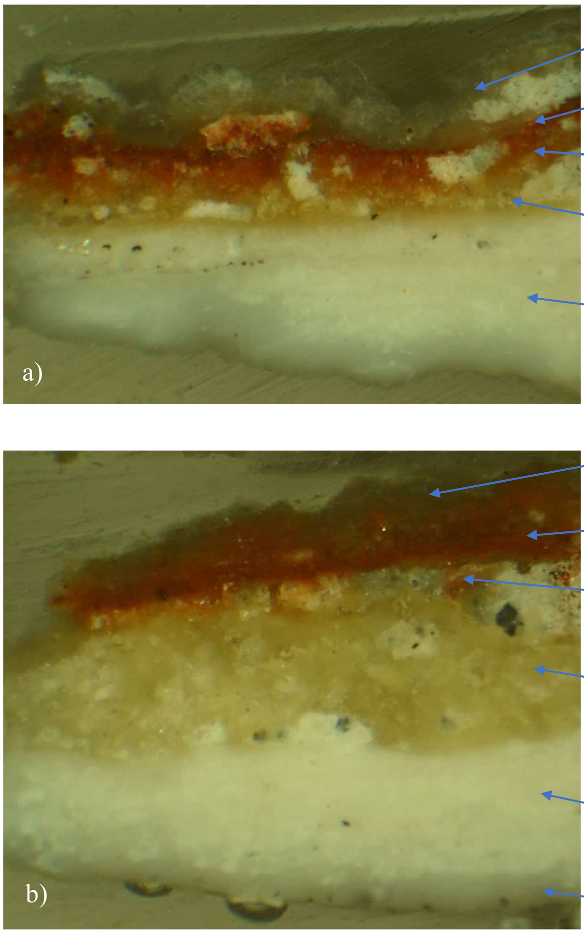

Figure 2. Two cross-sections obtained from the painted plaster fragment showing the decorative structure with layers indicated (shown in reflected white light at x100 magnification).

4 Popelka-Filcoff, R.S., Robertson, J.D., Glascock, M.D. & Descantes, C. "Trace element characterization of ochre from geological sources" *Journal of Radioanalytical and Nuclear Chemistry* 272 (2007) 17-27; Dayet, L. "Invasive and non-invasive analyses of ochre and iron-based pigment raw materials: a methodological perspective" *Minerals* 11 (2021) 210-247; Duval, A.R. "Les préparations colorées des tableaux de L'Ecole Français des dix-septième et dix-huitième siècles" *Studies in Conservation* 37 (1992) 239-258.

5 Pérez-Rodriguez, J.L., del Carmen Jimenez de Haro, M. & Maqueda, C. "Isolation and characterisation of barium sulphate and titanium oxides in monument crusts" *Analytica Chimica Acta* 524 (2004) 373-377; Cortea, I., Ghervase, L. & Dumbrăvicean, M. "Combined spectroscopic analysis for identification of mural paintings materials" *2015 International Conference on Systems, Signals and Image Processing (IWSSIP)* (2015) p329-332; Rösch & Schwarz (1993) *op. cit.*

6 Barium sulphate ($BaSO_4$), also known as *barium white* or *blanc fixe*, has been used as a synthetic white pigment since the early 19^{th} century (c.1810-1820) as well as an extender, filler, lake base and component phase in various co-precipitated pigments such as *Lithopone* (Feller, R.L 'Barium Sulfate – Natural and Synthetic' in *Artists' Pigments. A Handbook of their History and Characteristics* 1 (ed: R.L. Feller) Cambridge University Press (1986) 47-64).

The black paint visible on the sample fragment appears to have been applied as a primary layer over the white plaster in some areas, with the edges of the pale yellow-brown paint observed to overlap this opaque paint (see Figure 1b). It is not clear whether the gypsum component identified in each decorative layer is original plaster material used in the fresco painting technique or whether it has developed from the degradation of a lime plaster more typically used for freso layers.[7,8]

3. CONCLUSIONS

The painted plaster fragment from the trefoiled niche in the church of *St Michael and All Angels* consists of a series of thin, white calcium carbonate (lime) plaster layers added to the coarser plaster substrate, over which a pale yellow-brown paint layer comprising primarily gypsum and a small amount of yellow-brown ochre was applied; a thin red-orange paint layer containing gypsum and red ochre was then added in isolated areas. A dark red paint layer was subsequently applied which is composed principally of red ochre, with calcium carbonate, gypsum and barium sulphate also present; a translucent white layer was later added thinly over the surface containing gypsum. The barium sulphate identified in the darker red paint layer may occur as a natural component in the red ochre used or as part of a later salt deposit; however, its quantity may indicate that it is a pigment added to the red paint which would indicate that the dark red layer was applied after the early 19th century (when this synthetic pigment was first introduced).

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7 Thompson, D.V. *The Materials and Techniques of Medieval Painting* Dover Publications (2012) pp256; Merrifield, M.P. *The Art of Fresco Painting in the Middle Ages and the Renaissance* Dover Publications (2012) pp192.
8 Rösch, H. & Schwarz, H-J. “Damage to frescoes caused by sulphate-bearing salts: where does the sulphur come from?” *Studies in Conservation* 38 (1993) 224-230.

4. APPENDIX I

4.1 Cross-sectional analysis

Cross-sectional analysis allows the layer structure of any item or object to be examined. In the current study, the samples were embedded in Polylite clear polyester setting resin and upon hardening of the resin, the samples were ground and polished using abrasive papers (180 to 12,000 grade MicroMesh) to reveal the layer structure. The samples were examined under reflected white light and ultraviolet (UV) on Brunel Instruments SP300-XP and SP330F microscopes which provided magnifications of up to 1000x. The examination in UV light showed no autofluorescence from the samples and hence images of them under such illumination are not shown in the report.

4.2 Scanning electron microscopy with energy dispersive X-ray (SEM-EDX) analysis

To establish the elemental content of selected layers, a Zeiss EVO 25 scanning electron microscope coupled with an Oxford Instruments x-max 80 energy-dispersive spectrometer was used; the accelerating voltage was set at 20 kV and the working distance at 8.5 mm. The sample was carbon coated using a Leica EM ACE200 carbon thread evaporation coater to aid analysis and several areas on the surface were analysed by this technique; the elemental content determined at each site was recorded and the resultant peaks in the spectra were compared with those of reference standards using Aztec software (Oxford Instruments Ltd). The spectra obtained are shown in Figures A1-A2.

a)

b)

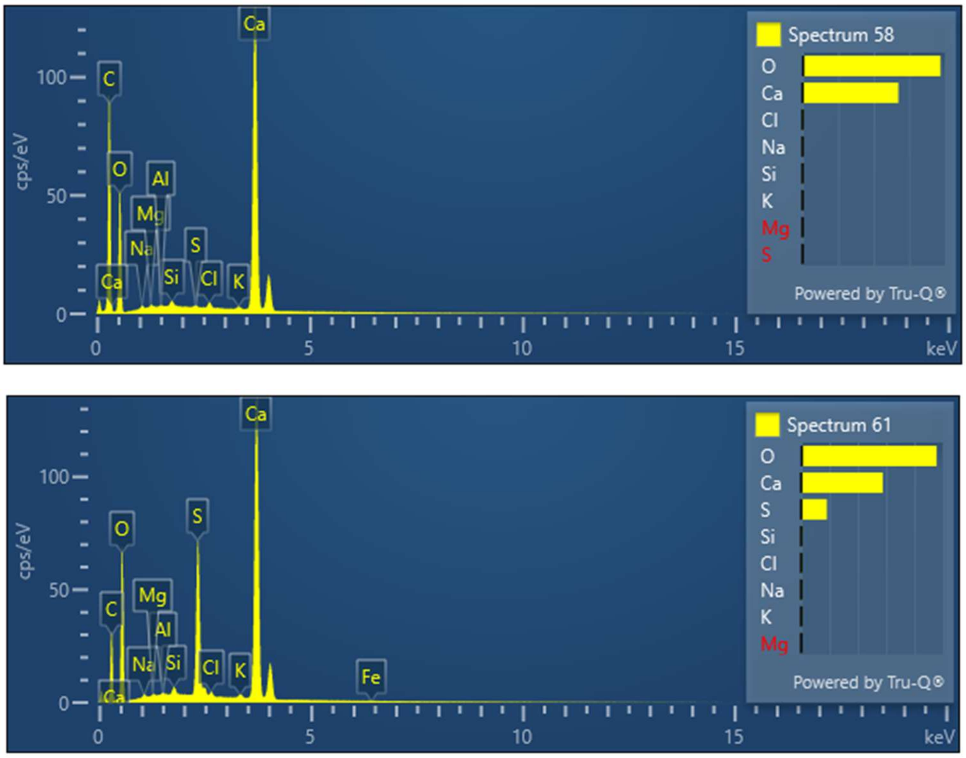
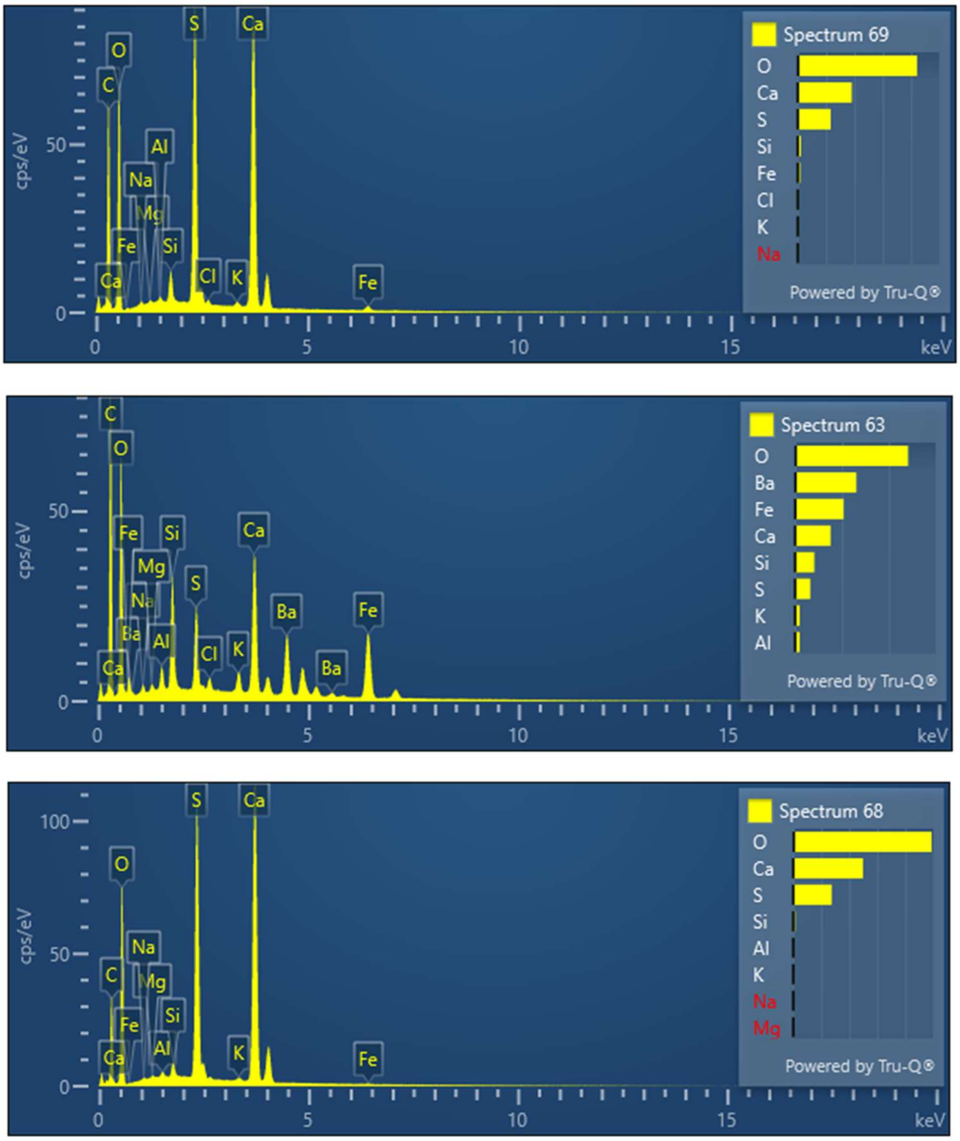


Figure A1. EDX spectra obtained for selected layers in the sample from the painted plaster fragment, showing the spectrum for **a)** the white plaster base layers (*Spectrum 58*), dominated by peaks for calcium (Ca) most likely associated with calcium carbonate ($CaCO_3$)/carbonated lime plaster; the weak peaks for sodium (Na), magnesium (Mg), aluminium (Al), silicon (Si), sulphur (S), chlorine (Cl) and potassium (K) may be attributable to natural impurities or silicate minerals added to the plaster; **b)** the off-white/pale brown layer (*Spectrum 61*), with strong peaks for calcium (Ca) and sulphur (S) most likely associated with *gypsum* ($CaSO_4.2H_2O$), with the calcium also possibly associated with calcium carbonate ($CaCO_3$); the weak peaks for sodium (Na), magnesium (Mg), aluminium (Al), silicon (Si), chlorine (Cl), potassium (K) and iron (Fe) may be attributable to the mineral content of an *ochre* as well as to other soluble salts and impurities.



a)

b)

c)

Figure A2. Further EDX spectra obtained for selected layers in the sample from the painted plaster fragment, showing the spectrum for **a)** the lower red layer (*Spectrum 69*), with strong peaks for calcium (Ca) and sulphur (S) most likely associated with *gypsum* ($CaSO_4.2H_2O$), with the peak for calcium also possibly attributable to calcium carbonate ($CaCO_3$); the peaks for sodium (Na), magnesium (Mg), aluminium (Al), silicon (Si), chlorine (Cl), potassium (K) and iron (Fe) are likely to be associated with the mineral content of *red ochre* as well as other soluble salts; **b)** the darker red paint layer (*Spectrum 63*), with strong peaks for silicon (Si), aluminium (Al) and iron (Fe), and weaker peaks for sodium (Na), magnesium (Mg), chlorine (Cl) and potassium associated with *red ochre*; the peaks for calcium (Ca) may be attributable to calcium carbonate ($CaCO_3$)/lime plaster or in conjunction with the peak for sulphur (S), to *gypsum* ($CaSO_4.2H_2O$); the peaks for barium (Ba) and sulphur (S) are likely to be due to the presence of barium sulphate/*barium white* ($BaSO_4$); and **c)** the surface off-white layer (*Spectrum 68*), with strong peaks for calcium (Ca) and sulphur (S) most likely associated with *gypsum* ($CaSO_4.2H_2O$), with the peak for calcium also possibly associated with calcium carbonate ($CaCO_3$); the weak peaks for sodium (Na), magnesium (Mg), aluminium (Al), silicon (Si), potassium (K) and iron (Fe) may be attributable to the mineral content of an *ochre* and/or to the typical silicate/oxide particles found in accumulated dirt layers.

4.3 Microchemical testing

Microchemical testing for the presence of protein was carried out using an acid fuchsin solution (1% dye in ethanol). One drop of the solution was applied to the surface of the cross-section for 30s-60s and then removed using a swab and deionised water; areas of the sample which contain protein are stained red-pink due to take up of the red-pink dye. The paint layers did not test positive for protein;

the white plaster layers absorbed the stain but this appears to be due to their porosity rather than due to an inherent proteinaceous medium.

4.4 Polarised light microscopy (PLM)

In this technique, individual samples are dispersed on a glass slide in a mounting medium of known refractive index (RI) which allows comparison with other known materials dispersed in the same medium. Here Cargille Meltmount with an RI of 1.66 was used as the medium. A dispersion was made from the white material present on the plaster fragment provided to establish the likelihood of it being a proteinaceous gesso layer containing natural calcium carbonate/chalk. The dispersion was examined using a Brunel Instruments SP300-XP microscope with magnifications of up to x1000. The optical properties of the materials were examined and compared with those of known materials previously examined by the author and colleagues.[9] The sample showed an absence of coccoliths (the fossilised remains of phytoplankton which characterise chalk) and the presence of fine-grained interlocking calcium carbonate particles more characteristic of lime plaster.

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9 Eastaugh, N., Walsh, V., Chaplin, T.D. & Siddall, R. *The Pigment Compendium – Optical Microscopy of Historical Pigments* Elsevier Science (2004).