

# JANE DAVIES CONSERVATION

## Architectural Paint Research

### PETERBOROUGH CATHEDRAL, NAVE CEILING

INVESTIGATION OF PAINTING MATERIALS AND TECHNIQUES, CONSERVATION PHASE 5



March 2004

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## **SUMMARY**

The nave ceiling at Peterborough is a rare survival of a thirteenth century timber ceiling *in situ* in England. It retains original thirteenth century paint although heavily restored in the 1740s and again in 1836. The ceiling is currently being conserved and recorded by the Perry Lithgow Partnership. As part of the conservation programme a thorough technical examination of the painting materials and techniques has been commissioned. A major research programme investigating the materials and techniques of the painted ceiling was undertaken by the Conservation of Wall Paintings Department, Courtauld Institute of Art between September 1997 and December 1999. As an aid to ongoing conservation programmes, further research has been carried out by Jane Davies and reported on in August 2001, May 2002 and May 2003.

This report discusses eleven samples from the phase 3 area of the cleaning which was re-visited to remove smoke deposits after the fire. All of the samples were taken from areas below original nail heads, which are now absent. The samples are consistent with previous samples and appear to bear an identical range of materials to those identified in original work during previous research, suggesting a uniformity of painting technique across the breadth of the ceiling. Once again the samples confirm that original paint dating from the thirteenth century does survive in a number of areas, some having remained exposed despite extensive repainting, but some having been revealed by loss of original nail heads. The original palette comprised natural azurite, red lead, lead white, basic verdigris, yellow and red iron oxide, orpiment, carbon black and vermilion in a drying oil medium. As the samples are so similar to those analysed during earlier phases, the extent of current analysis has been limited to microscopy, no expensive instrumental analysis was deemed necessary at this time.

**SUMMARY**

**CONTENTS**

*PAGE*

**1 BACKGROUND AND BRIEF**

3

**2 PAINT ANALYSIS**

4

**3 DISCUSSION OF FINDINGS**

16



## 1 BACKGROUND AND BRIEF

The nave ceiling at Peterborough is a rare survival of a thirteenth century timber ceiling *in situ* in England. It retains original thirteenth century paint although heavily restored in the 1740s and again in 1836. The ceiling is currently being conserved and recorded by the Perry Lithgow Partnership. As part of the conservation programme a thorough technical examination of the painting materials and techniques has been carried out. A major research programme investigating the materials and techniques of the painted ceiling was undertaken by the Conservation of Wall Paintings Department, Courtauld Institute of Art between September 1997 and December 1999. As an aid to ongoing conservation programmes, further research was commissioned by Julian Limentani (of Marshall Sisson) from Jane Davies and was reported on in August 2001, May 2002 and May 2003.<sup>1</sup>

This report discusses eleven samples from the phase 3 area of the cleaning which was re-visited to remove smoke deposits after the fire. All of the samples were taken from areas below original nail heads, which are now absent.

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<sup>1</sup> Howard, H. 'Peterborough Cathedral, Nave ceiling: Scientific examination of the original decoration', unpublished report, Conservation of Wall Painting Department, Courtauld Institute of Art, September 1997. Howard, H. 'Peterborough Cathedral, Nave ceiling: Scientific examination of the original decoration of bays 36-39', unpublished report, Conservation of Wall Painting Department, Courtauld Institute of Art, September 1998. Kakoulli, J. 'Peterborough Cathedral, Nave Ceiling Paintings: Scientific Examination Phase 2', unpublished report, Conservation of Wall Painting Department, Courtauld Institute of Art, December 1999. Davies, J., 'Peterborough Cathedral, Nave Ceiling Phase 3 investigation of painting materials and techniques and full analysis', report commissioned for the Dean and Chapter of Peterborough Cathedral, October 2001. Davies, J., 'Peterborough Cathedral, Nave Ceiling investigation of painting materials and techniques, conservation Phase 4, Bays 9-17', report commissioned for the Dean and Chapter of Peterborough Cathedral, May 2002. Davies, J., 'Peterborough Cathedral, Nave Ceiling roof space, investigation of painting materials and techniques', report commissioned for the Dean and Chapter of Peterborough Cathedral, May 2003. Davies, J., 'Peterborough Cathedral, Transept Ceiling, investigation of painting materials and techniques', report commissioned for the Dean and Chapter of Peterborough Cathedral, May 2003.

## 2 PAINT ANALYSIS

### 2.1 METHODOLOGY

Paint samples were examined under low power magnification (2.5x-10x) and representative fragments mounted in acrylic modified polyester resin and polished in cross-section using a Metaserve 2000 grinding/polishing machine and a range of graded abrasives. Prepared cross-sections were examined under dark-field reflected light and ultraviolet illumination at magnifications 50x-500x using a Leica DMLM research grade microscope. Microchemical tests were carried out to identify some metallic ions and functional groups. Histochemical tests were undertaken to indicate the presence of proteins (glue) and oils.<sup>2</sup> Samples were also mounted as dispersions (in Meltmount, which has a refractive index of 1.662) and polarised light microscopy (PLM) carried out. Representative samples were photographed for reproduction within this report.

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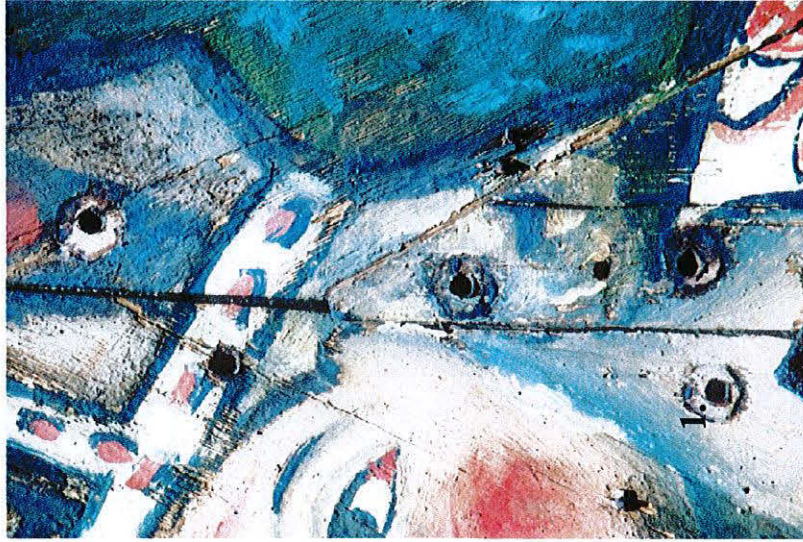
<sup>2</sup> The microchemical tests included: hydrochloric acid and potassium chromate, which produce a yellow stain for lead and hydrochloric acid, which results in the evolution of carbon dioxide to identify carbonates. Preliminary staining for oils used Sudan Black B which stains oils a blue black colour. Preliminary staining for proteins used Coomassie blue (R250) which stains proteins (glue) a mid-blue colour.



## 2.2 Sample 1 (3105)

Paint under original nail head (now missing). Flesh tone on neck of Archbishop 22 III a, lozenge.

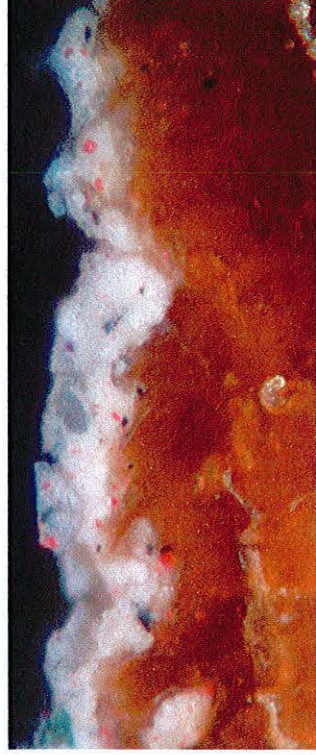
**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

## Description

The sample shows a single layer of flesh coloured paint, comprised mainly of lead white with some vermilion and carbon black particles. Its appearance is consistent with it being of thirteenth century date.



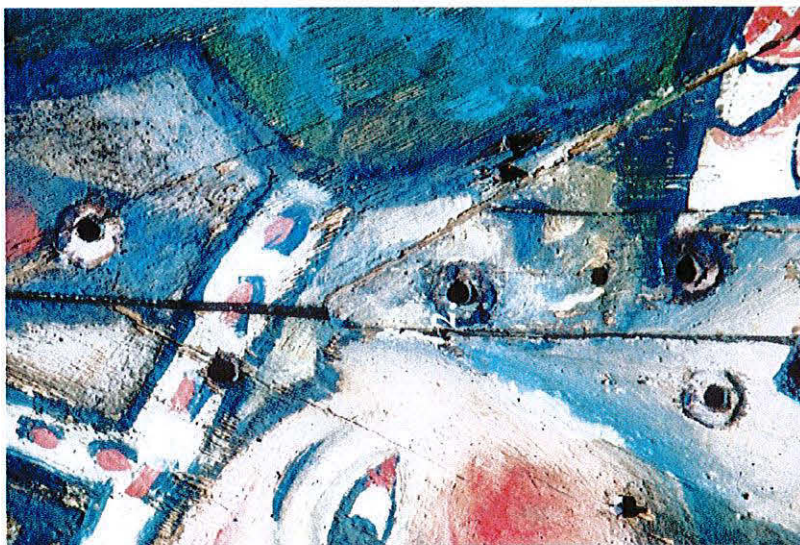
Sample 1 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).



**Sample 2 (3106)**

Paint under original nail head (now missing). Green with red stripe within hair of Archbishop 23 II cc, lozenge.

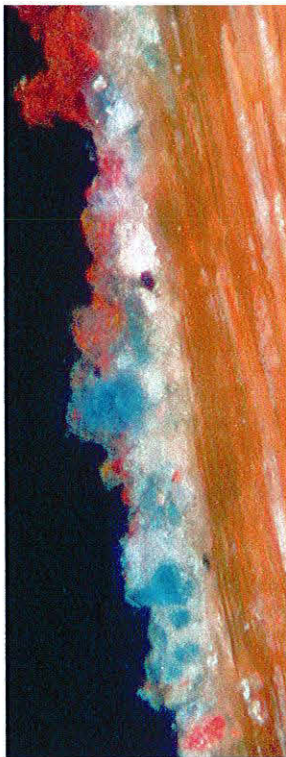
**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The sample clearly shows the blue-green paint superimposed by a layer of deep red pigment. The blue-green layer containing a mixture of natural azurite with lead white and a red pigment, possibly Vermilion. This paint appears very similar to the bright blue-green seen in previous research.<sup>3</sup> The upper red layer has a microscopic appearance consistent with iron oxide.



Sample 2 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

<sup>3</sup> Davies, 2001, *op cit*, sample 21 (3068), Howard, 1997, *op cit*, samples 2108 and 2115.



**Sample 3 (3107)**

Paint under original nail head (now missing). Flesh tone with red edge on neck of Archbishop 23 II cc, lozenge.

**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The paint comprises two layers, the lower appears to be red lead (minium) and the upper iron oxide. No flesh tone paint is visible on the sample as polished. The paint appearance is consistent with it being of thirteenth century date.



Sample 3 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).



**Sample 4 (3108)**

Paint under original nail head (now missing). Light red from within lower robe drapery of Archbishop 22 III a, lozenge.

**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The paint is a single layer of red lead with a little carbon black and possibly some calcium carbonate. The white could be cerussite arising from the conversion of minium.<sup>4</sup> The paint appearance is consistent with it being of thirteenth century date.



Sample 4 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

<sup>4</sup> Pers. Comm. Sharon Cather to author. I am indebted to Ms Cather for describing the conversion of minium to cerussite (basic lead carbonate), then to brown lead (plattnerite). The Courtauld Institute of Art, Conservation of Wall Paintings Department have observed this phenomena in various contexts, for example, Canterbury Cathedral, St Gabriel's Chapel c. 1130; Westminster Abbey, Chapter House, c. 1380.



**Sample 5 (3109)**

Paint under original nail head (now missing). Light red from within lower robe drapery of Archbishop 22 III a, lozenge.

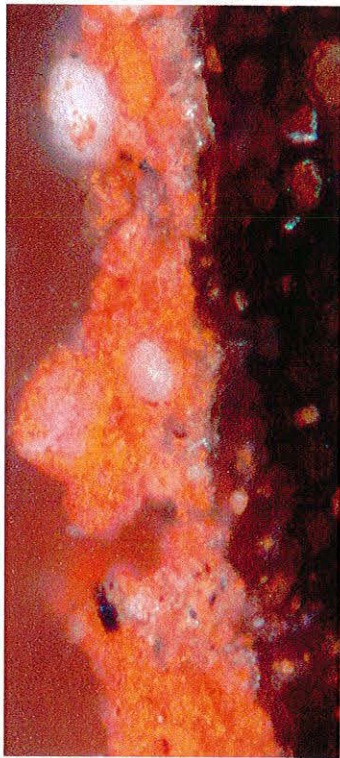
**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The paint is a single layer of red lead with a little carbon black and possibly some calcium carbonate. The white could be cerussite arising from the conversion of minium.<sup>5</sup> The paint appearance is consistent with it being original.



Sample 5 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

<sup>5</sup> Pers. Comm. Sharon Cather to author, as previous sample.



**Sample 6 (3110)**

Paint under original nail head (now missing). Dark red from within lower robe drapery of Archbishop 22 III a, lozenge.

**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The lower paint layer appears to consist of red lead with some carbon black particles. The upper paint layer has a microscopic appearance consistent with iron oxide. Some white and black particles are present within the iron oxide matrix.



Sample 6 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).



**Sample 7 (3111)**

Paint under original nail head (now missing). Off-white from white edging of drapery of Archbishop 23 II cc, lozenge.

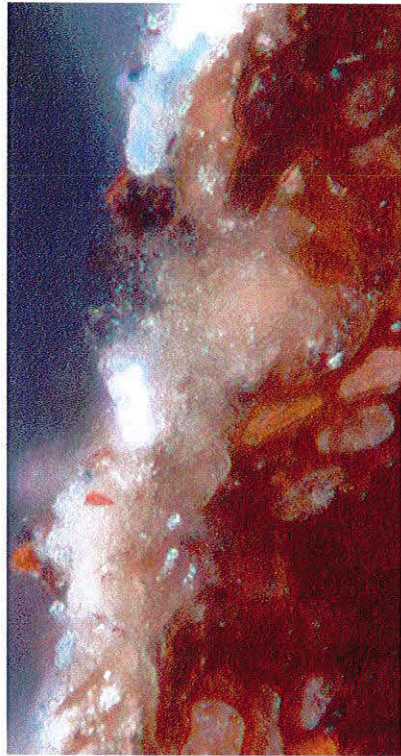
**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

Sample shows a single layer of off-white paint over a translucent substance directly on the timber surface. The translucent material may be the calcium sulphate combined with a proteinaceous material (probably animal glue) which was identified at the timber/paint interface during previous research.<sup>6</sup>



Sample 7 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

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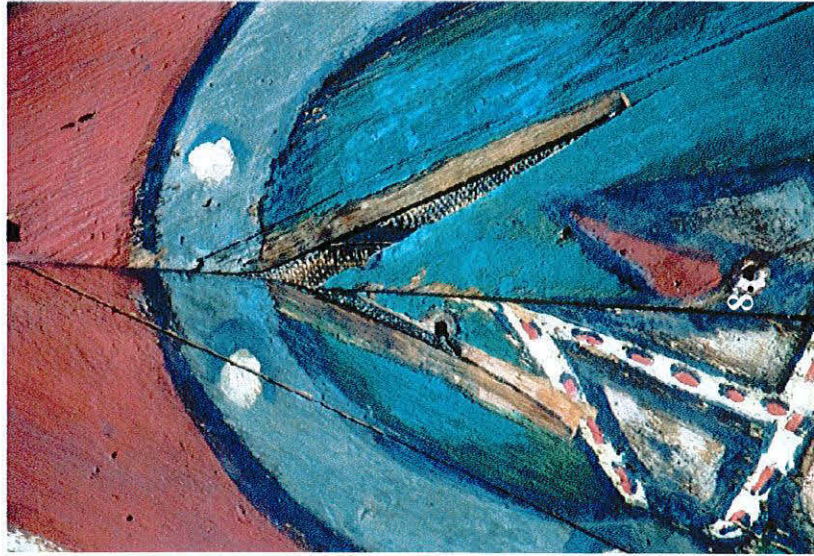
<sup>6</sup> Howard, 1997, *op cit*.



**Sample 8 (3112)**

Paint under original nail head (now missing). White paint from mitre of Archbishop 23 II aa, lozenge.

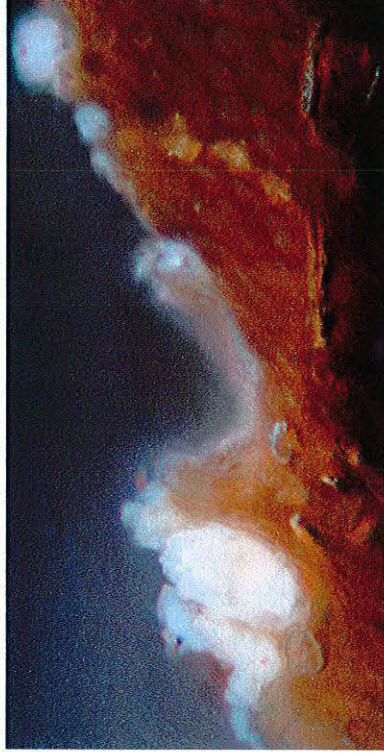
**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

Single thin layer of white paint, shows no evidence of design. Possibly a significant sample in aiding our understanding of the original production of the ceiling, as it suggests the basic colours were blocked out prior to the ceiling being fixed in place, but the design details added after the nails were inserted. However, it maybe that during later interventions the design details were considerably altered and the sample is simply from an area that was originally plainly painted.



Sample 8 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

**Sample 9 (3113)**

Paint under original protruding nail head. Black from apparent black line on outer curved edge of board 21 III e wave.

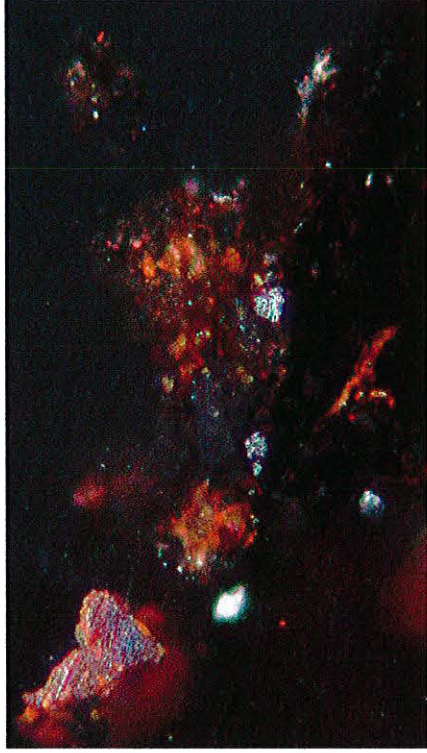
**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

Very limited evidence on sample of carbon black paint.



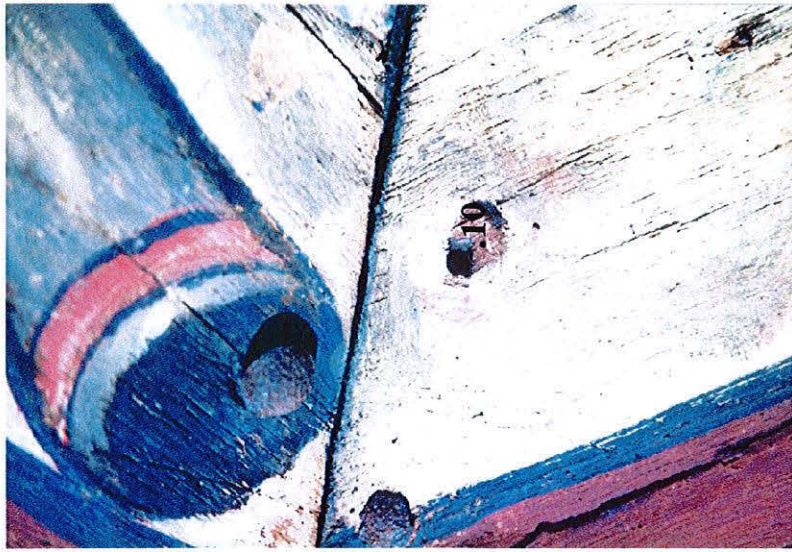
Sample 9 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).



**Sample 10 (3114)**

Paint under original nail head (now missing). Red paint from within white background of angel with cornetto lozenge 21 I c, lozenge.

**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The paint is a single layer of red lead with a little carbon black and possibly some calcium carbonate. The white could be cerussite arising from the conversion of minium.<sup>7</sup> The paint appearance is consistent with it being original.



Sample 10 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

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<sup>7</sup> Pers. Comm. Sharon Cather to author, as previous sample.

**Sample 11 (3115)**

Paint under original nail head (now missing). Green paint from within drapery (?) of Grammar lozenge 18 I ee, lozenge.

**Sample location photograph (below):**



© Perry Lithgow Partnership 2003

**Description**

The blue-green layer containing a mixture of natural azurite with lead white and an red/orange pigment, possibly iron oxide. This paint is similar to the bright blue-green seen in previous research.<sup>8</sup>



Sample 11 photographed in cross-section under reflected light at 200x magnification. (Printed magnification not calculated).

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<sup>8</sup> Davies, 2001, *op cit*, sample 21 (3068), Howard, 1997, *op cit*, samples 2108 and 2115.



### **3 DISCUSSION OF FINDINGS**

This report discusses eleven samples from the phase 3 area of the cleaning which was re-visited to remove smoke deposits after the fire. All of the samples were taken from areas below original nail heads, which are now absent. The samples are consistent with previous samples and appear to bear an identical range of materials to those identified in original work during previous research, suggesting a uniformity of painting technique across the breadth of the ceiling. Once again the samples confirm that original paint dating from the thirteenth century does survive in a number of areas, some having remained despite extensive repainting, but some having been revealed by loss of original nail heads. The original palette comprised natural azurite, red lead, lead white, basic verdigris, yellow and red iron oxide, orpiment, carbon black and vermilion in a drying oil medium. As the samples are so similar to those analysed during earlier phases, the extent of current analysis has been limited to microscopy, no expensive instrumental analysis was deemed necessary at this time.