Santa Maria Antiqua

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The Sistine Chapel of the Early Middle Ages

EDITED BY
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Palimpsests and Pictorial Phases in the Light of Studies of the Techniques of Execution and the Materials Employed

Research on the murals of Santa Maria Antiqua has benefitted from the integration of art historical and scientific studies, with a particular focus on the investigation of the painting processes and the materials employed.[1] This integration constitutes a useful approach for disentangling the complex stratigraphy of the various phases of painting, particularly in the sanctuary. Using a consistent methodological framework, the 'Progetto Santa Maria Antiqua' has examined all the painted surfaces in the church; the present paper, however, focuses on two select case-studies, which bring to the fore new and interesting elements that illuminate the pictorial cycle at large.[2]

The Christological cycle on the sanctuary wall

On the walls of the sanctuary, particularly the west wall (Plate 50: K3), stratigraphic investigation has made it possible to identify three pictorial phases, painted one over the other in successive layers (Figure 1). Two of these, the first and third levels, displayed scenes from the life of Christ, so it is highly likely that the second level also featured the same theme.[3]

The most recent and best preserved of the Christological cycles (layer III) belongs to the most extensive of the decorative campaigns undertaken in the church, that of Pope John VII (705–7).[4] The mural was executed on a single layer of plaster containing vegetal fibres, and has a fresco underpainting enhanced with brushstrokes added in lime. The mural was composed of twenty scenes arranged in two registers, enclosed by a frame with red and white borders, and set above a series of medallion portraits of the apostles, with a fictive *velum* beneath (Plates 42–3, 45–6).

Below the John VII layer, fragments of two earlier pictorial phases can be also identified. Their reading, made difficult by the state of preservation of the painted surfaces, depends principally on the traces of the framing systems that organized the figural scenes (Figure 2). The oldest cycle (layer I), of which only a few scenes can be identified, depicts the Passion and

1 Santa Maria Antiqua, west wall of the sanctuary (photo: Gaetano Alfano, 2015)

2 Santa Maria Antiqua, west wall of the sanctuary: the system of red borders that defined the spaces of the Christological cycle (photo: Paola Pogliani, 2013)

3 Santa Maria Antiqua, west wall of the sanctuary: the dark-red vertical border with white outlines of the second phase (photo: Paola Pogliani, 2013)

is distinguished by the use of single juxtaposed red borders that divide the space into ten panels and two rectangles, distributed over two registers.[5] It was applied on a level of mortar, followed by fresco paintings executed primarily with earth-based pigments.

Above this there are traces of a second pictorial phase (layer II) entirely painted *a secco*, using a very thin lime wash.[6] There are traces of borders and a grey-blue background that now looks like an extended 'stain', interfering with the reading of the images from the earlier cycle. Also belonging to this second phase is a system of red borders that defined the spaces intended for the narrative scenes (Figure 2). These have the same scale as the rectangles used for the same purpose in the John VII phase, which led Nordhagen to interpret them as a preparatory stage for that redecoration.[7] However, on the basis of a detailed analysis of the traces of painting on the west wall of the sanctuary, the authors of this paper are convinced that they must be attributed to a separate campaign. The best-preserved fragments reveal patches of actual painting. One example is the small section of a dark-red vertical border, composed of red ochre with white outlines in lime wash (Figure 3). This demonstrates that it was not simply a preparatory design, but rather an actual painting. In addition, the analysis of the grey ground showed that it was a background covering the entire area inside the borders, obtained from a black vegetal pigment. on which there are also faint traces of Egyptian blue, corresponding to the zones where the sky would have been depicted in the narrative scenes. This is conclusive evidence for the existence of a third pictorial cycle, which used a system of painted frames that, according to Manuela Viscontini's reconstruction, must have been organised in ten panels over two registers.[8] Unfortunately, however, nothing remains that would permit an identification of the subject matter.

The 'Angelo bello' and the image of Saint Anne

On the west wall of the sanctuary, next to the entrance to the Chapel of the Holy Physicians (Figure 1), John VII's decorative campaign preserved the painted icon belonging to an earlier phase, depicting Saint Anne holding the infant Mary (Figure 4).[9] Anyone closely examining Saint Anne's face (Figure 5) cannot help but notice its extraordinary technical and artistic accomplishment, with thick brushstrokes used to suggest her three-dimensionality, the delicate definition of the features, and the vibrant highlights. Set against the background, Anne's face has been constructed with applications of paint following methods previously encountered in the *Angelo bello* of the 'palimpsest' wall (Figure 6), defined by the use of rich strokes of lime applied in an articulated sequence.[10] The analysis of the formal techniques used to create the faces of both figures, undertaken by means of a targeted graphic and micro-photographic campaign of documentation (Figures 7–8), has revealed the presence of at least nine applications of paint, which correspond to the number of steps employed by the painter to create the faces (Figure 9). An identical grey application was used for the shadows, green for the *Angelo bello* and brown for the Saint Anne, onto which were painted the backgrounds for the pink and yellow flesh tones, with the shadows again highlighted with green and brown. Finally, the facial features were delineated in reddish brown, with black for the pupils and nostrils, and white highlights.

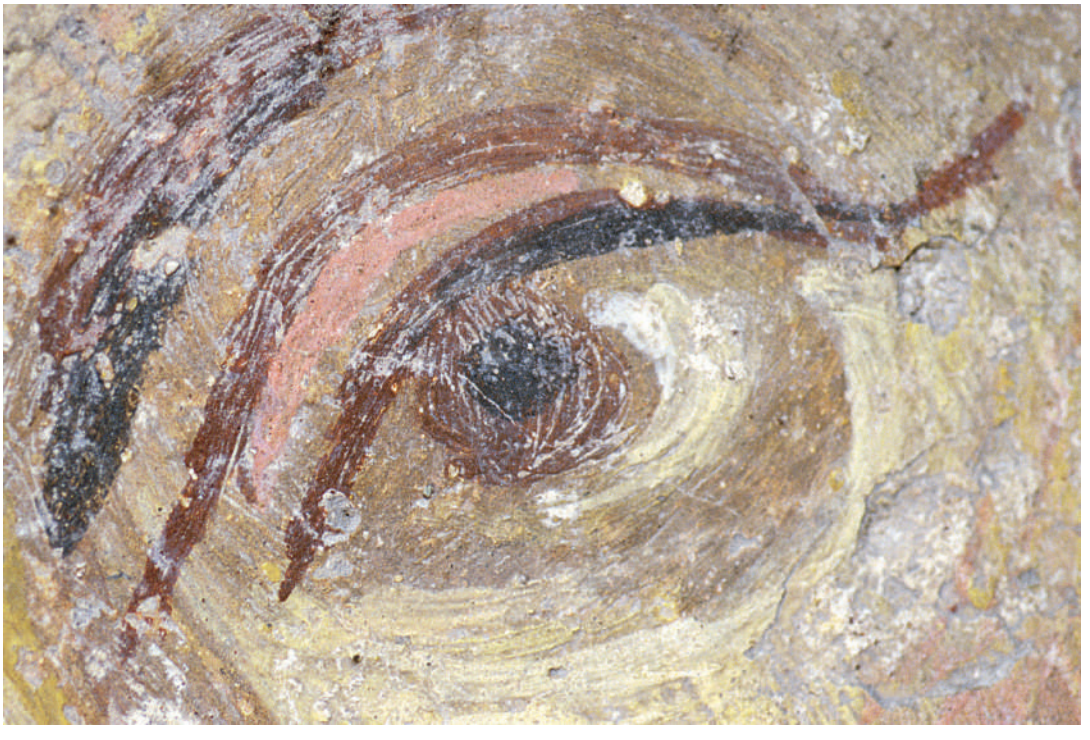
The similarities observed between the *Angelo bello* and the Saint Anne are not limited to the applications of paint or the structural analysis of the surfaces (Figure 9), but also include the

Santa Maria Antiqua, west wall of the sanctuary: panel with Saint Anne holding the infant Mary (photo: Giulia Bordi, 2015)

Santa Maria Antiqua: Saint Anne's face
(photo: Gaetano Alfano, 2015)

Santa Maria Antiqua, palimpsest wall: the face of the *Angelo bello*
(photo: Paola Pogliani, 2000)

7 Santa Maria Antiqua, Saint Anne: the sequence of strokes for the the eye
(photo: Gaetano Alfano, 2015)



8 Santa Maria Antiqua, *Angelo bello*: detail of the sequence of strokes for the the eye
(photo: Paola Pogliani, 2000)

Santa Maria Antiqua, Saint Anne and the *Angelo bello*, the colour painting sequence (Paola Pogliani, 2013)

composition of the plaster and the types of pigment employed. The use of similar constituent materials in medieval workshops that are close in time and space is usually considered significant only for understanding the painting itself. In this case, however, the use of Egyptian blue in both examples is noteworthy, and even more so is the use of the same mixture of pigments, in identical quantities and with similar granulometry, to create the green backgrounds. This last colour is a light and slightly cold shade, readily distinguishable from green pigments derived from natural earths that are common in early medieval mural painting and more practical because usable in pure form. The green employed in the two Santa Maria Antiqua figures was created ad hoc to obtain the pastel ground that defines the space occupied by the figures. Its uniqueness is so distinctive that may be used as evidence for attributing the works to the same painter or workshop. Indeed, it is even possible to go so far as to hypothesise, following Werner Schmid, that the artist/s working on the murals with the *Angelo bello* and Saint Anne shared the same dish of pigments.

This important discovery, together with the technical analysis of the faces and of the materials employed, allows us to suggest that the Saint Anne belongs to the same pictorial context as the *Angelo bello*, for which a date is proposed in the last third of the sixth century.[11]

Paola Pogliani

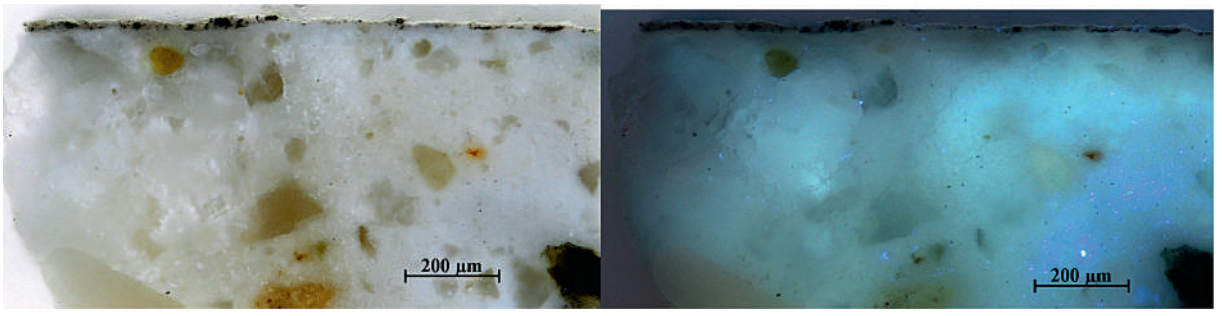
The materials

The identification and analysis of the materials used in the wall paintings of Santa Maria Antiqua form an integral part of the research project undertaken by the Università degli Studi della Tuscia with the aim of investigating the techniques used to create murals in the different historical phases of the site, ranging from the sixth to the ninth century. The results of the analysis are useful to illuminate the complex stratigraphic sequence of the pictorial phases, and to clarify their chronology.[12] The examples presented below are significant in this respect.

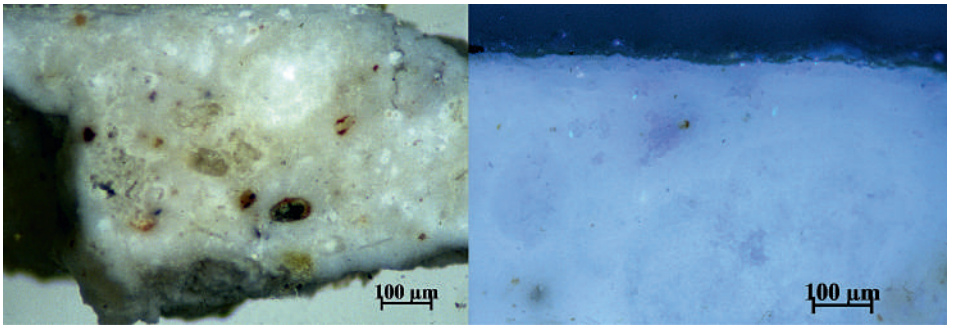
The Christological cycles on the walls of the presbytery

Three pictorial phases are visible on the west wall of the sanctuary (Figure 2). Two of these, the oldest (phase I) and the most recent (phase III), are painted on a plaster, while the intermediate phase (phase II) is dry-painted (*a secco*) directly on the previous painting.

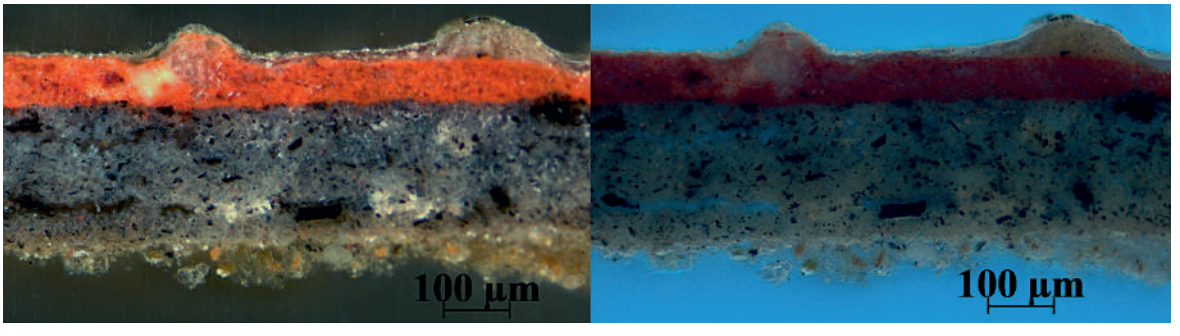
The plasters can be distinguished from one another by their physical characteristics. Phase I plaster is made of a white lime-rich mortar with few aggregates of quartz sand and limonite minerals (Figure 10); while the layer of the phase of John VII (phase III) is characterised by a very white mortar, rich in lime with little quartz sand, and traces of vegetable fibres and protein substances (Figure 11). Both phases exhibit fresco painting with lime finishing. The oldest painting is made with pigments based on natural earths and ochre. The red colour of the frame was obtained from red earth mixed with carbon black, probably intended to darken the hue.



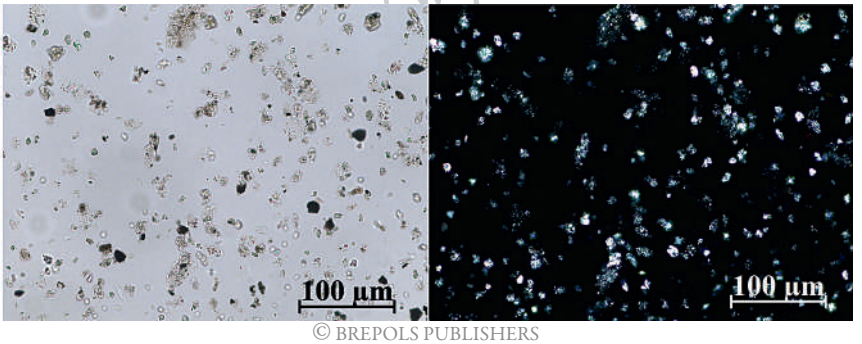
10 Santa Maria Antiqua, west wall of the sanctuary, the phase I plaster: microphotographs of sample cross-sections under reflected light and ultraviolet fluorescence. Objective magnification 10× (photo: Giorgia Agresti and Claudia Pelosi)



11 Santa Maria Antiqua, west wall of the sanctuary, phase II (John VII): microphotographs of sample cross-sections under reflected light and ultraviolet fluorescence. Objective magnification 10× (photo: Giorgia Agresti and Claudia Pelosi)



12 Santa Maria Antiqua, phase II, cross-section of the mortar: microphotographs of sample cross-sections under reflected light and ultraviolet fluorescence. Objective magnification 20× (photo: Giorgia Agresti and Claudia Pelosi)



13 Santa Maria Antiqua, phase II: microphotographs of sample powder embedded with Canada balsam, under parallel and crossed polars. Objective magnification 20× (Egyptian blue grains) (photo: Giorgia Agresti and Claudia Pelosi)

The entire pictorial cycle of John VII's campaign has been examined to determine the pigments used, and the results are the following:

GREEN EARTH, CELADONITE TYPOLOGY	The pigment powder, embedded in Canadian balsam, appears heterogeneous under the optical-mineralogical microscope, with particles measuring more than 20 μm. The pigment grains are birefringent and of greenish-brown colour with irregular contours. Other grains appear smaller and transparent or green in colour. The Raman spectrum of pigment samples is characterised by medium intensity bands at 121, 134, 148 159, 166 and 496 cm^{-1} that are typical of green earths. SEM-EDS analysis revealed the presence of silicon, aluminium, iron, potassium, magnesium and sodium with the following percentages: Si (1.98%), Al (0.825%), Fe (0.428%), K (0.259%), Mg (0.242%) and Na (0.202%).
YELLOW OCHRE, GOETHITE MINERAL	The pigment powder, observed under the optical-mineralogical microscope, is characterised by grains of different colours, ranging from yellow to red and black, and transparent with dimensions of about 20 μm. All particles are birefringent except the black ones that are made of amorphous carbon. SEM-EDS analysis revealed the presence of Si (3.68%), Al (1.63%), Fe (1.25%), K (0.768%).
RED OCHRE, HEMATITE MINERAL	The pigment powder, under the optical-mineralogical microscope, appears to be constituted by red grains with irregular edges and more than 20 μm in size. The grains also contain some black particles; and when observed under crossed polars they appear birefringent. The Raman spectrum is characterised by a sharp and strong band at 291, two medium intensity bands at 222 and 407 cm^{-1}, and three weak bands at 177, 609, 659 and 1310 cm^{-1}; all bands are characteristic of hematite. SEM-EDS revealed the presence of Fe (6.04%), Si (2.06%) and Al (0.895%), in one examined point; and Fe (52.6%), Pb (3.37%), Mg (0.974%) and Si (0.665%), in a second point. All elements are typically present in red-earth-based pigments.
CARBON BLACK, VEGETAL TYPOLOGY	The pigment powder, observed under the optical-mineralogical microscope, is constituted by black particles less than 20 μm in size. The particles show irregular edges and are not birefringent if observed with cross polars. Little grains of calcium carbonate are also visible in the sample. Raman spectrum shows the two typical bands of carbon black-based pigment at 1336 and 1590 cm^{-1}.
EGYPTIAN BLUE	The pigment powder shows light blue particles, birefringent under crossed polars. The blue grains have a glassy appearance and are less than 20 μm in size. Raman spectrum gives the typical bands of Egyptian blue at 431, 465, 1086 cm^{-1}.

The second phase, as noted previously, was painted using a *secco* technique applied directly on the surface of the earlier pictorial layer. The cross section of this layer shows a thin preparatory layer of a light-grey colour (Figure 12), onto which the painting was applied. The presence of superimposed materials, such as waxes and other protective substances added during modern restorations of the paintings, prevented a conclusive identification of the binder used. The presence of lead-based pigments, however, incompatible with the fresco technique, suggests that it was an organic protein binder, whose traces have been found in the analysed samples.

The red pigment of the frames is composed of red earth and minium (red lead) (Figure 12). The presence of lead, highlighted by SEM-EDS analysis, confirmed the use of pigments incompatible with the use of lime as a binder for the painting. The analysis of this particular sample, taken from inside the pictorial field, adjacent to the frame, has highlighted a new element of great interest for the art historical studies aimed at understanding the pictorial stratigraphy of the wall. The analysis, in fact, showed also the presence of Egyptian blue applied on the grey ground, the latter made with carbon black of vegetal origin, presumably vine black (Figure 13).

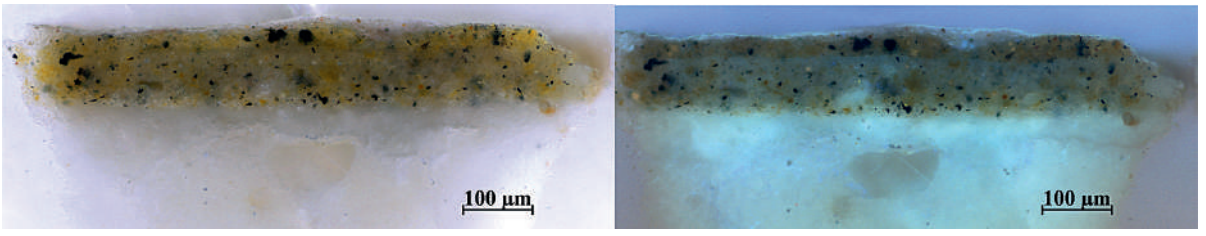
The 'Angelo bello' and Saint Anne

The analysis of the mortars used in the palimpsests permits a comparison between the composition and structure of the paintings' preparatory layers. For example, it emerged that the mortars used to for the *Angelo bello* on the 'palimpsest' wall and the panel with Saint Anne on the right wall are very similar in composition and stratigraphic pattern. Both paintings were made on a single preparatory layer composed of white lime-based mortar with little quartz sand and other aggregates (Figures 14–15).

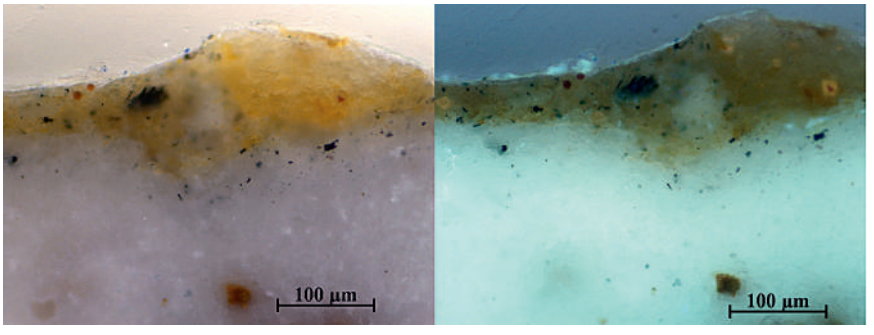
Furthermore, the cross-sections obtained from samples of the green background in the two paintings demonstrate a clear correlation. In both cases, in fact, the painting layers appear homogeneous, and composed of a mixture of yellow ochre and carbon black. It is interesting to note that the combination of yellow ochre and carbon black of vegetal origin (vine black) produces a green hue, testifying to the painters' considerable knowledge of the optical properties of pigments.

The observation of these green samples under an optical-mineralogical microscope has revealed the presence of yellow ochre, whose colour is due to the birefringent goethite grains, with green-brown and small black particles. SEM-EDS analysis, executed in two different areas, revealed the presence of Si (2.51%), Al (0.971%) and Fe (0.768%) in the first one, and of Cu (9.99%), Sn (2.63%), Si (1.82%), Al (0.679%), Fe (0.388%) and Cl (0.333%) in the second area, confirming the mixture of yellow ochre and carbon black.[13]

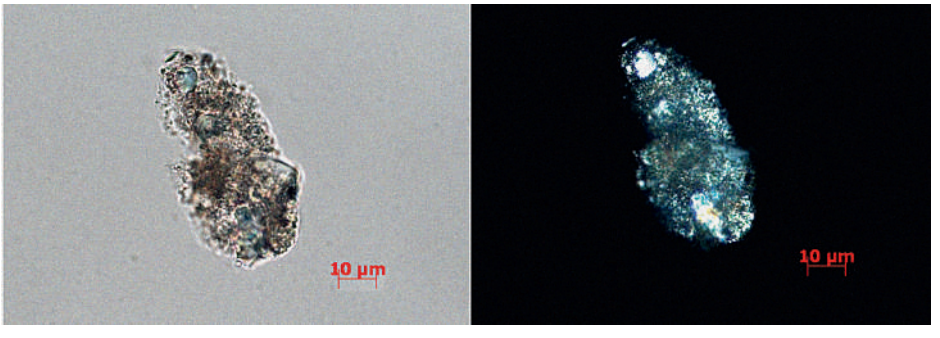
A further discovery obtained from this scientific analysis concerns the presence of traces of Egyptian blue in the background of both paintings. XRF analysis, performed by ENEA on the upper part of the background in the Saint Anne painting, showed the presence of Cu and Si, which are elements of Egyptian blue. In order to obtain a definite identification of this blue pigment, a micro sample was taken for laboratory analysis (Figure 16). This sample was examined under an optical mineralogical microscope and using SEM-EDS analysis. In the first case, small blue birefringent particles (about 5 μm) have been observed, showing also light pleochroism and blue-green interference colours typical of Egyptian blue. SEM-EDS further



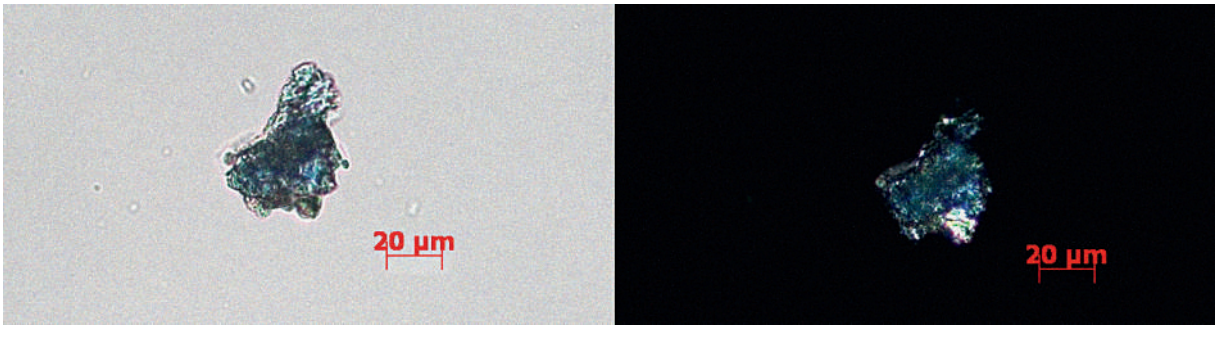
14 Santa Maria Antiqua, mortar of the Saint Anne mural: microphotographs of sample cross-sections under reflected light and ultraviolet fluorescence. Objective magnification 20× (photo: Giorgia Agresti and Claudia Pelosi)



15 Santa Maria Antiqua, mortar of the *Angelo bello*: microphotographs of sample cross-sections under reflected light and ultraviolet fluorescence. Objective magnification 20× (photo: Giorgia Agresti and Claudia Pelosi)



16 Santa Maria Antiqua, Saint Anne, background: microphotographs of sample powder embedded with Canada balsam, under parallel and crossed polars. Objective magnification 40× (Small pale blue grains of Egyptian blue are visible, associated with calcium carbonate binder) (photo: Giorgia Agresti and Claudia Pelosi)



17 Santa Maria Antiqua, *Angelo bello*, background. Microphotographs of sample powder embedded with Canada balsam, under parallel and crossed polars. Objective magnification 10x (An aggregate of Egyptian blue grains is visible) (photo: Giorgia Agresti and Claudia Pelosi)

confirmed the presence of Cu and Si, elements that allow us to identify the pigment as Egyptian blue.

The pigment sample taken from the background of the Angelo bello (Figure 17) was also observed under an optical mineralogical microscope. Different kinds of particles were found: small green-blue grains, transparent particles, yellow and red grains, irregular carbon black particles, and deep blue birefringent crystals of Egyptian blue.

Claudia Pelosi and Giorgia Agresti

1 The results presented here draw on the larger 'Progetto Santa Maria Antiqua' of the Università degli Studi della Tuscia, directed by Maria Andaloro between 1997 and 2014, in which the present author, together with Giulia Bordi, Manuela Viscontini, and Mariella Ranieri, studied, documented, and mapped the painted plasters preserved in the church, and identified the technical procedures and materials used in creating the murals. This research was undertaken in collaboration with the Laboratorio di Diagnostica per la Conservazione e il Restauro 'Michele Cordaro' of the Università degli Studi della Tuscia, coordinated by Claudia Pelosi, and the X-ray fluorescence studies were made possible through a collaboration with ENEA and 'Ars Mensurae'. See Silviarita Amato and others, 'A Multi-Analytical Approach to the Study of the Mural Paintings in the Presbytery of Santa Maria Antiqua al Foro Romano in Rome', *Archaeometry*, 59.6 (2017), 1050–64 <online, doi: 10.1111/arcm.12296> [accessed 8 December 2020]. An initial campaign of studies, focusing on conservation issues and the climatic conditions of the building, formed part of a project undertaken by the Norwegian Institute in Rome.

2 For an overview of the palimpsests in Santa Maria Antiqua and the new data that emerged from the project, see Maria Andaloro, 'La parete palinsesto: 1900, 2000', in *Santa Maria Antiqua al Foro Romano cento anni dopo: atti del colloquio internazionale, Roma, 5–6 maggio 2000,* ed. by J. Osborne, J. R. Brandt, and G. Morganti (Rome: Campisano, 2004), pp. 97–111; Maria Andaloro, 'Dall'angelo "bello" ai Padri della Chiesa della "parete palinsesto"', in *Santa Maria Antiqua tra Roma e Bisanzio,* ed. by M. Andaloro, G. Bordi, and G. Morganti, (Milan: Mondadori-Electa, 2016), pp. 180–9; Giulia Bordi, 'Santa Maria Antiqua attraverso i suoi palinsesti pittorici', in *Santa Maria Antiqua tra Roma e Bisanzio,* ed. by M. Andaloro, G. Bordi, and G. Morganti, pp. 34–53; and Werner Schmid, 'Il lungo restauro di Santa Maria Antiqua e delle sue pitture', in *Santa Maria Antiqua tra Roma e Bisanzio*, ed. by M. Andaloro, G. Bordi, and G. Morganti, pp. 386–95.

3 For the reconstruction of the wall decoration, based on an analysis conducted from the scaffolding, see Manuela Viscontini, 'I cicli cristologici' del presbiterio di Santa Maria Antiqua', in *L'officina dello sguardo. Scritti in onore di Maria Andaloro*, ed. by G. Bordi, I. Carlettini, M.L. Fobelli, M.R. Menna, and P. Pogliani, 2 vols (Rome: Gangemi, 2014), I, pp. 291–6; and Giulia Bordi's contribution to this chapter.

4 Per Jonas Nordhagen, 'The Frescoes of John VII (A.D. 705–707) in S. Maria Antiqua in Rome', *Acta ad archaeologiam et artium historiam pertinentia*, 3 (1968).

5 For a detailed discussion of the dating and the various arguments proposed, please refer to Giulia Bordi's contribution to this chapter.

6 Pictorial palimpsests with phases pained in *secco* on top of earlier levels are very common in the churches of Cappadocia (Turkey), particularly in the earliest examples (VI–IX c.). These are the subject of another research project conducted by the Università degli Studi della Tuscia, focusing on their study, preservation, and research *in situ*: see Giulia Bordi, 'La chiesa di Haghios Basilios e la pittura delle origini in Cappadocia. Palinsesti pittorici', *Medioevo, natura e figura*, ed. A.C. Quintavalle, I convegni di Parma, 14 (Milan: Skira, 2015), pp. 229–38; Paola Pogliani, 'La chiesa di Haghios Basilios e la pittura delle origini in Cappadocia. Materiali e stesure pittoriche', in *Medioevo*, ed. by A.C. Quintavalle, pp. 257–64; and Maria Andaloro and Paola Pogliani, 'Techniques and materials of medieval wall painting in Cappadocia', forthcoming. A similar case may be found at the Abbey of Grottaferrata: see Maria Andaloro, 'La decorazione pittorica medioevale di Grottaferrata e il suo perduto contesto', in *Atti della IV settimana di studi di storia dell'arte medievale dell'Università di Roma 'La Sapienza'*, ed. by A. M. Romanini (Rome: L'Erma di Bretschneider, 1983), pp. 253–87; and Maria Grazia Chilosi, 'Gli affreschi duecenteschi con le storie di Mosè dell'Abbazia di Grottaferrata: storia e conservazione: Storia e lettura delle fasi esecutive degli affreschi attraverso il restauro', *Bollettino d'arte*, 94 (2009), 11–40.

7 Nordhagen, 'The Frescoes of John VII', p. 22.

8 Viscontini, 'I cicli cristologici'; and Giulia Bordi's contribution to this chapter.

9 Nordhagen, 'The Frescoes of John VII', pp. 87–90.

10 Maria Andaloro reconstructed the painting technique employed for the faces in the course of research linking the Santa Maria Antiqua paintings to early medieval Roman icons. The intention was to build a database of painting techniques in both mural and portable images that would enable closer structural comparisons; see Maria Andaloro, 'Le icone a Roma in età preiconoclasta', in *Roma fra Oriente e Occidente. Atti delle Settimane di Studio del Centro Italiano di Studi sull'Alto Medioevo, 49*, (Spoleto: Centro Italiano di Studi sull'Alto Medioevo, 2002), pp. 719–53; and Andaloro, 'La parete palinsesto', pp. 97–111.

11 See Bordi, 'Santa Maria Antiqua attraverso i suoi palinsesti pittorici', p. 43, with earlier bibliography, and her contribution to this chapter; and Maria Andaloro, 'Dall'angelo "bello" ai Padri della Chiesa', p. 188.

12 This investigation, summarised in the present contribution, was undertaken between 2002 and 2009, with further analysis in 2013. See Michela Pasquali, 'Studio dei pigmenti utilizzati nell'area presbiteriale della chiesa di Santa Maria Antiqua al Foro Romano' (unpublished Master's thesis, Università degli Studi della Tuscia, 2008); and Amato and others, 'A Multi-Analytical Approach'.

13 The presence of copper (Cu) and tin (Sn) can be associated with bronze residues of the metal cramps used during the first restoration work in the twentieth century.