

COLOUR AND PAINTING TECHNIQUE ON THE ARCHAIC PANELS FROM PITSA, CORINTHIA

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Recent examination of four votive wooden panels from Pitsa in Corinthia, dated to the second half of the 6th century BC, allowed us to evaluate the use of colour and the painting techniques applied to those early pictorial documents. The tablets depict religious scenes connected with the cult of the nymphs. Preserved due to the stable microclimatic conditions inside the cave where they were discovered, they represent the earliest examples of panel painting to survive in Greece and a unique testimony of Archaic painting. The tablets serving as support are wooden panels, covered with a preparatory thin white layer of gesso and painted with a variety of pigments comprising black, white, blue, red, yellow, purple and brown hues, surprisingly well preserved.

Introduction

The present study offers an overview of the results of an ongoing study of the four fragmentary Archaic painted panels¹, which came to light in 1934 by Anastassios Orlandos inside a cave located at Ano Pitsa in Corinthia, a village west of Sicyon, part of the territory of the ancient city of Donoussa². Our aim was to explore issues related to the technique and the nature of the materials employed on those unique testimonies of free standing panel painting in the broader context of ancient Greek painting. The panels were originally deposited as votive offerings together with other numerous artefacts inside a cave dedicated to a local cult of the Nymphs and probably other chthonian divinities³. They were found by the excavator in a pile, laid one on top of another. Apart from the four panels there are a large number of mostly Corinthian vases dated to the second half of the 6th c. BC, terra cotta figurines dated from the 7th to the 2nd c BC (which covers the entire period the cave was in use as a cult place), a wooden incised pyxis, a complex of two wooden figurines presumably depicting Demeter and Kore, bronze artefacts, Corinthian and Sikyonian coins, fragments of a

¹The final publication of the panels is a joint project between the Institute of Historical Research (Hariclia Brecolaki) the National Archaeological Museum of Athens (G. Kavvadias), with the collaboration of G. Verri (The Courtauld Institute of Art, London), B. Bourgeois (C2RMF, Louvre, Paris) and A. G. Karydas (IAEA Laboratories, Vienna).

² Orlandos 1935; Lemerle 1935, 258-259; Orlandos 1965.

³ Larson 2001.

purple textile and numerous knucklebones⁴. Based on stylistic criteria and the form of the letters in the Corinthian alphabet, the panels have been dated to the second half of the 6th BC. The panels fill a gap in our knowledge of ancient painting, and give us an idea of the Corinthian style at a time when vase-painting had ceased to be representative of the local tradition⁵. They also show how close the style of the best clay plaques stands to that of the polychrome panel painting of the time⁶.

The Pitsa panels A, B, C and D⁷

Pinax A, the best preserved and most famous panel (**Fig. 1**), is a slab of wood 5 mm thick, measuring 33 cm long by 15 cm high. It is covered with a white slip, which has dissolved in many areas. The subject of the composition is most probably a procession to a sacrifice with children and grown-ups bringing all the necessary paraphernalia, a tray with jugs and a box, a sheep led on a rope and holding myrtle branches, taenias and musical instruments. The figures are moving towards an altar depicted on the right of the picture. The style of the painting is extraordinarily refined, like that of some of the finest clay plaques from Pente Skouphia⁸, but what is most remarkable in this and in the other wooden plaques is the vividness of the colours comprising hues of blue, yellow, red, black, and gray. Following the tradition of early Greek painting, gender distinction is made by using white for women and red-brown for men⁹. Pinax A bears a number of inscriptions in the Corinthian alphabet and Doric dialect, stating that it was dedicated to the Nymphs, and giving the names of the participants or dedicators, and presumably the signature of the artist, whose name is lost though his designation as a Corinthian is preserved¹⁰.

The other three panels are less well preserved. Pinax B (**Fig. 2**) measures 9,3 cm long and 15 cm high, showing three partially overlapping women dressed in a long chiton and wrapped in a single himation of brown-purple colour, also bearing a written dedication to the Nymphs. It has been suggested that the figures may have depicted the Nymphes or other female deities. The difference in the style of the letters in comparison to the first pinax, denote either a different artist or that the dating of this pinax was more recent, as it has been suggested by epigraphists. The back of the panel bears traces of white preparation and colour, showing that it was originally placed on top of pinax C (**Fig. 3**).

The third panel (pinax C, **Fig. 4**) of approximate dimensions 13 cm long and 20 cm high, preserved in a fragmentary state, depicts three overlapping figures whose heads and feet are missing, facing to the right, dressed in chiton and himation. Two pendants, one with yellowish round beads and beads in the form of blue flowers and another one in the form of braided

⁴ Orlandos 1965.

⁵ Amyx 1983; Scheibler 1994, 95-97.

⁶ Boardman 1954.

⁷ The inventory numbers of the panels at the National Archaeological Museum are as follows: Panel A: 16464; Panel B: 16465; Panel C: 16466; Panel D: 16467.

⁸ Pfhul 1939, figs 180-189.

⁹ Walter-Karydi 1991.

¹⁰ Rizakis 2008, 249-254, with previous bibliography on the inscriptions and dating of the panels.

snakes in red, blue and brown, were probably held by the women. The rendering of the drapery is sophisticated with an unusual elaboration of patterned and figured motifs. The preserved letters may correspond to the signature of the artist. The back of the panel is covered by a weathering black crust, probably due to a biodeterioration effect.

In pinax D (**Fig. 5**), with dimensions 32 cm long and 15 cm high, the paint layer is preserved only at the right part of the composition. The scene originally depicted a ritual dance or perhaps a dance of deities with their local names inscribed on top of their heads¹¹. Three women are well preserved, dressed with a chiton and an himation pulled up to cover their heads, while traces of the outlines of another six female figures and a flute player are discernible on the middle and the left part of the panel (**Fig. 6**). On the back of panel D there are traces of gesso and red paint that originally belonged to the pictorial layer of panel A, that was originally piled on top of pinax A. The upper edge of panels A and D are pierced with two holes, serving most probably to facilitate their suspension against a wall, or their hanging from a tree. The practice of painting on wood by ancient Greek artists and the dedication of painted plaques in sanctuaries is afforded by both literary and iconographic evidence from vase representations¹². The Pitsa panels are admittedly of high quality, far from being rustic dedications¹³.

Shortly after their discovery, the panels were transferred to the National Archaeological Museum where copies of the originals were made (pinax A by the Swiss artist Jules Guillieron) and displayed until recently as part of the vase collection, while the originals were kept in the Museum's treasury. Despite their obvious fragility, the panels seem surprisingly well preserved, as far as colours are concerned, with the exception of some loose flakes of paint on panel B. The stable microclimatic conditions of the cave together with a low oxygen circulation and the total absence of light, had certainly enhanced their preservation¹⁴. Their post-excavation environment in the museum's treasury, apparently also prevented the panels from further decay, since they were not directly exposed to light and air for more than half a century. With the occasion of the Museum's renovation and re-exhibition of finds in 2007, the panels were properly restored, cleaned and consolidated, photographed and finally displayed in a display case with controlled conditions of relative humidity and temperature¹⁵.

The support

The wooden planks serving as support to the paint layer present a variable condition. The largest ones, almost preserved *in toto*, do not seem to have suffered any extensive mechanical

¹¹ Lonsdale 2001.

¹² Boardman 1954, 186-190.

¹³ Their decoration compares with contemporary and earlier dedications of painted clay plaques as the rural Pente Skouphia site near Corinth (Pfhul 1939, 180-189).

¹⁴ According to Orlandos's description the find spot of the panels was located around 60m deep from the cave's aperture (Orlandos 1965, 200).

¹⁵ Kaltsas 2007, 217-219.

damage or have been attacked by living organisms, unlike the weakened structure of the two other warped tablets. Although a positive identification of the type of tree the panels were made from still needs to be done, their texture and colour is indicative of pine. According to Theophrastus pine and fir wood were used for both writing tablets and for the painters' panels (*Hist. Plant.* 2.9.7; 5.7.4). According to Pliny, artists of great fame would only paint on panels (*HN* 35.118) and children were given lessons in drawing on boxwood (*HN* 35.77). While the references from ancient authors on the works of famous Greek painters on wooden panels are quite abundant - either fixed on the walls and ceilings of public buildings or decorating luxurious private palaces of Hellenistic kings, the archaeological evidence remains very scarce. A fragmentary wooden pinax from the Samian Heraion dating to the end of the 8th century exists, but hardly any trace of color is preserved¹⁶. The only other painting on wood that has been discovered in Greece so far is an unpublished fragmentary frieze with floral motifs inside the tomb III at Aigai together with fragments of wooden furniture still preserving traces of painting and polychromy¹⁷. An early 4th century BC fragmentary pinax depicting a seated woman from Saqqarah, has recently been investigated at the laboratory of the British Museum offering interesting comparanda with the Pitsa panels¹⁸. Wooden pieces of Hellenistic sarcophagi from Kertch and Kul Oba, with gilding and painted floral motifs preserved in many areas are also dated to the second half of the 4th century BC¹⁹. Finally, the 5th century BC Phrygian timber chamber tomb at the tumulus of Tatarli, with its rich iconographical program, offers a unique example of ancient painting on wood²⁰.

The painting materials

Considering the uniqueness and fragility of the Pitsa panels, our examination was limited to non-destructive analytical methods only performed *in situ*²¹, consisting of Mobile Raman Microscopy (MRM)²², X-Ray Fluorescence (XRF)²³ and Imaging Techniques (VIL)²⁴.

¹⁶ Kyrieleis 1980.

¹⁷ Kottaridi 2011, 106-107.

¹⁸ Tanimoto et al. 2008.

¹⁹ On the Kul Oba sarcophagus see Miller 2015.

²⁰ Emmerling et al. 2010.

²¹ A first presentation of the preliminary results of this investigation were presented by H. Brecolaki, D. C. Smith, G. Economou, M. Perraki, I. Kougemitrou, E. Stasinopoulou, « The panel paintings from Pitsa (Greece, 6th c. BC): A first analytical assessment of their materials and technique », in *5th Symposium of the Hellenic Society of Archaeometry, Athens 2008, Book of Abstracts*, O17.

²²A Kaiser "Holoprobe" Mobile Raman Microscope (MRM) from the Institute of Geological and Mineral Exploration at Athens (IGME) was used for the examination of the Pitsa panels, subjected to a 785 nm laser beam coming from an objective mounted on a specially-made large tripod support.

²³The portable in-house developed milli-probe X-ray Fluorescence (XRF) spectrometer is based on a side window Rh anode (with 75 µm Be window) air-cooled low power X-ray tube. The XRF measurements were performed at 20 kV operational voltage and 100 µA as tube current with the exciting radiation impinging at normal incidence with respect to the sample surface. The beam spot size at the sample position is about 2.7 mm and the counting interval was set to 150s. The characteristic X-rays emitted from the sample are detected by a Si-PIN diode X-ray detector (Amptek XR-100CR, with 165 eV FWHM at MnK α , 500 µm Si crystal thickness and 12.7 µm Be window) placed at 45° from sample normal. Two laser spots coupled on the spectrometers head are aligned in such a way to ensure the placement of the analyzed area on the reference plane.

²⁴ Each of the artifacts was positioned on the copy stand and illuminated with two blue single wavelength (425 nm) Light Emitting Diode (LED) forensic handheld lights in a darkened room. On the Visible Induced Luminescence technique see Verri 2009.

Prior to the analytical investigation the following features were observed on the paintings' surfaces:

1. All wooden panels were covered with a thin white ground, serving as a substrate to the paint layer. Paint was applied directly on the ground to shape bodies in pinax A (**Fig. 1**), with black and red contour lines drawn at a second stage and details superimposed at the final stage. The only occurrence of a black undercoat is visible on the areas of blue paint.
2. The white ground layer was not preserved entirely, but has perished in many areas, leaving ghosts of the original sketch of the figures and traces of paint on the wooden surface (**Fig. 6**).
3. Incisions were traced in pinax B and D (**Figs. 2, 5**) for a preliminary set up of the figures, which the painter did not follow rigorously once he applied his colours and lines.

The white substrate was identified by MRM with gypsum (calcium sulfate dihydrate), a usual preparation for painting in tempera, as it has been widely attested in painted documents from the 2nd century AD to the Byzantine and primitive Italian painters of the quattrocento. This is believed to be the first historical occurrence of the use of gesso in western painting. Theophrastus reports gypsum, among the three other natural kinds of earth (the Melian, the Kimolian, and the Samian), suggesting that painters used the famous Melian earth as a pigment (*De Lap.*, 62), but that gypsum was also employed by painters for some parts of their work (*De Lap.* 67). On the metopes of the temple of Apollo Thermios the ground was also composed of a mixture of gypsum and yellow ochre, while gypsum alone was also used as a white pigment to indicate details added after firing on the smaller metopes of Apollo Lyseios²⁵. On the Pitsa panels, gypsum must have been mixed with an organic binder, presumably animal glue, in order to give strength to the ground and fix it to the wooden surface. As recent analyses have shown from paintings of the Early Bronze age and the Hellenistic period, egg and vegetable gums, mainly tragacanth, were abundantly used by ancient Greek painters on both marble and plaster²⁶. Further investigation is required to shed more light on the organic media employed on the Pitsa panels.

After the application of the gypsum layer, the incised lines were traced, visible on the heads and shoulders of the figures on panel D (**Fig. 6**), as well as on the sandals on panel B (**Fig. 2**). No incisions are visible on the two other panels. Delicate outlines in black and red were then drawn and were subsequently filled with colours in rather homogeneous paint layers without shading. Superimpositions of paint layers are made to indicate details, mainly ornaments on the garments, wreaths on the heads and lines to show folding. The examination of the pigments from the pictorial layers gave the following results:

On panel A, the black used for the outlines and hair of the figures was identified to charcoal (carbon black). The gamut of coloured pigments contained iron oxide pigments. Hematite has

²⁵ Papapostolou 2002.

²⁶ Brecolaki 2006, 400-405 ; Brecolaki 2012.

been identified for the dark red of the chiton and himatia, and a mixture of hematite and gypsum was applied to render the colour of the men's skin. The blue applied on the Doric peplos of the female figures is the well-known synthetic pigment Egyptian blue, identified in almost all ancient Greek paintings and polychromy. The pale olive green colour, used to render the myrtle wreaths on the heads of the figures and the branches is mixture of a yellow ochre and carbon black. The distribution of Egyptian blue on the panels and its absence in the greenish layers was confirmed with the VIL technique (**Fig. 7**). Scanty traces of yellow are visible on the lower parts of the peplos, applied on top of Egyptian blue. Further investigation is required to identify the nature of the yellow pigment. On panels B and C, apart from hematite and Egyptian blue, bright cinnabar was also applied on the garments (**Spectrum A**). Cinnabar was even more generously employed on panel D together with a brighter hue of Egyptian blue, presumably due to its finer grinding. Cinnabar was used on this panel not only to promote vividness of the garments, but also to trace outlines of the figures on the gesso background and facial features except the eyes, which are drawn with a rather diluted black. The hair of the figures, unlike panel A, is rendered with a yellow ochre, evoking a blond colour.

Together with iron based pigments, cinnabar and Egyptian blue, a rather unexpected pigment was also identified on panel C. The very bright yellow of the pendant attracted our attention (**Fig. 8**). MRM analysis confirmed its identification as pararealgar, an arsenic sulfide (**Spectrum B**). The fact that the spectrum did not correspond to orpiment, a well-known arsenic based pigment, often reported by ancient authors, seemed interesting. In fact, going back to the photos taken in 1986, the copy of the originals made shortly after their discovery and the description of the excavator, we confirmed that the original colour of the necklace beads was orange-red and not yellow. There had been a photodegradation of the red pigment realgar to the yellow pigment pararealgar, which is its light-induced polymorph (As_4S_4)²⁷. Realgar has been used as a pigment since antiquity and is known today for the lack of permanence of its colour, which changes from red to yellow on exposure to light. Naturally occurring arsenic sulfide minerals are brightly coloured and consequently have been used as artists' pigments since ancient times²⁸. Its identification on the Pitsa panel represents the earliest occurrence of this pigment in ancient Greek painting and polychromy. The deliberate will of the painter of pinax C to include in his palette three different reds is of a particular interest. Bright cinnabar was used for the chiton, deep brown for the details on the garment, and orange-red for the beads of the necklace, perhaps wishing to suggest the colour of amber²⁹.

While the principles of composition and proportion must have been the same in vase painting, wall painting and panel painting until the 5th century BC³⁰ and the technique of overlapping

²⁷ Corbeil, Helwig 1995.

²⁸ Brecolouki 2014.

²⁹ Brecolouki 2012, 15-19.

³⁰ Boardman 1954.

figures to suggest depth represented a logical evolution in the painter's art³¹, the striking difference of the Pitsa panels, compared with those other early documents, relies almost exclusively on the use of colour. The Archaic painters who produced the four wooden panels from Pitsa, still far away from the concept of pictorial mimesis and the use of colour as a tool of producing likeness to the model, adopt a more varied palette that allows them to convey a richer polychromy and vividness in their compositions. The new elements obtained through the analytical examination of the Archaic panels from Pitsa with the identification of expensive and rare pigments, revive our speculations for both their quality as art works and their function as votive offerings in Greek sacred contexts.

Bibliographical References

Amyx, D.A., 1983, Archaic Vase-Painting vis-à-vis 'Free Painting' at Corinth, in W. G. Moon (ed), *Ancient Greek Art and Iconography*. Madison.

Boardman, J., 1954, Painted Votive Plaques and an Early Inscription from Aegina, *BSA*, vol. 49, 183-201.

Brecoulaki, H., 2001, *L'esperienza del colore nella pittura funeraria dell'Italia preromana, IV-II s. av.* C. Naples.

Brecoulaki H., 2006, *La peinture funéraire de Macédoine. Emplois et fonction de la couleur, IV-IIe s. av. J.-C.*, Meletemata 48. Athens.

Brecoulaki, H., Andreotti, A., Bonaduce, I., Colombini M. P. and Lluveras, A. Characterization of organic media in the wall-paintings of the 'Palace of Nestor' at Pylos, Greece: evidence for a secco painting techniques in the Bronze Age, *Journal of Archaeological Science* 39, 2866-76.

Brecoulaki H., 2014, Precious Colours in Ancient Greek Polychromy and Painting: Materials Aspects and Symbolic Values, *Révue Archéologique* 2014/1, n° 57, p. 1-36.

Brecoulaki H., Kavvadias G., Verri G., 2014, Colour and Luxury. Three Classical Painted Marble Pyxides from the Collection of the National Archaeological Museum of Athens, in J. S. Østergaard and A.M. Nielsen (eds.), *Transformations: Classical Sculpture in Colour*, Carlsberg Glyptotek, Copenhagen, p. 152-165.

Douglass D. L./Ching Ch./Wang G., 1992, The light-induced alteration of realgar to pararealgar, *American Mineralogist*, 77, 1266-1274.

Emmerling E., Adelfinger K. and Reischl J., On the Painting Technique of the Tomb Chamber, in L. Summerer, A. von Kienlin (eds), *Tatarli. The Return of Colours*, Istanbul, 204-233.

Kaltsas N., 2007, *To Εθνικό Αρχαιολογικό Μουσείο*, Athens.

Kottaridi A., 2011, *Macedonian Treasures: A Tour through the Museum of the Royal Tombs of Aigai*, Kapon Editions, Athens.

Kyrieleis, H., 1980, Archaischen Holzfunde aus Samos, *AM* 95, 87-147.

³¹ Observed on both miniature style vase painting (as on the the Chigi vase; Mugione 2012), on clay plaques with larger scale figures (as those of the Thermon metopes; Papapostolou 2002, 57-58) and monumental paintings (as the recently discovered wall paintings at the Kalapodi Archaic temple of Apollo; Niemeier et al. 2012).

- Larson, J., 2001, *Greek Nymphs, Myth, Cult, Lore*, Oxford.
- Lee L., Quirke S., 2000, Painting Materials , in P. T. Nicholson, I. Shaw (eds), *Ancient Egyptian Materials and Technology*, Cambridge.
- Lonsdale, S. H., 1993, *Dance and Ritual play in Greek Religion*, Baltimore.
- Miller, S. G., « Hellenistic Painting in the Eastern Mediterranean, Mid-Fourth to Mid-First Century B.C., in J. J. Pollit, *The Cambridge History of Painting in the Classical World*, Cambridge, 2015, 170-237.
- Mugione E., (ed.), 2012, *L'olpe Chigi. Soria di un agalma*, Ergasteria 2, Salerno.
- Niemeier W.D, Niemeier B., Brysbaert A. (2012), «The Olpe Chigi and new evidence for early Archaic Greek wallpainting from the Oracle Sanctuary of Apollon at Abai (Kalapodi)», in Mugione E., éd., *L'olpe Chigi. Soria di un agalma*, Ergasteria 2, Salerno, p. 79-86.
- Orlandos, A. K., 1935, Pitsa, AA 50, 197 – 198.
- Orlandos, A. K., 1965, Pitsa, *Enciclopedia dell' arte antica classica e orientale*, VI, Roma, 201 – 220.
- Lemerle, P. 1935, Chronique des fouilles et découvertes archéologiques dans l' Orient hellénique, *BCH* 59, 258-259.
- Papapostolou, J.A., 2000, Colour in Archaic Painting, in Tiverios and Tsiafaki 2002, 53-64.
- Pfuhl, E., 1939, *Malerei und Zeichnung der Griechen*, Munich.
- Rizakis, A. D., 2008, *ACHAÏE III*, Achaïe. 3, *Les cités achéennes: épigraphie et histoire*, MELETEMATATA 55, Athens.
- Scheibler, I., 1994, *Griechische Malerei der Antike*, Munich.
- Tanimoto S., Ambers J., Stacey R., 2008, Identification of the pigments, gesso and binding media found on a 4th century BC wooden panel (1975, 0728.1), *DCDS Report NO. AR2007/97*, The British Museum.
- Tiverios M. And Tsiafaki D. (eds), 2002, *Colour in Ancient Greece. The Role of Color in Ancient Greek Art and Architecture 700-31 BC*, Thessloniki.
- Verri, G., 2009, The spatial characterisation of Egyptian blue, Han blue and Han purple by photo-induced luminescence digital imaging, *Analytical and Bioanalytical Chemistry* 394 (4), 1011–1021.
- Walter-Karydi, E., 1986, Prinzipien der archaischen Farbgebung , in K. Braun, A.Furtwängler (ed.), *Studien zur klassischen Archäologie. Festschrift Fr. Hiller*, Saarbrücken, Archaeological Institute, 23-41.
- Walter-Karydi, E., 1991, Χρῶς: die Entstehung des griechischen Farbwortes, *Gymnasium*, XCVIII, 517-533.