



«Κύρτου πλέγματα»
Δίκτυα οικονομίας, εξουσίας και γνώσης στον ελληνικό χώρο από τους προϊστορικούς χρόνους έως τη σύγχρονη εποχή: αναλυτική τεκμηρίωση – ερμηνευτική χαρτογράφηση – συνθετικές προσεγγίσεις
(ΚΡΗΠΙΣ 447995)

ΕΝΟΤΗΤΑ ΕΡΓΑΣΙΑΣ 4
Δίκτυα γνώσης και πολιτισμού
«Παραδοτέο 4.2: Επιστημονικά δημοσιεύματα»

- 1 -

HARIKLEIA BRECOULAKI
“Precious Colours” in Ancient Greek Polychromy and
Painting: Material Aspects and Symbolic Values

στο: *Revue archéologique* 2014/1, 1-35.

Ευρωπαϊκή Ένωση
Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Υπουργείο Πολιτισμού, Παιδείας & Θρησκευμάτων
Γενική Γραμματεία Έρευνας & Τεχνολογίας

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΥΠΟΥΡΓΕΙΟ ΟΙΚΟΝΟΜΙΑΣ
ΥΠΟΔΟΜΩΝ, ΝΑΥΤΙΛΙΑΣ & ΤΟΥΡΙΣΜΟΥ

ΑΝΤΑΓΩΝΙΣΤΙΚΟΤΗΤΑ
ΕΠΙΧΕΙΡΗΜΑΤΙΚΟΤΗΤΑ
ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
ΕΠΑΝ ΙΙ

ΕΣΠΑ
2007-2013
Πρόγραμμα για την ανάπτυξη

η περιφέρεια στο **επίκεντρο** της ανάπτυξης

Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης - Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης (ΕΤΠΑ), στο πλαίσιο του Ε.Π. Ανταγωνιστικότητα και Επιχειρηματικότητα (ΕΠΑΝ ΙΙ) και των Π.Ε.Π. Αττικής, Π.Ε.Π. Μακεδονίας - Θράκης

Η Πράξη ΚΡΗΠΙΣ 447995 με τίτλο «Κύρτου πλέγματα. Δίκτυα οικονομίας, εξουσίας και γνώσης στον ελληνικό χώρο από τους προϊστορικούς χρόνους έως τη σύγχρονη εποχή: αναλυτική τεκμηρίωση — ερμηνευτική χαρτογράφηση — συνθετικές προσεγγίσεις» υλοποιείται στο πλαίσιο της Δράσης «Αναπτυξιακές προτάσεις Ερευνητικών Φορέων-Κρητίς», που χρηματοδοτείται από το Επιχειρησιακό Πρόγραμμα «Ανταγωνιστικότητα και Επιχειρηματικότητα» (ΕΠΑΝ-ΙΙ), Άξονα Προτεραιότητας (Α.Π.) 1 «Δημιουργία και Αξιοποίηση της Καινοτομίας Υποστηριζόμενη από Έρευνα και Τεχνολογική Ανάπτυξη» και από τα Περιφερειακά Επιχειρησιακά Προγράμματα (ΠΕΠ) στις 3 Περιφέρειες μεταβατικής στήριξης του Εθνικού Στρατηγικού Πλαισίου Αναφοράς (ΕΣΠΑ) 2007 – 2013. Η Δημόσια Δαπάνη συγχρηματοδοτείται από το Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης (ΕΤΠΑ) της Ευρωπαϊκής Ένωσης και από Εθνικούς Πόρους.

revue archéologique

2014 - Fascicule 1

“Precious Colours” in Ancient Greek Polychromy and Painting: Material Aspects and Symbolic Values, par Harikleia Brecoulaki	1
Sarapis et Néôtera élus parmi les dieux, par Richard Veymiers	37
<i>Documents et chroniques</i>	
Le monoptère carré d’Orikos (Albanie), par Saimir Shpuza	57
«...quod semper pateret». La porta Pandana, la porta Carmentalis e l’Asylum, par Francesco Marcattili	71
<i>Variétés</i>	
Nuove prospettive e vecchi paradigmi negli strumenti della formazione universitaria contemporanea. Considerazioni sulla manualistica di archeologia e storia dell’arte antica, par Mario Denti	89
<i>Bulletin de la Société française d’Archéologie classique (XLIV, 2012-2013)</i>	
Découvertes récentes à Péluse (Tell el-Farama et Tell el-Makhzan), par Charles Bonnet et Jean-Yves Carrez-Maratray, p. 101 – Deux lieux du pouvoir dans le monde italique archaïque : les dernières recherches à Torre di Satriano (Basilicate), par Massimo Osanna, p. 108 – Recherches récentes au théâtre de Baelo Claudia, par Hélène Eristov, Myriam Fincker et Jean-Charles Moretti, p. 118 – Égyptiens et Grecs à Naucratis et Daphnae. Projets en cours du British Museum, par François Leclère, Jeffrey Spencer et Alexandra Villing, p. 126 – Les mosaïques d’Antioche du Louvre : nouvelle présentation, nouvelles recherches, par Cécile Giroire, p. 136 – La présence isiaque dans le Péloponnèse. Sur les traces des lieux de culte, par Richard Veymiers, p. 143 – Excursion à Alésia, p. 152	
<i>Comptes rendus bibliographiques</i>	153
<i>Ouvrages adressés à la Revue archéologique</i>	223



Couverture : création Christian Colonna de Leca.

Cliché : Héraion d'Olympie, Grèce.

© CNRS, IRAA

(photographie : Hélène Virepinte).

Remerciements : Service archéologique grec, Athènes.

ISBN 978-2-13-062915-3

Dépôt légal — 1^{re} édition : 2014, juin

© Presses Universitaires de France, 2014
6, avenue Reille, 75014 Paris

“PRECIOUS COLOURS” IN ANCIENT GREEK POLYCHROMY AND PAINTING: MATERIAL ASPECTS AND SYMBOLIC VALUES

par Harikleia Brecoulaki

Abstract. – Within the broad corpus of polychrome artefacts and paintings from ancient Greece, uncommon pigments have been identified, which signify high social status, or seem to have functioned as components of ritual displays. In this paper, I attempt to track possible markers of meaning within the diachronic use of “precious colours” in Ancient Greek polychromy and painting, covering a wide chronological span, with specific examples from the Bronze Age to Hellenistic times. The conclusions here presented about this class of uncommon pigments, and their application to polychromy and figural painting, are based on the results of recent analytical investigations and on information taken from ancient textual sources.

Key-Words. – Greek World. Wall paintings. Precious pigments. Azurite. Cinnabar. Lapis lazuli. Purple. Conicalcrite. Orpiment. Colour symbolism. Bronze Age. Classical and Hellenistic times.

Les « couleurs précieuses » dans la polychromie et la peinture grecque antiques : aspects matériels et valeur symbolique

Résumé. – Dans le vaste corpus d’objets et de peintures polychromes de la Grèce antique, des pigments peu banals ont été identifiés, qui renvoient à un haut statut social ou semblent avoir joué un rôle dans une pratique rituelle. Dans cet article, l’auteur tente de relever les éventuels marqueurs de signification à travers l’utilisation diachronique de « couleurs précieuses » dans la polychromie et la peinture antiques, en couvrant une large fourchette chronologique, à partir d’exemples caractéristiques qui vont de l’âge du Bronze à l’époque hellénistique. Les conclusions présentées ici sur ce groupe de pigments et sur leur utilisation dans la polychromie et la peinture figurée se fondent sur les résultats d’analyses récentes et sur des informations tirées de sources écrites de l’Antiquité.

Mots clés. – Monde grec. Peintures murales. Pigments précieux. Azurite. Cinabre. Lapis-lazuli. Pourpre. Conicalcrite. Orpiment. Symbolisme des couleurs. Âge du Bronze. Époques classique et hellénistique.

INTRODUCTION

Within the broad corpus of polychrome artefacts and paintings of ancient Greece, a class of non-frequently used painting materials may be referred to as “precious” considering their extraordinary visual properties, their intrinsic material value, their remote geological source, the complexity of the manufacture and preparation process, and finally the symbolic values they may have conveyed within a broader cultural context. In a number of cases, when polychromy is still preserved on prestigious artefacts—usually signifying high social status or functioning as a component of ritual display—, a predilection for the use of uncommon pigments seems to reflect the overall

4 *Harikleia Brecoulaki*

value and meaning attached to those objects¹. Indeed colour (together with material, texture and shape) may have played a salient role in the classification of precious objects. As far as representational painting is concerned, the “value” of a colour may often be grasped through its connection to specific iconographic elements of the composition and its possible further involvement in pictorial narratives. However, colour *poikilia* may also reflect the economic affluence of the patron, with rare and expensive pigments serving as markers of private wealth. In this article issues of colour sensibility and artistic colour application in ancient Greece are discussed, by integrating the results of recent analytical investigation of the polychromy of selected artefacts and wall paintings from the Bronze Age to Hellenistic times.

COLOUR AND MATERIAL EVIDENCE FROM THE BRONZE AGE

AZURITE AND CINNABAR IN CYCLADIC CULTURE

Already in the very remote Early Bronze Age in the Cyclades, pigments were used in paint layers (mostly red, with ghosts of blue, green and black paint)² —decorating the surface of figurines and marble vessels³; on tools used for the preparation and application of pigments⁴ (mullers for grinding and marble slabs for mixing); within special containers⁵ used for storage or trade (terracotta aryballoids, bone pipes and marble caps), and in the form of lumps⁶. Discussions of the significance of colour on Cycladic artefacts have implied a possible ritual function, related to burial⁷. Indeed, on such an extra-utilitarian class of objects, which served both as social markers for the people who possessed them⁸ and possibly as ritual paraphernalia, colour may have played an important role. The extraordinary shape of the bone pipes containing ground blue azurite pigment, which were deposited as offerings in rich tombs on Syros and Naxos, indirectly informs us about

Warm thanks are due to Garth Fowden for reading my manuscript and for sharing with me his thoughts.

1. On the relationship between individuals' social identity and the objects that represent them, see J. HOSKINS, *Biographical Objects: How Things Tell the Stories of People's Lives*, New York, Routledge, 1998.

2. BIRTACHA 2003, p. 270, n. 45 with bibliogr. The traces of green are probably due to the chromatic alteration of azurite, a hydrated copper carbonate mineral turning to green malachite, and not to the intentional use of a green pigment (J. RUTHERFORD, J. GETTENS, E. FITZHUGH, 'Azurite and Blue Verditer', *ROY* 1993, p. 23-31).

3. P. G. PREZIOSI, S. WEINBERG, 'Evidence for Painted Details in Early Cycladic Sculpture', *AntK*, 13, 1970, p. 4-12; E. OUSTINOFF, 'The Early Cycladic Sculptor: Materials and Methods', P. GETZ-PREZIOSI (ed.), *Early Cycladic Art in North American Collections*, Richmond, Virginia Museum of Fine Arts, 1987, p. 90-102; E. HENDRIX, 'Painted Ladies of the Early Bronze Age', *Metropolitan Museum of Art Bulletin*, 55, 1998, p. 4-15; ead., *The Paint Motifs on Early Cycladic Figures*,

PhD University of Michigan, Ann Arbor, 2000; HENDRIX 2003; P. GETZ-GENTLE, *Stone Vessels of the Cyclades in the Early Bronze Age*, University Park, Pennsylvania State University Press, 1996, p. 177-179, 330, table XXV.

4. BIRTACHA 2003, p. 265-267.

5. BIRTACHA 2003, p. 268-269, n. 25, 28 with bibliogr.

6. M. E. MARTHARI, *To αρχαιολογικό Μουσείο της Ιου*, Athens, TAPA, 1999, p. 25, fig. 16.

7. D. W. J. GILL, C. CHIPPINDALE, 'Material and Intellectual Consequences of Esteem for Cycladic Figures', *AJA*, 97, 1993, p. 601-659; C. BROODBANK, *An Island Archaeology of the Early Cyclades*, Cambridge, CUP, 2000, p. 63-65. For the cultural significance of the process of painting in tombs, see E. A. HENDRIX, 'Painted Early Cycladic Figures: An Exploration of Context and Meaning', *Hesperia*, 72, 2003, p. 437-439.

8. M. HELMS, *Craft and the Kingly Ideal: Art, Trade, and Power*, Austin, University of Texas, 1993; G. PAPADATOS, 'Eva παλίμνηστο, λοιπόν...', VLACHOPOULOS, BIRTACHA 2003, p. 277-291, with bibliogr.

the value of the material they enclose. We have no clear evidence about the use of these enigmatic pigment-filled pipes⁹, but it seems likely that they were also connected with ritual display. The practice of filling bone pipes with azurite has been recently documented in a number of Kurgan burial mounds in the South Urals and Kazakhstan dated to the 7th and 6th cent. BC, and it is suggested that azurite was probably used as a cosmetic or for tattooing¹⁰. The use of azurite within funerary contexts is already attested in Neolithic settlements (Çatal Hüyük, levels VIII-VI and Azmak), suggesting a very early deployment of this material as a cosmetic or as a colour related to burial practices¹¹. The identification of azurite inside Cycladic marble vessels and bone containers represents the earliest use of this natural copper-based blue in ancient Greece (fig. 1), although its application within a paint layer on Cycladic artefacts is not yet satisfactorily documented¹². For the Cycladic people, the closest sources of copper ores for the procurement of azurite would have been Kythnos, Siphnos and Seriphos¹³. It seems likely, therefore, that besides its chromatic resonance



1. Blue pigment azurite on the bottom of a stone bowl from Syros. Prehistoric collection of the National Archaeological Museum of Athens. © S. Sotiropoulou.

9. Ch. TSOUNTAS, 'Κυκλαδικά', *AE*, 1899, p. 104, 113; N. KONTOLEON, 'Ανασκαφαί Νάξου', *PAE*, 1970, p. 153, pl. 144; Ch. DOUMAS, *Early Bronze Age Burial in the Cyclades* (*SIMA*, 48), 1977, p. 161; BIRTACHA 2003, fig. 2a. H. GENZ, *Ritzverzierte Knochenhälsen des dritten Jahrtausends im Ost-mittelmeerraum. Eine Studie zu den frühen Kulturverbindungen zwischen Levante und Ägäis*, Wiesbaden, Harrassowitz, 2003.

10. A. TAIROV, A. FILIPPOVICH BUSHMAKIN, 'The Composition, Function and Significance of the Mineral Paints from the Kurgan Burial Mounds of the South Urals and North Kazakhstan', JONES, MACGREGOR 2002, p. 175-193.

11. J. MELLAART, 'Excavations at Çatal Hüyük. 4th Preliminary Report, 1965', *AnatSt*, 16, 1966, p. 183-184.

12. HENDRIX 2003, p. 145, table.

13. C. RENFREW, 'Cycladic Metallurgy and the Aegean Early Bronze Age', *AJA*, 71, 1967, p. 1-20; Y. BASSIAKOS, O. PHILANIOTOU, 'Early Copper Production on Kythnos. Archaeological Evidence and Analytical Approaches to the Reconstruction of the Metallurgical Process', P. M. DAY, R. C. P. DOONAN (ed.), *Metallurgy in the Early Bronze Age Aegean* (*Sheffield Studies in Aegean Archaeology*, 7), Oxford, Oxbow, 2007, p. 19-56.

the choice of azurite was very much related to its availability in nearby mineral sources. Indeed, the total absence of other imported natural or synthetic blue pigments (Egyptian blue, or raw blue minerals such as lapis lazuli) in the restricted Cycladic “palette” suggests that azurite was the only available blue pigment for use in this specific context. The association of azurite—a weathered product of copper ores—with the technological processes of early metallurgy and the transformative creation involved in the act of making bronze objects may well have charged it with symbolic overtones¹⁴. Furthermore, the fact that azurite was mainly used as an offering to the dead, in both open vessels and closed containers, cannot be dismissed as pure chance. The use of azurite in Greek polychromy and painting does not seem to have been common. A blue lump of azurite was found in the Middle Minoan palace at Knossos, but its function was probably associated with cosmetics rather than wall decoration¹⁵, and recently lumps of azurite together with other green copper carbonates (malachite) and copper chlorides (paratacamite) were identified in Mycenaean tholos tombs on the Greek mainland¹⁶.

The predilection for cinnabar, a mercury sulfide, for decorating marble figurines and vessels¹⁷ reflects the special attention that was given to the choice of this pigment, whose hues and market value were distinguished from more humble widespread materials such as iron based ochres. Red ochre has been found on the bodies of marble figurines, but recent analysis has shown that much of the red material employed both on figures and in vessels may in fact have been cinnabar¹⁸. The bright red of cinnabar is very attractive to the eye and its visual qualities are further enhanced when light-reflecting white marble serves as its support¹⁹. Nonetheless, its application would have required a strong binding medium because of its sandy texture, and it would have offered very restricted chromatic variety, compared to the great range of hues that can be easily obtained from iron oxide based ochres. Red ferric oxides were abundant within the Aegean²⁰, and sources such as Kea and Thasos became famous in the historic periods for their high-quality red ochres²¹. But what about cinnabar? The scarcity of this mercury compound is stressed by many classical and Roman authors (Theophrastos, *De Lap.*, 58; Pliny, *NH XXXVII*, 114, and Vitruvius, *De Arch.* VII, IX, 4) who suggest the coasts of Asia Minor (Ephesus and Miletus), ancient Colchis in the Black Sea, and Almaden in Spain as the nearest sources to Greece for this material (fig. 2). Let us not forget

14. As N. Saunders points out: “When metalworking first appears it may have possessed a significance beyond modern definitions of economical and technological efficiency. By comparison with existing technologies of wood, bone and stone, metallurgy is a time-consuming and technologically complex process whose advantages over existing technologies were possibly related to spirituality, ritual and display (N. J. SAUNDERS, ‘The Colours of Light: Materiality and Chromatic Cultures of the Americas’, JONES, MACGREGOR 2002, p. 209-226). For hypothetical symbolism of colour in Bronze Age Crete, see PETERS 2008, p. 197-208.

15. DANDRAU 1999, p. 14.

16. The analytical data obtained from the examination of numerous pigment lumps from Mycenaean contexts is part of a broader joint project on colouring matters dated to the 3rd and 2nd millennium BC, from the Prehistoric Collection at the Archaeological Museum of Athens. The project is coordinated by S. Sotiropoulou (Ormylia Art Diagnosis Center), in collaboration with the author

and E. Papazoglou (National Archaeological Museum, Athens), and is sponsored by the Institute of Aegean Prehistory (INSTAP).

17. R. A. HIGGINS, ‘A Cycladic idol’, *The British Museum Quarterly*, 36, 1972, p. 118; S. SHERRATT, *Catalogue of Cycladic Antiquities in the Ashmolean Museum: The Captive Spirit*, Oxford, OUP, 2000, p. 117-118; HENDRIX 2003, p. 145.

18. HENDRIX 2003, p. 141, n. 12 and 145, table; BIRTA-CHA 2003, p. 272, n. 63.

19. On cinnabar’s physical properties and colour see R. J. GETTENS, R. L. FELLER, W. T. CHASE, ‘Vermilion and Cinnabar’, ROY 1993, p. 159-182.

20. Kythnos and Seriphos are rich in secondary iron ore deposits (hematite, limonite, goethite, magnetite).

21. C. KOUKOULI-CHRYSSANTHAKI, G. WEISGERBER, ‘Παλαιολιθικό ορυχείο όχρας στη Θάσο’, *Archaiologia & Technes*, 60, 1996, p. 82-89; E. PHOTOS-JONES, A. COTTIER, A. J. HALL, L. G. MENDONI, ‘Kean Miltos: the Well-known Iron Oxides of Antiquity’, *ABSA*, 92, 1997, p. 359-371.



2. Natural cinnabar and mercury from Almaden, Spain. © P. Géry.

that cinnabar is completely unknown throughout the entire vast corpus of Aegean wall-painting²², despite the famous “thalassocratie” and the intensive trade with the East, while its use remained parsimonious during the Archaic and Classical periods. Were there alternative cinnabar sources available in the Cyclades or within the Cycladic sphere²³? Or did its exotic origin indeed add to the potency of the red material²⁴, considering the prestige in early societies of materials brought home from afar? Even though some evidence for cinnabar in the Aegean exists (traces have been found in Euboea, Naxos, Chios, Samos²⁵ and Thasos²⁶), so far it has turned up only in extremely small quantities and mainly in waterborne secondary contexts²⁷. Therefore it seems unlikely that potential mercury sources in the Aegean were used for the procurement of cinnabar as a pigment within Cycladic societies of the Early Bronze Age.

22. DANDRAU 1999; JONES, PHOTOS-JONES 2004. Cinnabar was not used in Dynastic Egypt or in the early civilizations of Mesopotamia: A. LUCAS, J. R. HARRIS, *Ancient Egyptian Materials and Industries*, London, Edward Arlond Ltd, 1962; LEE, QUIRKE 2000, p. 104-120.

23. CARTER 2008, p. 119-129.

24. On the rarity of cinnabar, and possible sources in Asia Minor and the Balkans, see HENDRIX 2003, p. 141. On the use of cinnabar to paint bodies, as evidenced by traces of paint found on skeletal remains from Çatal Hüyük, see B. S. DÜRING, ‘Burials in context: The 1960s inhumations of Catalhöyük East’, *AnatSt*, 53, 2003, p. 3.

25. CARTER 2008, p. 122; R. HÖLL, ‘Genese und Altersstellung von Vorkommen der Sb-W-Hg formation in der Türkei und auf Chios-Griechenland’, *Abhandlungen der Bayerischen Akademie der Wissenschaften*, 127, 1966, p. 1-138; K. ZAGOUROGLOU, ‘Συνοπτική Έκθεση επί της κατανομής του Hg στην περιοχή Ζεστό της Σάμίου’, *Internal Report, Institute for Geology and Mineral Exploration*, Athens, 1980.

26. A. DIMITRIADES, ‘The use of primary and secondary dispersion halos of mercury in the prospecting for concealed mineral deposits’, *3rd interim report* (Thasos island, Thrace, Greece), *Internal Report, Institute for Geology and Mineral Exploration*, Athens, 1983.

27. CARTER 2008, p. 122.

PURPLE AND NATURAL GREEN COPPER MINERALS IN THE "PALETTE" OF THE AEGEAN PAINTERS

In so far as we are attempting to attribute meaning to colours in early societies where linguistic context is scarce or missing, emphasis is inevitably given to their materiality and significant patterns that may arise from their applications. As I already mentioned above, although cinnabar and azurite received special attention within the Cycladic cultural context, both materials were absent from the "palette" of Aegean artists of the Late Bronze Age. The reasons for the exclusion of azurite may easily be hypothesized. Despite its warm deep blue colour, which simulates the hues of precious lapis lazuli, azurite did not offer ideal working properties for use as a painting material. Its sandy texture requires grinding to a coarse grain for its colour to show, and its chemical instability once hydrated causes its colour to turn from blue to green²⁸. There is also the issue of supply and competition. The cessation of local copper production in the Aegean during the second millennium, due mainly to the exhaustion of oxidized copper ores (azurite, malachite, chrysocolla etc)²⁹, may have reduced the availability of azurite from the marketplace and made it less accessible to artisans. The importation of synthetic Egyptian blue pigment³⁰, a copper calcium silicate, which offers excellent properties for pictorial applications in a wide variety of hues and textures³¹, together with the exploitation of local resources, such as the blue-gray mineral riebeckite of the amphiboles family in Crete³² and Thera³³, provided possibly cheaper and more attractive solutions for the application of blue colour. Current research on the composition of Egyptian blue may also indicate an Aegean origin for this important blue painting material³⁴. In one very exceptional case, on a Mycenaean wall painting fragment from Gla, grains of lapis lazuli have been identified. However, this precious pigment was not used as a pure blue paint layer but in a mixture with red ochre and an organic pigment, to produce a violet hue³⁵. Further research is required to understand the motivation for the choice of this extraordinary pigment in such an early context, and what its iconographic associations were. The discovery of a hoard of Mesopotamian cylinder seals made of lapis lazuli, together with raw lapis fragments, in the New Palace at Thebes³⁶, may perhaps explain the presence and use of this material in an artisan's workshop in nearby Gla. Further research, however, is required in order to confirm the presence of this mineral on the wall paintings from Gla through cross checking of the results with different analytical techniques and evaluate its intentional use as a painting material.

28. L. DEI, A. AHLE, P. BAGLIONI, D. DINI, E. FERRONI, 'Green Degradation Products of Azurite in Wall Paintings: Identification and Conservation Treatment', *Studies in Conservation*, 43. 2, 1998, p. 80-88; A. LLUVERAS, S. BOULARAND, A. ANDREOTTI, M. VENDRELL-SAZ, 'Degradation of azurite in mural paintings: distribution of copper carbonate, chlorides and oxalates by SRFTIR', *Applied Physics*, A 99, 2010, p. 363-376. A chromatic alteration from blue to green was also attested on the Amathus Sarcophagus: HENDRIX 2001, p. 53.

29. I. BASSIAKOS, Th. TSELIOS, 'On the ceasing of the local copper production in the Aegean 2nd millennium BC', paper presented at: *Eastern Mediterranean Metallurgy and Metalwork in the 2nd Millennium BC, A conference in honour of James D. Muhly*, University of Cyprus, Nicosia, 10th-11th Oct. 2009, Conference abstracts, p. 1-2.

30. JONES, PHOTOS-JONES 2004, p. 209, 215, with bibliogr.

31. G. A. MAZZOCCHIN, D. RUDELLO, C. BRAGATO, F. AGNOLI, 'A Short Note on Egyptian Blue', *Journal of Cultural Heritage*,

5, 2004, p. 129-133, with previous bibliogr. on the properties and synthesis of Egyptian blue.

32. M. A. S. CAMERON, R. E. JONES, S. E. PHILIPPAKIS, 'Scientific Analysis of Minoan Fresco Samples from Knossos', *ABSA*, 72, 1977, p. 121-184.

33. V. PERDIKATIS, V. KILIKOGLU, S. SOTIROPOULOU, E. CHRYSICOPOULOU, 'Physicochemical Characterization of Pigments of Thera Wall Paintings', *SHERRATT 2000*, p. 103-118.

34. BRYLSBAERT 2008, p. 134-139.

35. A. BRYLSBAERT, 'Lapis Lazuli in an enigmatic "purple" pigment from a 13th-century BC Greek wall painting', *Studies in Conservation*, 51. 4, 2007, p. 325-359.

36. K. SYMEONOGLOU, 'Kadmeia I', *SIMA*, 35, 1973, p. 63-71; E. PORADA, 'The Cylindrical Seals Found at Thebes in Boeotia', *AJO*, 28, 1981, p. 1-70 (esp. 68-70); P. R. S. MOOREY, *Ancient Mesopotamian Materials and Industries. The Archaeological Evidence*, Oxford, Clarendon Press, 1994, p. 90.

In the Late Bronze Age palette, the only red documented so far is iron based. Red ochres were used to achieve a wide variety of hues ranging through pale pink, orange, red and brown. Their compatibility with all kinds of supports and painting techniques, their physico-chemical properties³⁷ and local procurement explain their abundant use in painterly applications³⁸. Interestingly, despite the use of bright red and pink lead based minerals as cosmetics in Thera³⁹, these materials do not seem to have been present as pigments in the painters' palette. Whether they were dismissed because of their cost, difficult manipulation, or inadequate visual impact is not yet understood. Cinnabar also remained outside the Aegean repertoire of coloured pigments, but the reasons for such an exclusion perhaps have more to do with practical/economical criteria than aesthetic requirements. Its absence from Mycenaean workshops is probably to be explained simply in terms of the difficulty of getting hold of it. However, in place of this 'precious' mineral red, Aegean painters adopted another 'precious' pigment, not from the mineral universe but from the organic sea world: murex purple.

The earliest applications of murex purple have been documented at Thera in certain wall paintings⁴⁰, as well as on powdered material which probably served as a cosmetic⁴¹. The uses and functions of murex purple in this period still need to be further explored. However, from its iconographic associations and the context where this pigment was found at Akrotiri (in the public building of Xeste 3, probably a religious center⁴²), it seems likely that it was employed in selected figurative motifs, emphasizing the overall symbolic value of the composition. The purple applied on the petals of the crocuses in the famous composition of the "Saffron Gatherers", on the garments of the "Woman with the bouquet" and the "Woman with the basket" in the procession scene, although evoking the original colours of the depicted objects in a 'naturalistic way', may have also served as a visual allusion to the sphere of ritual⁴³. The use of purple on Mycenaean wall paintings from the mainland seems to have been restricted to specific details within figural compositions⁴⁴, as on the Theran murals. Nonetheless, the extraordinary preservation of a variety of purple, mauve and pinkish hues on numerous fragments from the Mycenaean palace at Pylos⁴⁵, never previously recorded, has allowed us to further investigate the use of murex purple in Aegean painting⁴⁶. What is interesting in the case of Pylos is that purple, used either as a background colour or to paint details within figurative compositions, seems to have acquired specific meaning according to the

37. R. M. CORNELL, V. SCHWERTMANN, *The iron oxides. Structure, Properties, Reactions, Occurrences and Uses*, Weinheim, Wiley-VCH Verlag, 2003, 2nd ed.; K. KOUZELI, 'Ο σίδηρος και οι ενώσεις του στα αρχαιολογικά υλικά', *Σίδηρος. Ημερίδα Συντήρησης*, Thessaloniki, Archaeological Museum of Thessaloniki, 2009, p. 17-36.

38. EASTAUGH et al. 2004, p. 200-202.

39. S. SOTIROPOULOU, V. PERDIKATSI, Ch. APOSTOLAKI, A. G. KARYDAS, A. DEVETZI, K. BIRTACHA, 'Lead pigments and related tools at Akrotiri, Thera, Greece. Provenance and application techniques', *J. Archaeol. Sci.*, 7, 8, 2010, p. 1830-1840.

40. S. SOTIROPOULOU, 'La pourpre dans l'art cycladique: identification du pigment dans les peintures murales d'Akrotiri (Théra, Grèce)', *Preistoria Alpina*, 40, 2004, *Suppl.* 1, p. 167-176; S. SOTIROPOULOU, I. KARAPANAGIOTIS, 'Conchylarian Purple Investigation in Prehistoric Wall Paintings of the Aegean Area', L. MEIJER, N. GUYARD, L. SKALTSOUNIS, G. EISENBRAND (ed.), *Indirubin, the red shade of indigo*, Roscoff, Life in Progress, 2006, p. 71-78.

41. E. ALOUPI, Y. MANIATIS, Th. PARADELLIS, L. KARALI-YANNACOPOULOU, 'Analysis of a Purple Material Found at Akrotiri', D. A. HARDY (ed.), *Thera and the Aegean World III*, 1, London, Thera Foundation, 1990, p. 488-490.

42. Ch. DOUMAS, *Wall Paintings of Thera*, Athens, Thera Foundation, 1992, p. 123-171, fig. 116-134.

43. N. ANGELOPOULOU, 'Nature Scenes: An Approach to a Symbolic Art', SHERRATT 2000, p. 545-554; C. ZAITOUN, 'Vêtement et safran dans le rituel. L'importance de la parure dans la société égéenne', Fr. CHAUSSON, H. INGLEBERT, *Costume et société dans l'Antiquité et le haut Moyen Age*, Paris, Picard, 2003, p. 7-24.

44. Examples with use of purple colour are visible on wall paintings from Tiryns, Gla and Mycenae, but the identification of the pigment has not yet been confirmed.

45. LANG 1969.

46. BRECOULAKI et al. forthc.

area of the palace or the iconographic program where it was employed. A direct visual reference to the material world of dyed cloth, as in the Thera wall paintings, may be suggested by the traces of purple colour on the garments of the “Lyre player” in the Throne Room and on certain figures from the hunting scenes in Rooms 43 and 48⁴⁷. This colour was perhaps used to underscore the status of the wearers, since the adjective designating purple in Linear B tablets (*po-pu-re-ja*) seems to be almost always associated with the dying of textiles or with sumptuous cloth (L758a, Lc561a, L474, KN X 976)⁴⁸. This suggests that perhaps purple was, already in the Late Bronze Age, a favorite colour with the elite⁴⁹. The use of purple as a background colour in two figural compositions at the ‘Palace of Nestor’ provides us with rare visual testimonies where abstract, plain colour may have enhanced the overall narrative. In the well known “Battle scene” from Hall 64⁵⁰ the colour of the background was originally reconstructed as a homogeneous bright blue, conforming to the tradition of the plain and purely “decorative” backgrounds very often encountered in Aegean painting (fig. 3). However, recent technological examination of the polychromy of this scene has revealed that a different colour concept and intention dictated the creation of the background. Instead of applying a layer of uniform Egyptian blue, conforming with the traditional technique, the artist adopted murex purple for his primary pictorial layer and then added on top of it a thin layer of Egyptian blue, creating a vibrant purple-mauve effect by the careful superimposition of the two layers (fig. 4). Considering the heroic value that purple represented in the Homeric epics, and the fact that “porphyreos death” meant the glorious death that occurs on the battlefield⁵¹, it is tempting to interpret the purple background of the battle scene from Hall 64, as symbolic. Furthermore, it is interesting to stress that the other “combat scenes” coming from Hall 64 depicting most probably training between Mycenaean and not war between enemies, are always associated with a light blue background. It seems that purple was used to attract and perhaps guide the eye of the spectator to a narrative *momentum* where action culminates and the act of killing takes place. A different field of background would therefore be used to suggest a different field of action.

Murex purple was also identified on the background colour used to indicate the area of the sea in an unprecedented naval scene recently brought to light, that originally decorated the wall to the right of the doorway between Hall 64 and lobby 66⁵² (fig. 5). The purple-violet hue of the sea

47. LANG 1969, pls. A, M.

48. In the descriptions of completed cloth at Knossos, the adjective *wa-na-ka-te-ra/wanakterai* (‘royal’) may either indicate cloth for the use of the monarch, or perhaps only fabric of particularly high quality (J. T. KILLEN, ‘A Problem in the Knossos Lc[II] [Cloth] Tablets’, *Hermathena*, 118, 1974, p. 82-90. On the terms used in Mycenaean Linear B tablets for red colours in textiles, see B. BURKE, ‘Purple and Aegean Textile Trade in the Early 2nd Millennium BC’, P. P. BETANCOURT, V. KARAGEORGHIS, R. LAFFINEUR, W.-D. NIEMEIER [ed.], *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener [Aegaeum*, 20], 1999, p. 75-82; M. L. NOSCH, ‘Red Coloured Textiles in the Linear B Inscriptions’, L. CLELAND, K. STEARS, G. DAVIES [ed.], *Colour in the Ancient Mediterranean World*, BAR IS 1267, Oxford, 2004, p. 32-39, with bibliogr.).

49. M. VENTRIS, J. CHADWICK, *Documents in Mycenaean Greek*, Cambridge, CUP, 1956, p. 136; P. CARLIER, ‘À propos des artisans *wa-na-ka-te-ro*’, E. DE MIRO, L. GODART, A. SACCONI (ed.), *Atti e memorie del secondo Congresso internazionale di*

micenologia, Roma-Napoli, 14-20 ott. 1991 (Incunabula graeca, 98), Rome, 1996, p. 569-580.

50. LANG 1969, p. 71-72, pls. 16, 117, A, M; J. BENNET, J. DAVIS ‘Making Mycenaean: Warfare, Territorial Expansion, and Representations of the other in the Pylian Kingdom’, R. LAFFINEUR (ed.), *POLEMOS: Le contexte guerrier en Égée à l’âge du Bronze*, Liège, Université de Liège, 1999, p. 105-120.

51. MOATSOS 1932, p. 110-112; L. GERNET, ‘Dénomination et perception des couleurs chez les Grecs’, I. MEYERSON (ed.), *Problèmes de la couleur*, Paris, SEVPEN, 1957, p. 313-326; J.-P. VERNANT, ‘Mort grecque, mort à deux faces’, *Le Débat*, 12, 1981, p. 51-59; GRAND-CLÉMENT 2004, p. 132-133.

52. BRECOULAKI et al. forthc.; H. BRECOULAKI, Sh. STOCKER, J. DAVIS, E. EGAN, ‘An Unprecedented Naval Scene from Hall 64 of the Palace of Nestor at Pylos’, H. BRECOULAKI, Sh. STOCKER, J. DAVIS (ed.), *Mycenaean Wall Paintings in Context: New Discoveries and Old Finds Reconsidered*, Athens, Institute for Historical Research (KERA), in press.



3. Reconstruction of "battle scene" from Hall 64, Palace of Nestor at Pylos, by Piet de Jong.
© J. Stephens. Archives of the American School of Classical Studies at Athens.



4. Fragment from the "battle scene," Hall 64, Palace of Nestor at Pylos.
Detail of the duomachy on a purple background. Archaeological Museum of Chora.
© J. Stephens.



5. Reconstruction of the "naval scene" from Hall 64, Palace of Nestor at Pylos, detail. © R. Robertson.

depicted in the Pylian wall painting provides significant evidence about the imagery of purple in elite Late Bronze Age societies and their visual conventions. It recalls Homer's chromatic descriptions of the sea as *porphyreos* (*Il.* XVI, 391), *ioeidis* (*Il.* XI, 298; *Od.* V, 56; XI, 107) and *oinops* (*Il.* I, 350; II, 613; V, 771 etc.; *Od.* I, 183; III, 286; etc.), evoking a chromatic range through violet, mauve, purple and dark red hues. The pictorial depiction of a 'purple sea' on a Mycenaean wall painting from the Greek mainland allows us to further speculate that the Homeric descriptions were inspired by visual phenomena (such as the purple shade of the sea during sunset, so often encountered in Greece in summer time), which negates the hypothesis of a non-chromatic character, in particular for the adjective *oinops*⁵³. May the purple background have evoked a departure ceremony during sunset? Or perhaps murex purple, in this context, was a visual marker of the Pylian power?

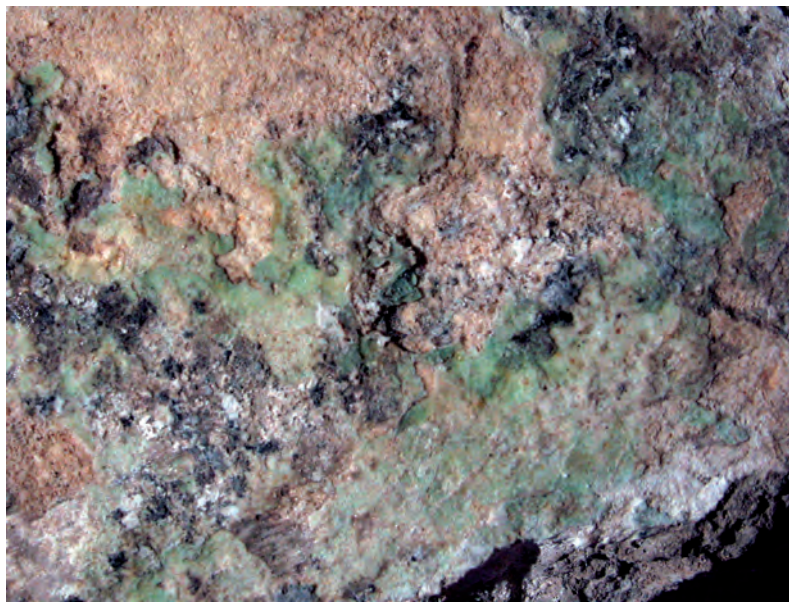
Another group of pigments which seem to have been unusual within Aegean painting are natural copper based greens. In the few cases where mineral green pigments have been identified on wall paintings, it has been suggested that they were obtained from local sources⁵⁴. Their scarcity

53. A. CHRISTOL, 'Les couleurs de la mer', L. VILLARD (ed.), *Couleurs et visions dans l'Antiquité classique*, Rouen, Publications de l'Université de Rouen, 2002, p. 31, 34; A. GRAND-CLÉMENT, 'La mer pourpre : façons grecques de voir en couleurs. Représentations littéraires du chromatisme marin à l'époque archaïque', *Pallas*, 92, 2013, p. 133-151.

54. Green malachite was identified by Heaton on the 'figure-of-eight shield' scene at Tiryns (N. HEATON, 'On the

nature and method of execution of specimens of painted plaster from the palace of Tiryns', G. RODENWALDT [ed.], *Tiryns II. Die Ergebnisse der Ausgrabungen des Instituts. Die Fresken des Palastes*, Athens, Eleutheroudakis and Barth, 1912, table 5), and the presence of green earth is recently attested in two green samples from Palaikastro (a mixture of celadonite and chlorite), presumably from a local source (BRYSSBAERT 2008, p. 133).

may be linked to the difficulty of procuring green minerals in general, rather than to an aesthetic prejudice that excluded vivid green hues from the palette. Mark Peters' hypothesis that green copper minerals were on purpose avoided as painting materials because of their direct association with the "destructive" process of oxidation and "decay" of azurite cannot be sustained and seems rather anachronistic⁵⁵. The wall paintings from the Mycenaean palace at Pylos offer interesting insights into the use of copper-based mineral green pigments. Green minerals including pseudomalachite, chrysocolla, atacamite and paratacamite have recently been identified on fragments from the Throne Room of the palace and vestibule, and are used mainly to indicate floral motifs⁵⁶ (fig. 6). The rare use of green mineral pigments, reserved only for special rooms of the palace, is perhaps also associated with 'market value' for such 'unusual' pigments, placing them, together with purple, high in the hierarchy of painting materials. From the early phases of the Late Bronze Age, Aegean painters had mixed blue and yellow pigments to achieve greenish hues. It seems therefore possible that the selection of copper-based greens at the Pylos palace was related to the special attention given to the scenes which decorate the Throne Room, the most significant and versatile space within a Mycenaean megaron.



6. Top surface of a green floral motif. The bright green is produced with the natural copper-based mineral paratacamite. © *H. Brecolaki*.

55. PETERS 2008, p. 200-203.

56. BRECOULAKI, PERDIKATIS 2006, p. 179-185; BRECOULAKI et al. *forthc.*

COLOUR IN THE ARCHAIC AND CLASSICAL PERIODS

THE “REVIVAL” OF CINNABAR AND AZURITE IN SCULPTURAL POLYCHROMY

In the early historical periods, polychromy is best preserved on sculptures, vases and terracotta slabs. Wall paintings are very rare, and even the astonishing new discovery of the 7th cent. BC wall painting in the temple of Apollo at Abai, which depicts a battle scene, preserves only a very restricted palette of iron-based pigments⁵⁷, conforming to that of the vase painting tradition. Wall painting fragments from the archaic temple of Poseidon at Isthmia, however, are providing more evidence for the use of a wider chromatic palette, including dark purple, light yellow and orange as backgrounds, light blue, black and various shades of red, brown and orange to depict the figures⁵⁸. Nonetheless, it is hard to draw general conclusions about the function and “value” of the applied pigments on such a limited group of tiny wall painting fragments. The pigments detected so far on terracotta slabs (metopes of Thermos and Kalydon⁵⁹) and vases of the Archaic period⁶⁰ seem to have derived mainly from iron- and manganese-based minerals, limiting colour variation to an earthen chromatic gamut. The two polychrome archaic ceramic plates from Delos, with figural compositions on a bright blue background, remain highly exceptional⁶¹. Bright pigments including a mixture of azurite and madder lake have also been attested on a recently analyzed terracotta slab from Ceri dated to the middle of the 6th cent. BC⁶². Sculptural polychromy is likely to offer the potential for a more thorough exploration of the variety of pigments and their meaning in the Archaic period, given the preservation of layers of paint on a significant number of free-standing sculptures and pedimental compositions. However, despite the great interest that has emerged in the last decade in reconstructing ancient polychromy on gesso replicas⁶³, there is little reliable scientific evidence on the nature of the pigments employed⁶⁴. From the scarce analytical data that we possess to date, and the visual testimony of preserved paint layers, it seems that the palette of pigments applied to marble sculptures was much more varied than

57. W. D. NIEMEIER, ‘Kalapodi’, *AR*, 53, 2006, p. 42, fig. 50; W. D. NIEMEIER, B. NIEMEIER, A. BRYLSBAERT, ‘The Olpe Chigi and new evidence for early Archaic Greek wallpainting from the Oracle Sanctuary of Apollon at Abai (Kalapodi)’, E. MUGIONE (ed.), *Lolpe Chigi. Storia di un agalma (Ergasteria, 2)*, Salerno, Pandemos, 2012, p. 79-86.

58. O. BRONEER, *Isthmia. Temple of Poseidon*, Princeton, ASCSA, XVI, 1971, p. 33-34, pls. A-D.

59. PAPAPOSTOULOU 2002, p. 53-64, with bibliogr.

60. K. KÜBLER, *Die Nekropole des späten 8. bis frühen 6. Jhs. (Kerameikos VI 2)*, Berlin, De Gruyter, 1970, p. 453, cat. nos 45-59; G. P. SCHAUS, ‘The Beginning of Greek Polychrome Painting’, *JHS*, 108, 1988, p. 107-117; N. J. KOCH, *De Picturae Initiis. Die Anfänge der griechischen Malerei im 7. Jahrhundert v. Chr.*, Munich, Biering & Brinkmann, 1996.

61. Ch. DUGAS, *EAD*, X, *Les vases de l'Héraion*, Paris, ÉfA, 1928, p. 30, H. 57 and 63. Delos Museum inv. n^o: B6231 and B6233.t

62. F. BORDIGNON, P. POSTORIN, P. DORE, ‘In search of Etruscan colours: A spectroscopic study of a painted terracotta slab from Ceri’, *Archaeometry*, 49, 1, 2007, p. 87-100.

63. V. BRINKMANN, *Beobachtungen zum formalen Aufbau und zum Sinngehalt der Friese des Siphnierschatzhauses*, Munich,

Biering & Brinkmann, 1994; *id.*, *Die Polychromie der archaischen und frühklassischen Skulptur*, Munich, Biering & Brinkmann, 2003; V. BRINKMANN (ed.), *Bunte Götter. Die Farbigkeit antiker Skulptur. Exh. Cat. Liebieghaus Skulpturensammlung*, Munich, Staatliche Antikensammlungen und Glyptothek, 2008.

64. The analyses of the polychromy of Archaic sculptures provided by Brinkmann seem problematic (V. BRINKMANN, U. KOCH-BRINCKMANN, ‘On the Reconstruction of Antique Polychromy Techniques’, BRINKMANN et al. 2010, p. 114-135). See for instance the puzzling identification of cobalt blue in a mixture with azurite on the so-called Persian Rider from the Akropolis, by means of UV-VIS absorption spectroscopy [p. 116]. The use of cobalt blue has been attested, so far, in dynastic Egyptian pottery only [LEE, QUIRKE 2000, p. 111], and its use as a painting material is considered to be an early 19th-century practice [EASTAUGH et al. 2004, p. 112-113]. How hard it is to interpret the UV-VIS spectra on ancient polychromy is clearly demonstrated by the published results from the 5th-cent. wall paintings of the Tatarli tomb in Phrygia, where the pigments identified by means of UV-VIS spectroscopy are often dramatically different from the results obtained by Raman spectroscopy and SEM-EDX (EMMERLING et al. 2010, p. 217, fig. 14, with a comparative table of the results of the various methods of analysis).

on terracotta artefacts and wall paintings. Indeed, natural copper-based minerals such as azurite and malachite, together with cinnabar, are found once again on the painters' palette, after a seemingly long absence. Malachite with grains of the rare mineral conicalcrite mixed with Egyptian blue have been identified on the headband of the Archaic *Kore* no. 684 from the Akropolis⁶⁵, while darkened cinnabar was detected on the belt of the famous *Kore* "Phrasikleia" at the National Archaeological Museum⁶⁶. Furthermore, metallic foils seem to have been adopted for the indication of selective ornamental details on the garments⁶⁷. The most extensive use of azurite in the late Archaic period is on the famous Amathus Sarcophagus⁶⁸, where this pigment was chosen for the colouring both the architectural elements and details within the figurative compositions (in particular on the horses). It is interesting to note that together with azurite, a paler hue of Egyptian blue was also used to paint the vertical bands and the horizontal ground-lines beneath the scenes, and other details, mainly on the chariots⁶⁹. The combination of two different blue pigments to obtain chromatic diversity and distinguish the various figurative elements of the scenes is very unusual in ancient Greek polychromy. It seems reasonable to suggest that the addition of azurite to the painter's palette may have been thanks to the availability of the high-quality deposits of this mineral on Cyprus.

NEW EVIDENCE FOR THE USE OF COLOUR IN THE 6th CENT. BC PAINTED PANELS FROM PITSA

An examination of the famous wooden panels from Pitsa, considered amongst the best preserved testimonies of archaic painting⁷⁰, has shown the extensive use of cinnabar on three of the panels, while another unusual arsenic-based pigment was chosen in one of the panels to depict the red beads of a pendant⁷¹. On panel 16464, dated to the third quarter of the 6th cent. BC, the

65. J. TWILLEY, 'Analysis of Pigments from a Late 5th Century *Kore* found on the Athenian Acropolis' (unpubl. report submitted to the National Ministry of Culture, Greece, August 21, 1990). Discussion of the results of this report in J. TWILLEY, 'Pigment Analyses from the Grave Stelae and Architectural Fragments from Chersonesos', TIVERIOS, TSIAFAKI 2002, p. 174.

66. A. KARYDAS, 'The Marble Statue of Phrasikleia at the National Archaeological Museum: Report of the XRF investigation' (unpubl. report 19/9/99); N. KALTSAS, 'Die *Kore* und der *Kouros* von Mirrhinos', *AntPl*, 28, 2002, p. 7-40, pls. 1-20.

67. V. BRINKMANN, 'La polychromie de la sculpture archaïque en marbre', *PACT*, 17, 1987, p. 35-70; V. BRINKMANN, U. KOCH-BRINKMANN, H. PIENING, 'The Funerary Monument to Phrasikleia', BRINKMANN et al. 2010, p. 197. The presence of lead, detected with XRF, would seem more likely to be associated with the pigment lead white —so commonly used as an undercoat to polychrome marble artefacts— rather than with a dim lead foil (BRECLOULAKI 2006, p. 408-409; A. KARYDAS, H. BRECLOULAKI, B. BOURGEOIS, Ph. JOCKEY, 'In situ X-Ray Fluorescence analysis of raw pigments and traces of polychromy on Hellenistic sculpture at the archaeological museum of Delos', *BCH*, Suppl. 51, 2009, p. 811-829).

68. HENDRIX 2001, p. 43-58.

69. HENDRIX 2001, table 1, p. 51.

70. The best preserved panel depicts a scene with a family bringing an animal to sacrifice. It is 15 cm high and 30 cm

long with a thickness of 5 mm, the same as panel 16466, where only the right edge of the composition is still preserved, showing three partially overlapping women conversing, also bearing a written dedication to the Nymphs. The two other smaller fragments depict parts of larger scale figures with an unusual elaboration of patterned and figured clothing. Based on stylistic criteria, the panels may not all be contemporary, but perhaps range from the 3rd to the end of the last quarter of the 6th cent. BC. A. ORLANDOS in *EEA VI*, 1964, s.v. Pitsa; E. WALTER-KARYDI, 'Prinzipien der archaischen Farbgebung', K. BRAUN, A. FURTWÄGLER (ed.), *Studien zur klassischen Archäologie. Festschrift Fr. Hiller*, Saarbrücken, Archaeological Institute, 1986, p. 23-41; PAPAPOSTOULOU 2002, p. 61-62; N. KALTSAS, *To Eθνικό Αρχαιολογικό Μουσείο*, Athens, Kapon, 2007, p. 217-219.

71. The Pitsa panels were examined by means of non-destructive analytical techniques (portable Raman spectroscopy and X-ray fluorescence). The preliminary results of this investigation were presented by H. BRECLOULAKI, 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', *5th Symposium of the Hellenic Society of Archaeometry, Athens 2008, Book of Abstracts*, O17; H. BRECLOULAKI, A. G. KARYDAS, J. STEPHENS, A. STEPHENS, 'Colour and painting technique on the Archaic panels from Pitsa, Corinthia', *AIPMA, International conference, Context and Meaning*, Athens, 16-18 Sept. 2013.

range of pigments remained restricted: carbon black for the outlines and hair of the figures, hematite for the dark red of the chiton and himatia, and a mixture of hematite and gypsum to render the brown-pink colour of the men's skin. Egyptian blue was uniformly applied to the Doric peplos of the female figures, and the pale olive green colour, used to depict the myrtle wreaths on the heads of the figures and the branches, is a mixture of a yellow ochre and carbon black. This typical, basic palette of Archaic painters was further enriched with two more pigments on the three other panels, which are dated to the last quarter of the 6th cent. BC. On panel 16466, bright cinnabar was applied to indicate details of the garment. Cinnabar was even more generously employed on panel 16467, together with a brighter hue of Egyptian blue, not only to make the colours of the garments more vivid, but also to trace outlines of the figures⁷² (fig. 7) on the whitish background and the facial features apart from the eyes, which are drawn with a rather diluted black.

For the time being, this may be considered the earliest occurrence of this pigment within a figural representation in Greek painting, however its use has also been documented on the remains of polychromy on a wooden chariot in the Celtic tomb at Vix in northern Burgundy, France, dated to the late 6th cent. BC⁷³. Evidence for the use of cinnabar in the palette of 5th-cent. painters also exists in the paintings in the two famous pre-Roman tombs, the “tomba del Tuffatore” from Paestum and the “tomba delle Danzatrici” from Ruvo, both representing extraordinary monuments within their cultural and chronological milieu⁷⁴, and recently a mixture of cinnabar with hematite has been attested on the paintings on wood from the Phrygian tomb in Tatarli⁷⁵. In the



7. The Pitsa panel 16467, detail showing two female figures with outlines in red cinnabar. National Archaeological Museum of Athens. © *H. Brecoulaki*.

72. Dioscorides (94.5) reports, that because of the high price of cinnabar, painters would use it parsimoniously, only to paint the outlines (*τὸ δὲ κιννάβαρι κομίζεται μὲν ἀπὸ τῆς Λιβύης, πιπράσκειται δὲ πολλοῦ καὶ τοσοῦτον, ὥς μόλις ἐξαρκεῖν τοῖς ζωγράφοις εἰς τὴν ἐν ταῖς γραμμαῖς ποικιλίαν*).

73. Cl. ROLLEY (ed.), *La tombe princière de Vix*, Paris, 2003.

74. M. NAPOLI, *La tomba del tuffatore. La scoperta della grande pittura greca*, Bari, De Donato, 1960; BRECOULAKI 2001;

G. GADALETTA, *La tomba delle Danzatrici di Ruvo di Puglia (Quaderni di Ostraka, 6)*, Napoli, 2002.

75. EMMERLING et al. 2010, p. 212-217. For a presentation of the iconographic program of the Tatarli paintings, see L. SUMMERER, 'Imaging a Tomb Chamber: The Iconographic Program of the Tatarli Wall Paintings', M. R. DARBANDI, A. ZOURNATZI (ed.), *Ancient Greece and Ancient Iran Cross-Cultural Encounters*, Athens, National Hellenic Research Foundation, 2008, p. 265-300.

late 5th cent. marble sarcophagus from Kition, bright cinnabar was identified on the various decorative motifs⁷⁶. For the period in which the Pitsa panels were created, there is not enough evidence to propose specific symbolic connotations cinnabar may have acquired. Although undoubtedly more expensive than iron oxide reds, considering the Archaic preference for bright and contrasting colours, it seems likely that cinnabar's intensity, and apparent ability to radiate inner light, alluding to the "φέγγος" of divine epiphanies as described by Homer, may have been associated with beauty and excellence deriving from the sphere of the divine⁷⁷.

Cinnabar was one of the most esteemed pigments in the Classical world, the equivalent of murex purple in the mineral universe. In his *Meteorologica* (378a26), Aristotle describes cinnabar among the coloured stones, while both Pliny and Vitruvius give us detailed information about its use, classifying it among the "bright", or *floridi* colours⁷⁸. Pliny also recalls the use of cinnabar in writing books and inscriptions on a wall or on marble, because of its "exceptional brightness" (*HN* 33.122). Dioscorides in his medical treatise *De materia medica* dedicates a quite extensive paragraph to the origin of cinnabar, its hues and pictorial uses. He too, like Pliny, describes its colour as *εὐανθέστατον καὶ φλογωδέστατον χρώμα* (5. 94), and tell us that painters would only use it in luxurious wall decorations. Later Roman sources specify that cinnabar was the pigment kings used to sign with (*τὸ κιννάβαρι ἔστι δὲ εἶδος βάμματα πυρροῦ, ἐξ οὗ γράφει ὁ βασιλεύς*, Aelius Herodianus, *Περὶ κλίσεως ὀνομάτων* 3, 2. 767), and the epithet *kinnavarinus* is often used to evoke a saturated red hue.

There are significant references to the use and function of cinnabar in Pausanias's *Periegesis* in Eastern Achaia. In book VII he reports the red colouration with cinnabar of a statue of Dionysos in the sanctuary of Phelloe (VII.26.11) (*τῷ Διονύσῳ δὲ ὑπὸ κινναβάρεως τὸ ἄγαλμά ἐστιν ἐπηνθισμένον*), while in book VIII he recalls another statue of Dionysos coloured with bright cinnabar at least in its upper part, at the sanctuary of Artemis in Phigaleia (VII.39.6). Pausanias adds that cinnabar is collected by Iberians together with gold. Clearly the very precious nature of this red colouring was not uninteresting to him. To what extent such information would allow us to speculate on the specific uses of cinnabar (rather than any other red pigment) in Dionysiac rituals or any other kind of ritual or religious performance, remains uncertain. It is interesting, however, to recall the use of cinnabar in divine rituals in the *Papyri Graceae Magicae* (PGMVII.795-845)⁷⁹ and Pliny's testimony (*HN* 33.111) to how important cinnabar was among the Romans, among whom it had acquired sacred associations⁸⁰.

In addition to cinnabar another imported pigment was identified on panel 16466. A bright yellow that was originally orange-red and used to depict the beads of the central figure's pendant (perhaps alluding to the colour of amber) has been identified as the mineral pararealgar (fig. 8), a

76. S. PAGÈS-CAMAGNA, 'Pigments, tints and colorants', P. FLOURENTZOS, *Two Exceptional Sarcophagi from Larnaka*, Nicosia, Department of Antiquities, 2011.

77. GRAND-CLÉMENT 2011, p. 177.

78. On the meaning and use of *colores floridi*, see H. BRECOULAKI, 'À propos des peintres tétrachromatistes et de la distinction entre *colores austeri* et *colores floridi*: l'économie des moyens picturaux contre l'emploi des matériaux onéreux', ROUVERET et al. 2006, p. 29-42.

79. "Take then a branch of laurel, and inscribe on each leaf a sign of the Zodiac with cinnabar having crowned yourself

with it...". Translation by BETZ 1992, p. 140; see also p. 82, 147, 179.

80. "...on holidays it was the custom for the face of the statue of Jupiter himself to be coloured with cinnabar, as well as the bodies of persons going in a triumphal procession, and that Camillus was so coloured in his triumph, and that under the same ritual it was usual even in their day for cinnabar to be added to the unguents used at the banquet in honour of a triumph, and that one of the first duties of the Censors was to place a contract for painting Jupiter with cinnabar", Pliny, *NH*, transl. by H. Rackham, Cambridge, Loeb Classical Library, 1940.



8. The Pitsa panel 16466, detail showing the pendant of a figure with yellow beads composed of pararealgar. National Archaeological Museum of Athens. © *H. Brecolaki*.

photodegradation product of the original red mineral realgar⁸¹. Naturally occurring arsenic sulphide minerals are brightly coloured and consequently have been used as artists' pigments since ancient times. Realgar or sandarac, reported by Theophrastos and Pliny, was considered as a pigment, and Vitruvius reports that the best sandarac was mined in Pontus (VII,VII.5). However, although orpiment and sandarac are present in Egyptian painting⁸², and the use of realgar mixed with hematite to produce a bright red has been also identified on the Tatarli wall paintings⁸³, its presence in Greece is very rare. It has only been confirmed so far on the late Classical marble throne in the "Tomb of Eurydice" at Aigai, where it is mixed with calcium carbonate to produce a mauve⁸⁴. Its identification

81. M.-C. CORBAIL, K. HELWIG, 'An Occurrence of Pararealgar as an Original or Altered Artists' Pigment', *Studies in Conservation*, 40, 1995, p. 133-138.

82. S. COLINART, E. DELANGE, S. PAGÈS, 'Couleurs et pigments de la peinture de l'Égypte Ancienne', *Techné*, 4, 1996, p. 37-38; LEE, QUIRKE 2000, p. 113-115.

83. EMMERLING et al. 2010, p. 214.

84. C. SIKALIDIS, V. PAPAGEORGIOU, A. KOTTARIDOU, Ch. PALIADELI, 'Analyses and Characterisation of the Pigments from the Tomb with the Throne in Vergina, Macedonia, Greece', *Proceedings of the 2nd Symposium of the Hellenic Archaeometrical Society, 26-28 March 1993*, Athens, The Hellenic Archaeometrical Society, 1996, p. 307-317.

on the Pitsa panel represents the earliest occurrence of this pigment in ancient Greek painting and polychromy. For such an early period, and considering the overall style of the paintings, the variety in the use of red pigments becomes significant. Could it possibly be associated with different workshops, aesthetics and chronology, or even evoke a wealthier dedicator? To what extent does the use of imported pigments reflect the particular attention those artefacts were given, considering their function as religious offerings? The examination of a limited number of painted knucklebones from Mount Helikon, among a huge collection of plain ones deposited as offerings to the Nymphs inside a cave, showed that when polychromy was applied on the *astragaloi*, it probably reflected a hierarchy in terms of materials: the commonest pigment was red ochre; a green copper based pigment was documented in fewer samples, and in a still less numerous group, organic pigments were preferred⁸⁵. Within this last group, madder lake proved to be the dominant colourant, while murex purple was found on only one specimen. The mixture of madder lake and grains of precious lapis lazuli on another unique *astragalos* offers us the first insight about the use of this precious blue material as a pigment in ancient Greek polychromy. The context of the finds does not allow for a precise dating of the *astragaloi*, which range from the 6th cent. to the Hellenistic period. But examination of a rare class of Attic painted marble vessels dated to the second half of the 5th cent. BC confirmed the first extensive pictorial use of lapis lazuli in ancient Greece⁸⁶.

THE FIRST HISTORICAL USE OF LAPIS LAZULI AS A PAINTING MATERIAL ON ATTIC MARBLE VESSELS

Preliminary investigation of an outstanding, yet unpublished, group of luxurious marble vases in the National Archaeological Museum of Athens, probably carved and painted in an Attic workshop, allows us further to enrich our knowledge of the range of unusual materials used by Classical painters. Two painted pyxis were examined in situ by means of portable Raman spectroscopy and X-ray fluorescence⁸⁷. Pyxis n° 11363⁸⁸, dated to the first quarter of the second half of the 5th cent. BC, bears on its main body an elegant battle scene with two polychrome chariots and charioteers fighting against two armed warriors (fig. 9). It is rendered much more freely than most white ground vases of the same period, and the painter is evidently less preoccupied by depicting form and mass through line, and more interested in experimenting with representational colour. I will not discuss here the general style and iconography of these vases, which certainly deserve a study of their own⁸⁹; but I would like to underline their extremely refined manufacture and the high cost of their original materials, in conjunction with their function as funerary offerings. The choice of the painting materials is indeed noteworthy, despite the reduced size of the painting itself: together

85. M. P. COLOMBINI, A. CARMIGNANI, F. FREZZATO, A. OLCHINI, H. BRECOULAKI, V. VASSILOPOULOU, P. KARKANAS, 'Integrated Analytical Techniques for the Study of Ancient Greek Polychromy', *Talanta*, 63, 2004, p. 839-848.

86. D. SMITH, H. BRECOULAKI, G. OIKONOMOU, I. KOUGEMITROU, M. PERRAKI, E. STASINOPOULOU, 'The in situ MRM first discovery of lazurite on a painted marble pyxis at the National Archaeological Museum, Athens', poster presented at the *5th International Congress on the Application of Raman Spectroscopy in Art and Archaeology, Bilbao (Spain), 14-18 Sept. 2009* (Book of Abstracts: RAA 2009).

87. Raman spectroscopy was conducted by the Institute of Geology and Mineral Exploration (Athens) with the assistance of David Smith (Museum national d'Histoire naturelle, Paris) and Maria Perraki (National Technical University of Athens). X-ray fluorescence was conducted by the Institute of Nuclear Physics 'Demokritos', with the assistance of Vicky Kantarelou.

88. Athens, National Museum, pyxis with pedestal foot. ZAPHIROPOULOU 1973, p. 624-625, fig. 32; GAUNT 2013, p. 391.

89. The full publication of the marble vessels from the collection of the National Archaeological Museum is being undertaken by the author and G. Kavvadias.



9. Marble vase n° 11363, detail showing a charioteer wearing a blue garment composed of lapis lazuli. National Archaeological Museum of Athens. © *J. Stephens*.

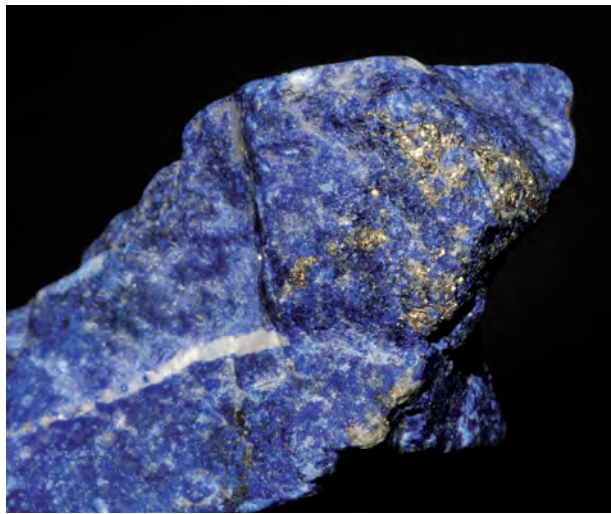
with hematite and goethite for red and yellow areas, cinnabar and orpiment (the *auripigmentum* of the Romans) were also identified. The deep blue garment of the charioteers was identified as lapis lazuli, while the dark hue of the horses is an admixture of carbon black and lapis lazuli⁹⁰. The interesting issue here—as in the case of the *astragalos*—is how we understand the possible motivation for choosing lapis lazuli, a precious stone imported from the East, and certainly not particularly convenient by this time as a painting material.

Ancient textual sources are very informative about minerals used as blue pigments, but they either refer to azurite (the natural *kyanos*)—a copper carbonate— or to the synthetic Egyptian

90. Supposedly, the intention of the painter was not to create a blue horse but rather reduce the uniformity of a plain black one, by adding some grains of blue. For the association of blue and black in Greek textual sources and painting see V. BRUNO, *Form and Colour in Greek Painting*, New

York, Norton, 1977, p. 73-87. In Homer *kyanos* is considered as a kind of black: *Κύανος δὲ εἶδος τι χρώματος μέλανος* (*Etymologicum magnum*, *κυανός, ὁ μέλας*). For the meaning of the epithet *kyaneos* in Homer and Archaic poetry, see GRAND-CLÉMENT 2011, p. 172-173, 369-370, 416-417.

blue (the artificial *kyanos*)⁹¹, by far the commonest blue pigment throughout Antiquity. But what do we know about the use of lapis lazuli as a painting material? Lapis was the *sappheirus* of the Greeks and was considered one of the most precious ancient gems⁹². Theophrastus lists it together with other opaque minerals, and by comparing it to the *kyanos* he implies that it was dark blue in colour, while his statement that *sappheirus* seems to be spotted with gold is especially important for its identification (*De Lap.* 23), since what causes this effect of gold sparkles or drops of gold, or gleaming gold veins as Pliny will describe it later (*HN* 37.119-120), is simply inclusions of iron pyrites (fig. 10). In later sources lapis is also described as χρυσοσάπφειρος (Alexander Med. *Therapeutica*, II 45.12). Both Theophrastus and Pliny report the Persian origin of lapis⁹³, information probably drawn from the early Hellenistic treatise on stones of Sotacus⁹⁴. In a Hellenistic epigram attributed to Posidippus of Pella (AB 5.I), gold-flecked lapis is described as "starry", ἀστερόης, associating this mineral with the heavenly sphere⁹⁵, while in the 1st-2nd cent. AD Hermetic medico-magical text known as the *Cyranides*, we further learn that lapis is the favorite colour of Aphrodite and that painters produced this pigment out of lazurite, the "excellent", which



10. Natural lapis lazuli with iron pyrite inclusions from Afghanistan. © P. Géry.

91. Theophrastus, *De Lap.* 55.

92. J. SPIER, *Ancient Gems and Finger Rings*, Los Angeles, Getty Publications, 1992.

93. Lapis lazuli is found in the mountains of Afghanistan. On the natural history of lapis lazuli and its occurrence in ancient written Sumerian, Akkadian and Hittite sources, see L. von ROSEN, *Lapis Lazuli in Geological Contexts and in Ancient Written Sources*, Uppsala, Astrom Editions, 1988; C. M. SCHMIDT, M. S. WALTON, K. TRENTELMAN, 'Characterization of Lapis Lazuli Pigments Using a Multitechnique Analytical Approach: Implications for Identification and Geological Provenancing', *Anal. Chem.*, 81, 2009, p. 8513-8518.

94. For Sotacus and other lost Hellenistic treatises on stones see HALLEUX, SCHAMP 1985, p. xiii-xxxiv.

95. M. SMITH, 'Elusive Stones: Reading Posidippus' *Lithika* Through Technical Writing on Stones', B. ACOSTA-HUGHES, E. KOSMETATOU, M. BAUMACH (ed.), *Labored in Papyrus Leaves: Perspectives on an Epigram Collection Attributed to Posidippus* (P. Mil. UJgl. VIII 309), Washington, DC, Center for Hellenic Studies, 2004, p. 105-117; K. GUTZWILLER, 'The Literariness of the Milan Papyrus or "What Difference a Book"?' GUTZWILLER 2005, p. 300-303.

they also call the “natural”⁹⁶. Moreover, Damigeron in his book of stones dated to the 1st cent. AD, ascribes to lapis (*saphirus*) important protective power (*Maximum enim est tutamentum*, XIV.3)⁹⁷. Considering both the outstanding hierarchical rank of lapis among ancient gem stones and its “heavenly” associations, could we further speculate on a possible “symbolic” reference of this mineral used within a funeral context? Was the choice of lazurite, in our marble pyxis, together with cinnabar and orpiment, linked to the overall value of the object as a precious offering, or does this division of hues also reflect a transition to a more painterly treatment?

The use of cinnabar, together with malachite and Egyptian blue in solid fields of colour, is also found on white ground lekythoi, usually on garments or in architectural settings. On the numerous examples of this type of object shading is extremely rare and perspective or other visual modifications unknown. Added colours are therefore primarily used to create a more vivid polychrome effect and attract the eye of the spectator⁹⁸. A similar use of polychromy is reflected on the unusual archaic polychrome aryballoid vases from Aiani, dated to the second quarter of the 5th cent. BC⁹⁹. The shapes and decoration of these funerary vases seem to have no immediate predecessors, nor descendants in the local tradition. The bright Egyptian blue and iron-based red pigments applied on a limited number of them, served to distinguish them from the rest of the local production and endow them with an ‘added’ material value.

In the case of our chariot marble pyxis (inv. n° 11363), the choice of unusual pigments may have been affected by the market value that such prestige artefacts may have held. However, the artistic aspirations of the painter who worked on its surface are clearly reflected in the system by which the colours were treated and combined. One could even argue that the high pictorial quality of the figural scenes —reflected in the sophisticated use of colour and line moving towards a more ‘realistic’ appearance of the depicted theme— derived from the tradition and achievements of large scale panel painting, rather than from a pottery *milieu* where pictorial experimentations were much more limited, as far as colour is concerned. The extraordinarily ‘realistic’ depiction of a rooster and a hen, decorating the two sides of a similarly shaped pyxis from the same collection (inv. n° 12904¹⁰⁰, fig. 11), seems to corroborate the hypothesis that the painters who created the images on those

96. Σάπφειρος λίθος, ἢ κύνεος ἀνήκεν τῇ Ἀφροδίτῃ, ἄσπιλος, ἔχων καὶ φλεβία χρυσᾶ· διὰ τοῦτο καὶ χρυσοσάπφειρος παρά τισιν ὀνομάζεται· ἀφ’ οὗ ποιοῦσιν οἱ ζωγράφοι τὸ λαζούριον τὸ ἄριστον, ὃ καλοῦσιν φυσικόν. Book 1, 18.10 (HALLEUX, SCHAMP 1985, p. xxvii); M. WAEGEMAN, *Amulet and Alphabet; Magical Amulets in the First Book of Cyranides*, Leiden, Brill, 1987; G. PANAYIOTOU, ‘Paralipomena Lexicographica Cyranidae’, *Illinois Classical Studies*, XV.2, 1990, p. 295-338; A. MESCHINI, ‘Le Ciranidi nel Marc. Gr. 512’, *Atti dell’Accademia Pontaniana*, n.s. XXXI, 1983, p. 145-177. It is interesting that in later sources lapis lazuli is still associated with the “heavenly sphere” (Διὰ τοῦτου εὐοκίτος τῷ οὐρανίῳ σώματι, ἐξ οὗ φασὶ καὶ τὸ λαζούριον γίνεσθαι, Andreas of Caesarea, *Commentarii in Apocalypsin*, 21.19c [J. SCHMID, *Studien zur Geschichte des griechischen Apokalypse-Textes. I Der Apokalypse-Kommentar des Andreas von Kaisareia. Text (Münchener Theol. Stud.)*, Munich, 1955]) and with Aphrodite (Τῆς Ἀφροδίτης αἱ χαρακτηῖται ὑπάρχουσι καὶ γράφει αὐτὰς μετὰ αἵματος νυκτερίδος ἢ μετὰ λαζουρίον ἀδόλου καὶ ῥοδοστάγματος εἰς χαρτὶ κινὸς ἢ εἰς χαρτὶ ἐλαφρινὸν ἀγέννητον

καὶ κάπνισον αὐτὰς μαστίχην καὶ λάδανον, *Astrologica, Hygro-mantia Salomonis* [excerptum e cod Monac. 70, fol 240r], 8, 2. 158; [D. C. DULING, *The Old Testament Pseudepigrapha*, H. CHARLSWORTH (ed.), New York, Doubleday, 1983; P. TORIJANO, *Solomon the Esoteric King. From King to Magus, Development of a Tradition (Suppl. to the Journal for the Study of Judaism, 73)*, Leiden, Brill, 2002]). In Italian pre-Renaissance and Renaissance painting, lapis lazuli because of its rarity and cost is usually found only on the robe of the Virgin Mary (D. BOMFORD, J. DUNKERTON, D. GORDON, A. ROY [ed.], *Art in the Making. Italian Painting before 1400*, London, National Gallery Publications, 1989, p. 34-36).

97. HALLEUX, SCHAMP 1985, p. 250-251.

98. U. KOCH-BRINCKMANN, *Polychrome Bilder auf weissgrundigen Lekythen. Zeugen der klassischen griechischen Malerei*, Munich, Biering & Brinkmann, 1999.

99. KEFALIDOU 2001, p. 183-219.

100. Athens, National Museum, ex Roussopoulos. H. 30 cm. Pyxis with pedestal foot. ZAPHIROPOULOU 1973, p. 624-625, fig. 31; GAUNT 2013, p. 391.



11. Marble vase n° 12904, detail showing a delicately painted rooster. National Archaeological Museum of Athens. © Chr. Simatos.

marble vessels had assimilated the pictorial manipulation of colour, and relied on a very different artistic background from that of the painters who worked on the white ground lecythoi. A close parallel of such an advanced painterly technique, emphasizing the role of colour vis-à-vis' outline, may be traced in the famous late 4th cent. BC painted marble *lekanis* from Ascoli Satriano, in which unusual pigments have been identified as well¹⁰¹.

101. A. WALLERT, 'Unusual Pigments on a Greek Basin', *Studies in Conservation*, 40, 1995, p. 177-188; A. BOTTINI,

E. SETTARI (ed.), *Il segreto di marmo. I marmi dipinti di Ascoli Satriano*, Verona, Electa, 2009, p. 30-41, 74-77.

PURPLE, GOLD AND OTHER UNUSUAL MATERIALS, AS SIGNS OF LUXURY ON ARTEFACTS
FROM THE CLASSICAL AND HELLENISTIC PERIODS

Another marble pyxis from the National Museum collection (inv. n° 11372) —presumably deriving from the same workshop as the chariot and rooster pyxis— preserves unusual pigments on its body and lid as well. A delicately painted floral motif in purple and bright yellow adorns its body¹⁰² (fig. 12), and two seated figures are depicted on its lid. Both the floral composition and the garments of the figures are rendered in purple with details in yellow and traces of gold leaf on the circumference of the lid. Preliminary analysis by non-destructive techniques (RAMAN and XRF) confirmed the presence of an organic colorant for the purple, while the absence of fluorescence with UV photography suggests that madder lake probably was not used. It is thus possible that murex purple was applied, or perhaps a purple organic colorant deriving from a plant or a weed, such as the *rocella tinctoria* recently identified on the collection of Greek terracotta figurines in the Louvre¹⁰³. Bright yellow used to depict the bracelet of the woman to the left was identified as orpiment, while an iron based ochre was used for the area of the hair. Similar painted marble vessels belonging to a woman's toilet have also been found in rich Macedonian graves¹⁰⁴, and the constant



12. Marble vase n° 11372, detail showing a floral motif in purple colour.
National Archaeological Museum of Athens. © J. Stephens.

102. A very similar floral motif in purple is depicted on the body of the recently discovered marble sarcophagus from Kition, dated to the early 4th cent. BC (G. GEORGIU, 'Three Stone Sarcophagi from a Cyprio-Classical Tomb at Kition', *CEC*, 39, 2009, p. 113-139, fig. 9).

103. S. PAGÈS-CAMAGNA, 'Terracottas and colour', V. JEAMMET (ed.), *Tanagra. Figurines for Life and Eternity. The Musée du*

Louvre's Collection of Greek Figurines, Paris, Louvre Ed., 2010, p. 250-251.

104. D. PANDERMALIS, *Alexander the Great. Treasures from an Epic Era of Hellenism*, New York, Alexander S. Onassis Public Benefit Foundation, 2004, p. 107-111, fig. 24-27.

association of purple and gold leaf may in such instances become significant, chiming with the very luxurious character of the objects and their destination or function as extraordinary, prestige offerings to the deceased. The extensive use of murex purple to decorate a luxury vessel is already well attested on the impressive Darius I stone jar, which bears remnants of murex purple paint on its body (*Hexaplex trunculus*), and the king's name inscribed in purple in four languages¹⁰⁵. The choice of precious materials to render polychromy and painting on luxurious artefacts is lavishly represented in royal Macedonia, on the famous marble throne of the so-called tomb of Eurydice and on the chryselephantine couches of the royal tombs. On the decorative friezes of the sumptuous throne, the association of red cinnabar used as the background colour, and gold leaf applied to the animals and griffins rendered in low relief, creates a powerful visual effect, alluding to power and royal prestige¹⁰⁶ (fig. 13). The extensive use of gold leaf on the background of the funerary couches and the combination of rare high quality pigments such as the natural copper based mineral conicalchalcite, further enrich their varied polychromy and enhance their exceptional character (fig. 14). The use of this bright green pigment —conicalchalcite— in such a pure state and unusually coarsely ground —remains unique in ancient polychromy¹⁰⁷ (fig. 15). Although conicalchalcite has been found



13. Vergina, "Tomb of Eurydice", marble throne, detail of gilded relief.
© 17th Ephorate of Prehistoric and Classical Antiquities.

105. Z. C. KOREN, 'Archaeo-chemical Analysis of Royal Purple on a Darius I Stone Jar', *Microchemica Acta*, 162, 2008, p. 381-392; J. GOODNICK WESTENHOLZ, M. W. STOLPER, 'A Stone Jar with Inscriptions of Darius I in Four Languages', *Arta*, 2002.005, p. 1-13. Online journal.

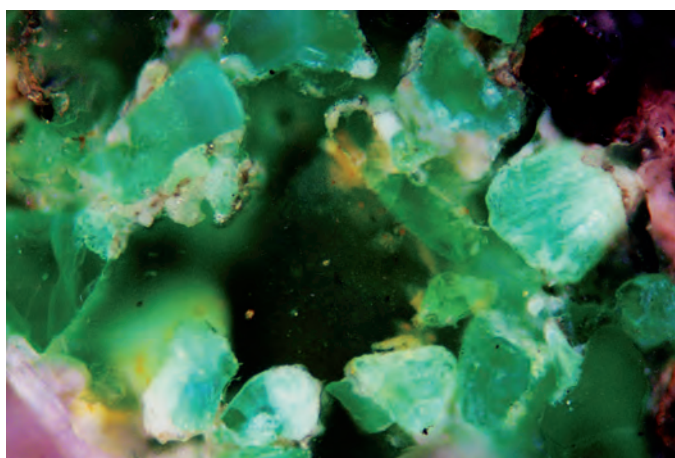
106. A. KOTTARIDI, 'Couleur et sens : l'emploi de la couleur dans la tombe de la reine Eurydice', A.-M. GUIMIER-SORBETS,

M. B. HATZPOULOS, Y. MORIZOT (ed.), *Rois, cités, nécropoles, institutions, rites et monuments en Macédoine (Meletemata, 45)*, Athens, The National Research Foundation, 2006, p. 154-166; BRECOULAKI 2006, p. 49-76, pls. 1-9.

107. H. BRECOULAKI, 'Sur la *techné* de la peinture grecque d'après les monuments funéraires de Macédoine', *BCH*, 124, 2000, p. 209-210.



14. Vergina, Tomb of Philipp II, chryselephantine couch, detail of gilded background and polychromy.
© 17th Ephorate of Prehistoric and Classical Antiquities. After A. KOTTARIDI, *Macedonian Treasures: A Tour Through the Museum of the Royal Tombs of Aigai*, 2011, p. 83.



15. Vergina, Tomb of Philipp II, chryselephantine couch, top surface of green paint layer composed of conicalcrite, 100x. © *H. Brecoulaki*.

in association with malachite on Hellenistic graves stones from Aigai¹⁰⁸ and Demetrias and was recently identified also on the monumental cist tomb from Pella, the so-called tomb of the philosophers¹⁰⁹, only on the hunting frieze of the chryselephantine couch in the tomb of Philip II at Aigai has it been applied pure and in very coarse grain size. Conichalcite, together with cinnabar, purple and Egyptian blue were used by the artist to adorn the hunters' bright garments. They emerge from a sparkling gold background which was created through a patchwork of thousands of gold leaves applied on a white gesso ground¹¹⁰. The use of such artefacts as signs of luxury (*τροφιή*) is in accordance with the material culture of the fourth-century Macedonian court, which emphasizes status through the display of precious objects. The colourful and bright effect of the expensive pigments and gold leaf used on the couch recall the universe of coloured gems decorating precious jewellery and vessels in the collections of the Macedonian queens and kings, as they are described in the *dactyliothecae*, the "gem museum" of Posidippus in his *Lithika*¹¹¹.

FIGURAL PAINTING AND REPRESENTATIONAL COLOUR IN THE HELLENISTIC TRADITION

If we move from polychromy to figural paintings the situation becomes problematic. While, for example, the association of red and gold in the frieze of the throne in the "tomb of Eurydice" is probably a symbol of royalty and power, there is no obvious symbolism apparent in representational colour. While polychromy and non-perspective application of colour may provide us with some clues as to a possible colour 'symbolism', in figural paintings in which shading is used and the incidental effects of light may be recorded, colour classification related to distinct colour concepts is much more difficult to grasp¹¹². Indeed, in textual sources it seems that ancient painters tended to favor low intensity colours for their figural representations. For example, Pliny the Elder records the preference for red-ochre and Sinopic ochre by painters, instead of bright cinnabar which was "thought excessively harsh" (33.117), while Theophrastus (*De Lap.* 51,6) records use of red ochre by painters to simulate the colour of the skin (*ἀνδρείκελον*)¹¹³. Likewise, the adoption of the "famous" four-colour palette among a group of the most renowned Greek painters—who

108. V. PERDIKASTIS, I. MANIATIS, Chr. SAATSOGLOU-PALIADELLI, 'Characterisation of the pigments and the painting technique used on the Vergina stela', TIVERIOS, TSIAPAKI 2002, p. 245-258.

109. G. MANIATIS, H. SAKELLARI, D. KAVOUSANAKI, N. MINOS, 'Φυσικοχημικός χαρακτηρισμός χρωστικών από τον κιβωτιόσχημο τάφο της Πέλλας', M. LILIMBAKI-AKAMATI, *Κιβωτιόσχημος τάφος με ζωγραφική διακόσμηση από την Πέλλα*, Thessaloniki, Ministry of Culture, 17th Ephorate of Prehistoric and Classical Antiquities, 2007, p. 138-175.

110. A. KOTTARIDI, *Macedonian Treasures: A Tour Through the Museum of the Royal Tombs of Aigai*, Athens, Kapon, 2011, p. 80-88, with fig.

111. A. KUTTNER, 'Cabinet Fit for a Queen: The *Λιθικά* of Posidippus' Gem Museum', GUTZWILLER 2005, p. 141-163.

112. J. BAINES, 'Color Terminology and Colour Classification: Ancient Egyptian Color Terminology and Polychromy', *American Anthropologist*, 87, 1985, p. 282-297; *id.*, *Visual and Written Culture in Ancient Egypt*, Oxford, OUP, 2007, p. 245-261.

113. A. ROUVERET, *Histoire et imaginaire de la peinture ancienne*, Paris, Éfr, 1989, p. 42-43, 50, 261; Fr. VILLARD, 'L'essor du chromatisme au IV^e siècle. Quelques témoignages contemporains', ROUVERET et al. 2006, p. 43-53; H. BRECOULAKI, 'Andreikelon, the Skin Colour in Ancient Greek Painting', P. ADAM-VELENI, K. TZANAVARI (ed.), *Διηγήσσα. Τιμητικός τόμος για την Κ. Ρωμοπούλου*, Thessaloniki, Archaeological Museum of Thessaloniki, 2012, p. 349-362.

were said to have produced masterpieces— reflects a very different preoccupation in the choice of colours, relying on their pictorial properties rather than their material value. Indeed, in well preserved examples of early Hellenistic paintings from Macedonia¹¹⁴ and Thessaly¹¹⁵, large scale human figures are rendered in a very restricted gamut of pigments, mainly composed of iron-based ochres, which allows for soft chiaroscuro effects and tonal passages in order to obtain a three-dimensional effect (fig. 16, 17). A tradition that will survive also in later periods, as is attested by the recent astonishing discovery, in Thebes, of the portrait of a young man called “Theodoros”, dated between the 1st cent. BC and the 1st cent. AD¹¹⁶. Bright pigments, such as conicalcrite or cinnabar, were also used to depict flesh tones or facial details, but always mixed with other pigments, to produce low intensity colours that would not stand alone for their chromatic values but be integrated into the overall realistic effect the image was likely to convey. Interesting examples are the small scale figures from the *symposium* scene on the tomb of Aghios Athanassios, where cinnabar is mixed with calcium carbonate white and kaolinite to produce a subtle tone of pink¹¹⁷; and the hunters



16. Aghios Athanassios, Tomb III, detail of warrior's face on the façade. © 16th Ephorate of Prehistoric and Classical Antiquities.



17. Demetrias, fragment of large scale painted grave stone n° 1235. Archaeological Museum of Volos. © H. Brecoulaki.

114. BRECOULAKI 2006.

115. A. S. ARVANITOPOULOS, *Γραπτά στήλαι Δημητριάδος – Παγασών*, Athens, Archaeological Society of Athens, 1912; A. BATSIU-ΕΦΣΤΑΘΙΟΥ, *Δημητριάς*, Athens, Archaeological Receipts Fund, 2001.

116. V. ARAVANTINOS, *Το Αρχαιολογικό Μουσείο Θεβών*, Athens, John S. Latsis Public Benefit Foundation, 2010, p. 321.

117. BRECOULAKI 2006, p. 283, pl. 95.

at the façade of the tomb of Philip II at Aigai, where conchalcite was mixed with carbon black to produce cold skin tones for the shadowed parts of their bodies¹¹⁸.

Although the choice of colour in figural painting of the Hellenistic period usually relies upon the pictorial properties and possibilities it may offer to the painter, there is still a preference for bright and expensive pigments to render garments, using both cinnabar and murex purple. Tracing its origin back to the Mycenaean period, murex purple continued to be used for painting the rich garments of princes and kings. It was a marker of the aristocratic universe¹¹⁹, as we may observe in the royal hunting scene on the frieze of the tomb of Philip II at Aigai¹²⁰ and on the symposium scene on the façade of the tomb at Aghios Athanassios, near Thessaloniki¹²¹. Although the taste for pinkish-purplish hues to render garments in Hellenistic art is still very popular within the mass production of terracotta figurines of the 3th and 2nd cent. BC¹²², the use of precious murex purple was restricted to luxurious artefacts and wall decorations¹²³. Artisans replaced it with cheap madder lake, which offers a gamut of bright and saturated pinkish hues, compared to the more subtle and varied chromatic nuances of murex purple, depending on the choice of the shell species. There is a voluminous literature on murex purple used as a dyestuff in antiquity¹²⁴. It certainly is the most discussed dye, with the longest history of use from the Bronze Age to the fall of the Byzantine empire. However we know very little about its uses as a painting material. Our only technical information comes again from Pliny's book 35 (*HN* 35.30) where he classifies *purpurissum* among the *coloures floridi*, holding the first place among the most prized of pigments. He also gives us quite detailed information on the procedure for its manufacture (*HN* 35.44). And finally he prescribes exactly how painters should apply it, by laying a coat of blue underneath, and then covering this with dark purple mixed with egg, if they wished to obtain a darker and cooler hue (*HN* 35.45). The mixture of purple pigment (murex purple or madder lake) with Egyptian blue, either in physical blending or in superimposed layers, is very frequently observed in ancient paint layers, from the Bronze Age to Hellenistic times. Moreover, purple colour was not used in Hellenistic painting only in order to render garments. On the painted ceiling of the "tomb of the Palmettes" at Lefkadia¹²⁵ murex

118. H. BRECOULAKI, 'Saisir la ressemblance ou surpasser le modèle ? Réflexions sur la représentation de la figure humaine dans la peinture grecque et la tradition du portrait peint dans l'Égypte gréco-romaine', P. LINANT DE BELLEFONDS, É. PRIoux, A. ROUVERET (ed.), *Mémoire, déconstruction, création dans les arts visuels et la poésie de l'époque hellénistique au I^{er} siècle après J.-C.*, Colloque de l'ANR CAIM, Paris, 10-12 mai 2012, in press.

119. GRAND-CLÉMENT 2004, p. 123-143. On the affinities between Macedonian material culture and the Mycenaean past, see A. COHEN, 'Alexander and Achilles – Macedonians and Mycenaeans', J. B. CARTER, S. P. MORRIS (ed.), *The ages of Homer. A Tribute to Emily Townsend Vermeule*, Austin, University of Texas Press, 1995, p. 483-506. On purple garments worn by Macedonians see Athenaeus 12.537e-538b and Plut. *Eum.* 8.7. The purple kausia had not been an exclusively royal badge with the Macedonians. The king could bestow it on his Companions too. Murex purple was also used for the garments of the Persian kings on the marble painted sarcophagus from Çan (N. SEVINÇ, R. KÖRPE, M. TOMBUL, Ch. B. ROSE, D. STRAHAN, H. KIESEWETTER, J. WALLRODT, 'A New Painted Greco-Persian Sarcophagus from Çan', *StTroica*, 11, 2001, p. 383-420).

120. M. ANDRONIKOS, *Vergina. The Royal Tombs*, Athens, Ekdotiki Athinon, 1984, fig. 67, 70, 71.

121. TSIMBIDOU-AVLONITI 2005, pls. 32-35; BRECOULAKI 2006, p. 262-303, pls. 90-102.

122. V. JEAMMET, C. KNECHT, S. PAGES-CAMAGNA, 'La couleur sur les terres cuites hellénistiques : les figurines de Tanagra et de Myrina dans la collection du musée du Louvre', DESCAMPS-LEQUIME 2007, p. 81-94.

123. Athenaeus reports the colouring of the bodies of the "Satyri" with murex purple in the procession in honour of Ptolemy Philadelphus (μεθ' οὗς Σάτυροι τεσσαράκοντα ἐστεφανομένοι κισσίνοις χρυσοῖς στεφάνοις· τὰ δὲ σώματα οἱ μὲν ἐκέχριντο ὀστρεῖω, τινὲς δὲ μίλτω καὶ χρώμασιν ἑτέροις, Athenaeus, *Deipnosophistae*, 5.27).

124. MOATSOS 1932; H. STULZ, *Die Farbe Purpur im frühen Griechenland: Beobachtet in der Literatur und in der bildenden Kunst*, Stuttgart, Teubner Verlag, 1990; Ch. COOKSEY, 'Bibliography on Tyrian Purple', *Dyes in History and Archaeology*, 12, 1994, p. 57-66; O. LONGO (ed.), *La porpora. Realtà e immaginario di un colore simbolico*, Venice, Istituto Veneto di Scienze, Lettere et Arti, 1998.

125. BRECOULAKI 2010, p. 102-118. For colour plates see pls. 13-14.

purple was used together with madder lake to depict floral motifs, whereas on the façade of the Macedonian tomb of Aghios Athanassios bright purple was used as a background for the head of a medusa on a large painted shield¹²⁶ (fig. 18). In both cases, the use of this pigment certainly reflects the economic affluence of the patrons who commissioned the tombs, although a possible symbolic overtone of purple colour within the ‘apotropaic’ imagery of Medusa’s head in Greek art may not be excluded¹²⁷. Furthermore, on a painted marble couch from a Macedonian tomb in Dion¹²⁸, a pink-purple colour was chosen as the background for a battle scene. In this case, the painting



18. Aghios Athanassios, Tomb III, detail showing a shield with the head of Medusa on a purple background.
© 16th Ephorate of Prehistoric and Classical Antiquities.

126. TSIMBIDOU-AVLONITI 2005, pl. 40; BRECOULAKI 2006, pl. 97.

127. On the use of purple cloth and skin in magical rituals see PGM 2622-2707, PGM V. 370-446, PGM XC VII.1-6; BETZ 1992, p. 88, 108, 306.

128. G. SOTERIAS, ‘Ανασκαφαί Δίου Μακεδονίας’, *PAE*, 1930, p. 36-51 fig. 1-7; *id.*, ‘Ανασκαφαί εν Δίω. Ο καμαρωτός τάφος’, *Επιστημονική επετηρίς της Φιλοσοφικής Σχολής του Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης*, 2, 1932, p. 5-19, pl. 1, 2; BRECOULAKI 2006, pl. 88.2.

is not preserved, and therefore it was not possible to analyze colour and determine its composition. However, on the famous "Amazon Sarcophagus" from Tarquinia – an extraordinary artefact reflecting the Hellenistic painting tradition in both style and technique –, analytical examination confirmed the abundant application of murex purple to create the background of the battle scenes on both its long sides¹²⁹ (fig. 19). Considering what was already said about the purple background of the Mycenaean battle scene at the Palace of Pylos, and its possible metaphoric association with "glorious death" on the battlefield in accordance with the heroic ideal as expressed in the Homeric epics, we might speculate that the stylistic convention of a "purple background" in those later artistic productions still conveyed meaning, and did not function merely as an abstract coloured surface.

CONCLUSION

The use of and preference for specific colours in ancient Greek polychromy and painting are determined not only by aesthetic criteria and material availability but also by the function and destination of each artefact or artwork, within its specific social and cultural context. Usually, what makes a colour "precious" or "extraordinary" relates to the material culture and the hierarchies



19. The "Amazon sarcophagus", detail of battle scene. Archaeological Museum of Florence. © H. Breccoulaki.

129. BRECCOULAKI 2001, p. 21-25; G. GIACHI, P. PALLECCHI, A. ANDREOTTI et al., 'Indagine analitiche sul sarcofago delle

Amazzoni', A. BOTTINI, E. SETARI, *Il sarcofago delle Amazzoni*, Florence, Electa, 2007, p. 132-166.

established by society at a particular place or time¹³⁰. A common pigment, such as Egyptian blue, may become prized in a context where importation is difficult and local manufacture is not possible. The archaic polychrome vases from Aiani¹³¹, for example, provide such evidence: Egyptian blue, although it is considered to be a common pigment, acquired extraordinary value on those locally produced vases, and its use set them apart from the plainer pottery produced in the area. Likewise, in the series of white ground lekythoi, a very small percentage bear additional colours such as cinnabar, Egyptian blue and malachite. In the context of Athenian pottery workshops, such pigments should therefore represent uncommon materials that were used occasionally and parsimoniously. The choice of extraordinary and particularly prized minerals —such as the lapis lazuli and orpiment on the marble pyxis from the National Museum at Athens, the sandaraka on the Pitsa panel, the coarse grained conicalcrite on the funerary couch in the tomb of Philip II at Aigai, or the vivid yellow mimetite found on the pediment of the “Tomb of the Palmettes” at Lefkadia¹³² and bright vanadate on the garment of a Hellenistic sculpture at Delos¹³³— may reflect a desire to produce uncommon and expensive artefacts, with the colour of the pigment engaging the eye just as precious stones do. In terms of physical appearance, crystalline cinnabar offers the transparency and deep red colour of ruby, pure coarsely grinded conicalcrite or malachite recall the colour of emerald, while certain murex species provide the colour of amethyst (Pliny, *HN* 19, 134-135). Furthermore, such prized pigments are in direct or indirect association with the most precious mineral, gold: chrysocolla (malachite) is the gold solder; orpiment is the *auripigmentum*; lapis lazuli is the golden blue of Aphrodite (*χρυσόσάπφειρος*). Among the *Fragmenta Alchemica* there is mention of the so-called cinnabar of the philosophers, used to dye gold from yellow to bright red (*βαφέντα τὸν χρυσὸν, πυρρὸν ὡς τὸ αἶμα*) and purple is very often applied together with gold, representing the precious materials par excellence, an association frequently documented in ancient textual sources. The combined application of purple and gold alludes directly to the prestigious and expensive dye and metal respectively, both characterized by extreme chemical stability and physical permanence. During the process of dying, the murex dye undergoes a series of “transformations” until it obtains its final hue, passing from white to yellow, then green, blue and purple¹³⁴. It therefore acquired significant symbolic connotations, associating it with the sphere of the sacred and divine¹³⁵. The application of gold leaf provides sparkling surfaces not only by reflexion, but also from the metal’s “inner light”, associating it directly with the divine sphere¹³⁶.

130. For an interesting approach to the value of vitreous materials in the Bronze Age, see S. SHERRATT, ‘Vitreous Materials in the Bronze Age and Early Iron Ages: Some Questions of Values’, JACKSON, WAGER 2008, p. 209-232.

131. KEFALIDOU 2001.

132. BRECOULAKI 2010, p. 109.

133. B. BOURGEOIS, Ph. JOCKEY, with the collab. of H. BRECOULAKI and A. G. KARYDAS, ‘Le marbre, l’or et la couleur. Nouveaux regards sur la polychromie de la sculpture hellénistique de Délos’, DESCAMPS-LEQUIME 2007, p. 176-177.

134. The colour changes of Tyrian purple were described in the *De Coloribus*, 797 a 5 sq. (Pseudo Aristotle, *I colori*, transl. and comments by M. Fernanda Ferrini, Pisa, Ed. ETS, 1999) and in the *Onomasticon* by Pollux (1. 49). On Pliny’s obsession with purple, due mainly to its “instability” which allowed it to

exhibit a great variety of hues (*rubens colos, nigrans, nitor cocci, amethysti colos, uiolacea, glaucum, sanguis concretus*), blacking at first sight then gleaming when held up to light, see M. BRADLEY, *Colour and Meaning in Ancient Rome*, Cambridge, CUP, 2009, p. 195-196.

135. L. SOVERINI, ‘Su alcuni simbolismi della tintura nella Grecia antica’, S. BETA, M. M. SASSI (ed.), *I colori nel mondo antico: esperienze linguistiche e quadri simbolici*, Florence, Ed. Cadmo, 2003, p. 67-79.

136. E. PARISINO, *The Light of the Gods*, Cambridge, CUP, 2005. However, the possible “symbolic” value of gold seems to become a means for “nouveau riche” display: on the practice and meaning of gilding on the Delian sculptures see B. BOURGEOIS, Ph. JOCKEY, ‘La dorure des marbres grecs. Nouvelle enquête sur la sculpture hellénistique de Délos’, *JSav*, 2005, p. 253-316.

Nonetheless, the "preciousness" of those materials was mostly appreciated on luxurious artefacts and garments rather than in figural painting. Just as Pliny discourages painters from using cinnabar because it is too harsh, he also reproaches the showy use of expensive pigments such as *purpurissum* and indigo, imported from the East (Pliny, *HN* 35. 46). The Neronian *Domus Aurea* will be considered by Pliny as the "prison of the art" of Famulus (*carcer eius artis domus aurea fuit*), "a dignified and severe but also very florid artist" (Pliny, *HN* 35.120)¹³⁷. In contrast with the evident parsimony with which prized cinnabar had previously been used throughout Classical Antiquity, wealthy Roman individuals would apply it as a background on their walls (Vitruvius, *De Arch.* VII, ix.2)¹³⁸, while Roman emperors lavishly spread precious malachite (gold-solder)¹³⁹ over the arenas as a means to display political status and material wealth (Pliny, *HN* 33.90)¹⁴⁰.

Harikleia BRECOULAKI,

*Institute for Historical Research, Department of Greek and Roman Antiquity (KERA),
The National Hellenic Research Foundation,
48, Vas. Constantinou avenue,
GR-11635 Athens.
hbrek@eie.gr*

BIBLIOGRAPHY ABBREVIATIONS

- BETZ 1991 H. D. BETZ, *The Greek Magical Papyri in Translation*, Chicago, The University of Chicago Press (1992 2nd ed.).
- BIRTACHA 2003 K. BIRTACHA, 'Χρόματα και χρωματισμός κατά την πρόιμη εποχή του χαλκού στις Κυκλάδες', VLACHOPOULOS, BIRTACHA 2003, p. 263-276.
- BRECOULAKI 2001 H. BRECOULAKI, *L'esperienza del colore nella pittura funeraria dell'Italia preromana, IV-II s. av. C.*, Napoli, Electa.
- BRECOULAKI 2006 H. BRECOULAKI, *La peinture funéraire de Macédoine. Emplois et fonctions de la couleur, IV^e-II^e s. av. J.-C.* (Meletemata, 48), Athens, The National Research Foundation.
- BRECOULAKI, PERDIKATSI 2006 H. BRECOULAKI, V. PERDIKATSI, 'The green colour in ancient Greek painting' [in Greek], *2nd International conference on Ancient Greek Technology, Proceedings*, Athens, EMAET, p. 179-185.
- BRECOULAKI 2010 H. BRECOULAKI, 'A Scientific Investigation on the Painted Decoration of the Tomb of the Palmettes', K. RHOMIOPOULOU, B. SCHMIDT-DOUNAS, *Das Palmettengrab in Lefkadia, AM*, 21. Beiheft, Mainz, Ph. von Zabern, p. 102-118.

137. C. JONES, 'Processional Colors', B. BERGMANN, C. KONTOLEON (ed.), *The Art of Ancient Spectacle*, Washington, National Gallery of Arts, Yale University Press, 1999, p. 247-257; M. BRADLEY, 'Fool's gold: colour, culture, innovation and madness in Nero's Golden House', *Apollo Magazine*, July 2002, p. 35-44.

138. "Among many others, the secretary Faberius, who wished to have his house on the Aventine finished in elegant style, applied vermilion to all the walls of the peristyle..." *Vitruvius. The Ten Books on Architecture*. Transl. by M. H. Morgan, New York, Dover Publications, 1960.

139. J. W. HUMPHREY, J. P. OLESON, A. N. SHERWOOD, *Greek and Roman Technology: A Sourcebook. Annotated Translations of Greek and Latin Texts and Documents*, London, Routledge, 1998; BRECOULAKI, PERDIKATSI 2006, p. 184-185.

140. "We have before now seen at the shows given Nero the sand of the circus sprinkled with gold-solder when the emperor in person was going to give an exhibition of chariot-driving wearing a coat of that colour", Pliny, *NH*, transl. by H. Rackham, The Loeb Classical Library, Harvard University Press, 1940.

34 *Harikleia Brecolaki*

- BRECOULAKI et al. forthc. H. BRECOULAKI, M. P. COLOMBINI, A. G. KARYDAS, 'Representing in Colours at the "Palace of Nestor". Original Polychromy, Painting Materials and their Meaning', J. BENNET, M. PETERS (ed.), *Technologies of Representation (Sheffield Round Table 25-27 Jan. 2008)*, Oxford, Oxbow books.
- BRINKMANN et al. 2010 V. BRINKMANN, O. PRIMAVESI, M. HOLLEIN (ed.), *Circumlitium. The Polychromy of Antique and Medieval Sculpture*, Frankfurt, Liebieghaus.
- BRYSSBAERT 2008 A. BRYSSBAERT, *The Power of Technology in the Bronze Age Eastern Mediterranean. The Case of the Painted Plaster*, Oxford, Archaeopress.
- CARTER 2008 T. CARTER, 'Cinnabar and the Cyclades: Body modification and political structure in the Late EBI Southern Aegean', H. ERKANAL, H. HAUPTMANN, V. SAHOGLU, R. TUNCEL (ed.), *The Aegean in the Neolithic, Chalcolithic and Early Bronze Age*, Ankara, Ankara University Center for Maritime Archaeology, p. 119-129.
- DANDRAU 1999 A. DANDRAU, 'La peinture murale minoenne, I. La palette du peintre égéen et égyptien à l'Âge du Bronze. Nouvelles données analytiques', *BCH*, 123, p. 1-41.
- DESCAMPS-LEQUIME 2007 S. DESCAMPS-LEQUIME (ed.), *Peinture et couleur dans le monde grec antique*, 5 Continents Editions, Milan/Musée du Louvre, Paris.
- EASTAUGH et al. 2004 N. EASTAUGH, V. WALSH, T. CHAPLIN, R. SIDDAL, *Pigment Compendium: A Dictionary of Historical Pigments*, Oxford, Elsevier.
- EMMERLING et al. 2010 E. EMMERLING, K. ADELFINGER, J. REISCHL, 'On the Painting Technique of the Tomb Chamber', L. SUMMERER, A. VON KIENLIN (ed.), *Tatarli. The Return of Colours*, Istanbul, Yapi Kredi Sanat Yayinilik.
- GAUNT 2013 J. GAUNT, 'The Classical marble pyxis and Dexilla's dedication', R. B. KOHEL (ed.), *AMILLA, The Quest for Excellence, Studies presented to Guenter Kopcke in Celebration of his 75th Birthday*, Philadelphia, INSTAP Academic Press, p. 381-398.
- GRAND-CLÉMENT 2004 A. GRAND-CLÉMENT, 'Histoire du paysage sensible des Grecs à l'époque archaïque : Homère, les couleurs et l'exemple de *porphureos*', *Pallas*, 65, p. 123-243.
- GRAND-CLÉMENT 2011 A. GRAND-CLÉMENT, *Histoire du paysage sensible des Grecs à l'époque archaïque : le problème des couleurs*, Paris, De Boccard.
- GUTZWILLER 2005 K. GUTZWILLER (ed.), *The New Posidippus. A Hellenistic Poetry Book*, Oxford, Oxford University Press.
- HALLEUX, SCHAMP 1985 R. HALLEUX, J. SCHAMP (ed.), *Les Lapidaires grecs*, Paris, CUF.
- HENDRIX 2001 E. HENDRIX, 'Polychromy on the Amathus Sarcophagus, a "Rare Gem of Art"', *Metropolitan Museum Journal*, 36, p. 43-58.
- HENDRIX 2003 E. HENDRIX, 'Some Methods for Revealing Paint on Early Cycladic Figures', K. P. FOSTER, R. L. LAFFINEUR (ed.), *Metron: Measuring the Aegean Bronze Age (Aegaeum, 24)*, Liege, 2003, p. 139-145.
- JACKSON, WAGER 2008 C. M. JACKSON, E. C. WAGER (ed.), *Vitreous Materials in the Late Bronze Age Aegean (Sheffield Studies in Aegean Archaeology, 9)*, Oxford, Oxbow books.
- JONES, MACGREGOR 2002 A. JONES, G. MACGREGOR, *Colouring the Past. The Significance of Colour in Archaeological Research*, Oxford, Berg.
- JONES, PHOTOS-JONES 2004 R. E. JONES, E. PHOTOS-JONES, 'Technical Studies of Aegean Bronze Age Wall Painting: Methods, Results and Future Prospects', L. MORGAN (ed.), *Aegean Wall Painting: A Tribute to Mark Cameron (BSA Studies, 13)*, London, BSA, p. 199-228.
- KEFALIDOU 2001 E. KEFALIDOU, 'Late Archaic Polychrome Pottery from Aiani', *Hesperia*, 70, p. 183-219.

"Precious colours" in Ancient Greek polychromy and painting 35

- LANG 1969 M. LANG, *The Palace of Nestor at Pylos in Western Messenia. The Frescoes*, II, Princeton, Princeton University Press.
- LEE, QUIRKE 2000 L. LEE, S. QUIRKE, 'Painting Materials', P. T. NICHOLSON, I. SHAW (ed.), *Ancient Egyptian Materials and Technology*, Cambridge, CUP, p. 104-120.
- MOATSOS 1932 G. MOATSOS, *Πορφύρα, το μαγικό κοχύλι. Ιστορία – Αρχαιολογία- Φυσιολογία*, Alexandria, 1932 [reprinted at Athens, Trohalia, 1998].
- ROUVERET et al. 2006 A. ROUVERET, S. DUBEL, V. NAAS (ed.), *Couleurs et matières dans l'Antiquité. Textes, techniques et pratiques (Études de littérature ancienne, 17)*, Paris, éd. Rue d'Ulm.
- ROY 1993 A. ROY (ed.), *Artists' Pigments, A Handbook of Their History and Characteristics*, 2, Washington, Oxford University Press and National Gallery.
- PAPAPOSTOULOU 2002 J. A. PAPAPOSTOULOU, 'Colour in Archaic Painting', TIVERIOS, TSIAFAKI 2002, p. 53-64.
- PETERS 2008 M. PETERS, 'Colour Uses and Symbolism in Bronze Age Crete: Exploring Social and Technological Relationships', JACKSON, WAGER 2008, p. 197-208.
- SHERRATT 2000 S. SHERRATT (ed.), *The Wall Paintings of Thera: Proceedings of the First International Symposium Petros M. Nomikos*, Athens, P. M. Nomikos and the Thera Foundation.
- TIVERIOS, TSIAFAKI 2002 M. TIVERIOS, D. TSIAFAKI (ed.), *Color in Ancient Greece. The Role of Color in Ancient Greek Art and Architecture 700-31 BC*, Thessaloniki, The Aristotle University of Thessaloniki.
- TSIMBIDOU-AVLONITI 2005 M. TSIMBIDOU-AVLONITI, *Μακεδονικοί τάφοι στον Φοίνικα και στον Άγιο Αθανάσιο Θεσσαλονίκης*, Athens, Archaeological Receipts Fund.
- VLACHOPOULOS, BIRTACHA 2003 A. VLACHOPOULOS, K. BIRTACHA (ed.), *Αργοναύτης. Τιμητικός τόμος για τον καθηγητή Χρήστο Γ. Ντούμα*, Athens, Kathimerini.
- ZAPHIROPOULOU 1973 Ph. ZAPHIROPOULOU, 'Vases et autres objets de marbre de Rhénée', *Études déliennes. Publiées à l'occasion du centième anniversaire du début des fouilles de l'École Française d'Athènes à Délos (BCH, Suppl. 1)*, p. 601-636.

