9th International Round Table on Polychromy in Ancient Sculpture and Architecture

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Stevenson Lecture Theatre, British Museum

ABSTRACTS

The British Museum

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Session 1 *Chair: Jan Stubbe Østergaard*

‘From textile to fictile’: large-scale painted terracotta statues from Salamis and the role of polychromy in defining regional sculptural style in Cyprus

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Between January and June 1890 the Cyprus Exploration Fund (CEF) conducted extensive excavations at the ancient city of Salamis on the east coast of the island. The most significant discovery according to the excavators (James Munro and Henry Tubbs) was a disturbed deposit of fragmentary votive sculpture on a low hill – called Toumba – located to the south of the main urban area. Apart from recognising the relationship between the style of the mainly male statues, some up to 3.5–4m high when intact, and that of contemporary Near Eastern cultures (especially Assyria) of the 8th to 6th centuries BC, Munro and Tubbs were struck by the rich painted decoration which reflected the otherwise unpreserved textiles used by the elite groups who dedicated these images of themselves. Crucially, Munro and Tubbs were aware of the importance of the statues in charting the flow of influences from the Near East to the Archaic Greek world (as seen on East Greek pottery, for example) through luxury goods such as textiles.

The discovery was made at the dawn of modern archaeology in Cyprus, and the assemblage itself was subsequently neglected due to lack of comprehensive publication but also because of the influence on ceroplastic studies by finds made by Swedish Cyprus Expedition between 1927-31. Einar Gjerstad defined the stylistic and chronological development of Iron Age Cypriot sculpture largely with reference to the large-scale but monochrome terracotta statues of the shrine of Ayia Irini in north-western Cyprus. Once believed to represent an earlier phase of sculptural development, the undecorated Ayia Irini statues are now believed to be just one of a series of regional tradition contemporary with that of Salamis. Recent research on the coroplastic traditions of Cyprus has emphasized the importance of regional terracotta workshops in defining the identity and power relations of the local kingdoms of Cyprus.

The Toumba assemblage represents not just an importance source of evidence for this workshop but also for how painted terracottas (and the related ceramic repertoire) were used to evoke or emulate the luxurious lifestyles of their users. More generally, it reflects the central role of painted terracotta as a medium for sculptural display which must be considered as integral to the development of monumental art in the Mediterranean in the 7th century BC.

Anaschetos, a youth from Kalymnos: on the colouring of an East Greek kouros

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In 2001, a marble kouros was discovered in the sanctuary of Apollon Dalios on Kalymnos. It is 1,095m high and dates to about 540-530 BC. According to the inscription, Anasche[t]os dedicated the statue to Apollon. The statue belongs to the well-known East Greek type of a kouros, clad in a long chiton and a himation.

It is rare that the polychromy of an archaic statue has been adequately preserved, and Anaschetos is the only East Greek, clad kouros that allows a reconstruction of its original colouring.

The polychromy of the frieze of the Siphnian Treasury at Delphi: new investigations, new results, new archaeological and historical questions

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The Siphnian Treasury is a small archaic votive building in Delphi that was dedicated to Apollo in 525 BC by the city of Siphnos, a Greek Cycladic island, just after the discovery of gold and silver mines in its *chôra.* Brilliant colour was preserved both on the building's architectural elements and on its carved frieze at the time of its rediscovery in 1894 by the French School of Archaeology in Athens, but it is no longer visible now.

A thorough study by Vinzenz Brinkmann, published in 1994, represents the most complete systematic description of its polychromy at the time. More than 20 years later, recent major technological advances led us to reinvestigate the frieze and its colours by using new methods.

The most recent investigation of the frieze, in 2015 and 2016, applied macroscopic XRF imaging (MA-XRF) and mobile hyperspectral imaging in the Visible and Near Infrared Range, revealing new traces of the lost pictorial treatment and providing new results about the localisation and characterisation of pigments.

This has raised new archaeological and historical questions concerning the chronology of the painting itself, the *technè* for producing and applying colours on marble, and the meaning of their use in specific parts of the frieze. The distribution of work for example implies much more than one workshop, as had been suggested before but is now confirmed by the fresh evidence supplied by new investigative techniques.

The architectural polychromy on the Athenian Acropolis: new data obtained through recent *in situ* non-invasive analytical investigation of the colour remains on the Parthenon and Propylaea

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A long period of time has passed without substantial and unambiguous data on the extent and composition of the colour that adorned the temples of Classical Antiquity, since the earliest references to traces of colour by 18th and 19th-century European travellers, architects and painter, who recorded what remained visible at that time on the classical monuments of the Athenian Acropolis, and after the first studies on the Polychromy, as the term was established in the early 19th century.[1]

In recent decades, research has been expanded and intensified, bringing new evidence for the architectural polychromy in the Classical world, in which colour is finely integrated in or interlaced with the sculptural elements of the architecture. The new data find a fertile interdisciplinary scientific ground to be explored, interpreted and understood. This forms a new perception of the classical aesthetics as a basis to reconstruct the original appearance of the architectural monuments. In this context, technical studies on surviving traces of polychromy are nowadays done systematically, following an integrated protocol, extending and exhausting the possibilities of non-invasive investigations and thus minimizing the need of any sampling or microdestructive measurements to the very last conclusive stages of the analytical methodology.

The results included in this paper have been obtained through non-invasive measurements that took place on site, in June-July 2015. Access to the architectural members under investigation was secured by scaffolding that was settled on the Parthenon and Propylaea during the last restoration program (2011-2015) undertaken by YSMA. The noninvasive investigation constituted an integral part of a complete analytical methodological approach, addressing the investigation of colour remains or surviving decorative patterns on the Parthenon west entablature and specific architectural members of the Propylaea. The methodology applied for the polychromy

1 Brommer, 1967. Jenkins & Middleton, 1988.

investigation took into consideration the current international state of the art[2] and consisted of the following four phases: a) Phase A - Archaeological documentation, b) Phase B-Imaging diagnostic techniques, c) Phase C – Non-invasive techniques applied in situ and d) Phase D - Microsampling and application of analytical techniques, in lab scale. Part of phase A and phase B results were presented in previous works.[3,4] In the present study, the discussion of the results of Phase C, combining optical examination, elemental (X-Ray fluorescence) and molecular (microRaman) analysis, aims to identify the pigments and to extract any technical traits in the application of the colours. The interpretation of the results presented is based on the interdisciplinary synergy and collaborative work that was carried out onsite.

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2 Brinkman, 2007. Verri, 2008. Bourgeois and Jockey 2001. Stubbe Østergaard, 2018.

3 Aggelakopoulou et al. 2013, in press

4 Aggelakopoulou et al., 2016, in press

New non-invasive/non-contact investigations of the polychromy of the Parthenon sculptures at the British Museum and their interpretation

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The polychromy of the Parthenon sculptures has long been the subject of scholarly research. The debate has continued now for almost two centuries: in 1837, physicist Michael Faraday concluded that no polychromy survived on the sculptures; in the 1980s, Andrew Middleton and Ian Jenkins discovered a brushstroke made of hydrocerussite — now largely altered to lead sulphide— and of uncertain significance; in 2008 traces of a 'greenish' pigment were noticed following laser cleaning by stone conservators of the West Frieze and the *Kekrops and Pandrosos* group at the Acropolis Museum in Athens; and in the same year, extensive remnants of Egyptian blue were found on several sculptures at the British Museum, including East Frieze 32, East Pediment A, E and F, G, K, L and M and West Pediment N.

In 2018, on the occasion of the exhibition *Rodin and the Art of Ancient Greece*, several sculptures were removed from the Duveen Gallery and prepared for display, allowing for closer visual examination and non-invasive/non-contact investigation. This paper offers insights into the production process from the carving of the marbles to their finishing with paint. It presents the results of the analytical investigation (observations under magnification, multispectral imaging, Xray and fiber-optics reflectance spectroscopy) of East Pediment L and M, where elaborate figurative and floral painted decorations — executed with paint containing Egyptian blue — were found on the carved textiles. The exceptional access to the group within the premises of the Stone Conservation Studio at the British Museum revealed the presence, and allowed for analysis of the nature, of another previously unseen painting material. The existence of elaborate patterns on the carved textiles leads to new interpretations of the original appearance of the figures. The significance of this colouring matter will be discussed and the findings placed within their broader art-historical and technological contexts, by drawing comparisons with primary and secondary sources, especially paintings, as well as fashions in 5th-century Athens. Finally, the conservation implications of the presence of painting materials on the sculpture will be discussed.

Investigating drawing and painting techniques on a monumental cist tomb of the late 4th century BC from Pella, Macedonia ("Tomb of the Philosophers")

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The so-called Tomb of the Philosophers, discovered in 2001 in the vicinity of the eastern cemetery of the ancient city of Pella, the capital of the Macedonian kingdom, is one of the largest cist-graves from antiquity that have been found to date. The mural decoration of the tomb is rich and most of its original polychromy is fairly well preserved, despite localised plaster delamination and loss, as well as paint decohesion.

Over a black toichobate and a light-coloured band, a colourful and intricate floral frieze runs around the walls of the tomb. The principal decoration of the monument occupies a broad space between the floral frieze and another frieze depicting horsemen, funerary mounds and stylized rosettes at the top of the tomb; this principal decoration displays large-scale portrayals of standing and seated men in different attitudes; e.g. pointing to a globe, holding scrolls or other objects suggesting intellectual activities, such as philosophy and astronomy.

The painting technology of the Tomb of the Philosophers is the subject of a detailed campaign of analytical investigations. The first phase included non-invasive and non-contact techniques (visible-, infrared- and ultraviolet-reflected and luminescence imaging, with and without the aid of magnification, and X-ray fluorescence spectroscopy). A second phase will include non-invasive and non-contact Fourier-transform infrared, Raman and ultraviolet-visible-infrared spectroscopy. These investigations are aimed at gaining insights into painting practice of the late 4th century BC in northern Greece and at providing further clues for the interpretation of the subject matter and iconography of the representations. Imaging techniques were used to provide a clearer visualisation of both the iconography and the distribution of painting materials, while analytical tools afforded clues for the identification of the latter.

This paper will report on the up-to-date understanding of the stylistic and technical differences and similarities observed between the floral and horsemen friezes and the principal representations. Setting out techniques, pigments and painting technology provide interesting clues on distribution of labour in the tomb and may indicate that the 'philosophers' were executed by a separate artist, more concerned with subtle variations of tones and accurate rendering of detail.

A 4th-century BC wooden coffin with sirens from Saqqara, Egypt: polychromy and meaning

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This presentation discusses the results of a preliminary investigation conducted on the polychromy and support of a 4th-century BC wooden coffin, excavated at Saqqara in the 19th century and preserved in the collections of the Egyptian Museum, Cairo [1]. The coffin, which is stylistically close to contemporary examples from the Black Sea region (now in the collections of the Louvre and the Hermitage Museum), is decorated with terracotta and stucco appliques in high-relief representing sirens and round coffin fittings with Medusa heads, comparable to examples from Naukratis (e.g. in the collections of the Egyptian Museum, Cairo, and the British Museum). Stylistic analysis revealed that this Greek-style artefact can be considered a local re-interpretation of the type of the funerary siren, widely attested in Classical Greece.

This remarkable, but scarcely known coffin is an excellent case study for investigating the techniques adopted for the application of polychromy on wood in Ptolemaic Egypt. The support is a fine example of multi-materiality, combining wood carving with the application of terracotta and stucco mouldings in high and low relief. The surface combines bare wood with a vivid polychromy, including painting and the application of gold foil. A visual examination conducted by naked eye and digital portable microscope (Dinolite) allowed the acquisition of preliminary information on the technical aspects of the polychromy. It was possible to observe the way of mixing and applying pigments, and the techniques adopted for applying gold foil, here combining two different methods, in order to obtain a variety of colour and textural effects. The high-relief figures are particularly interesting, because they provide an insight into the technique adopted for painting the fleshy tones, created with great care, by the application of a sequence of painted layers.

A more in-depth non-invasive technical investigation will be useful to acquire a comprehensive understanding of this exceptional object, identifying the nature of the materials.

[1] Edgar C.C., 1905. Graeco-Egyptian coffins, masks and portraits (Catalogue général des antiquités égyptiennes du Musée du Caire), Le Caire, pp. 1-8.

Colour and Light: a Hellenistic terracotta figurine of a Maenad from Myrina in the National Museum, Athens

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During the Hellenistic period, and under the growing influence of the art of painting, the polychromy of terracotta figurines focused not only on an elaborate rendering of colour, but also on the interplay of light and shadow; some of the best-preserved examples clearly show the subtlety of such pictorial effects. Among them is a statuette of a standing Maenad, now in the collections of the National Archaeological Museum in Athens (EAM inv. 5000). Dated to the 2nd century BC, it is a high-quality testimony of the sculptural, as well as pictorial, coroplastic production in the workshops of Myrina (Eolide, Turkey).

Combining visual examination (with and without the aid of magnification), multi-spectral imaging and non-invasive spectroscopic investigations (XRF, FTIR, FORS), a scientific study of the artefact was carried out within the framework of a collaborative research programme between the Louvre, the C2RMF, the National Archaeological Museum and the French School in Athens.

The paper will present the main results of the study by discussing the colour scheme, pigments and colourants, and by providing insights into the painting techniques used to apply the painting materials, with a focus on how the *chiaroscuro* effect was achieved. The polychrome style of the Maenad from Myrina will also be placed within a broader perspective linked to earlier representations of Maenads produced in Attica and Boeotia during the late fourth and third centuries BC.

Preliminary evidence for trends in pigment use in Graeco-Roman funerary portraits from Egypt at The British Museum

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The British Museum (BM) holds a collection of around thirty Graeco-Roman funerary portraits from Egypt, dating from the first to the third centuries AD and representing the fusion of two traditions; the embalming rituals of pharaonic Egypt and the portraiture practices of the Graeco-Roman world. As part of the APPEAR (Ancient Panel Paintings: Examination, Analysis, and Research) Project, a collaborative project coordinated by the J. Paul Getty Museum, multispectral imaging techniques were applied to twenty-six of these pieces. The aim was to survey the portraits using these techniques and create a systematic approach both to the collection of images and the interpretation of the data acquired.

A series of workflows were created which took into consideration the distinctive reflectance or luminescence properties of pigments typical of the palette used in these portraits, and how these properties can be used in tandem for the preliminary identification of these pigments. The data obtained not only provides preliminary evidence for the pigments used, but also delineates where and how these pigments were used in the creation of painterly effects, and allows meaningful comparisons to be made between portraits.

The ultimate goal of this research is to identify parallels or differences in the distributions and patterns of use of certain pigments, which may permit relationships to be defined between pigment choices and uses and other technical choices such as binding media or support. In addition, by relating these practices to factors such as find spot, time period and subject, the production of certain workshops, as well as changes in taste or resources may perhaps be identified.

An Achaemenid god in colour

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A relief fragment from the Hall of 100 Columns at Persepolis that was bequeathed to the Harvard Art Museums in 1943 preserves significant traces of its original colouration. The relief fragment depicts the figure in the winged disk often interpreted as the Zoroastrian deity Ahura Mazda. This paper recounts the history of the discovery, study, and reconstruction attempts of the relief's polychromy, and concludes with some thoughts on the valuation of colourfulness. Following a conservator's rediscovery of the pigment remains in 1965, Judith Lerner published a colour reconstruction of the fragment in 1971. Some 36 years later, a three-dimensional colour reconstruction was created to be displayed in the 2007 exhibition "Gods in Colour: Painted Sculpture of Classical Antiquity". Scientific analysis of the relief has included Raman spectroscopy, Fourier transform infrared (FT-IR) spectrometry, scanning electron microscopy (SEM), and infrared luminescence imaging to map Egyptian blue. The relief was also examined, drawn, and photographed under different lighting conditions, including raking light. Recent on-site investigation of the polychromy of the Persepolis sculptures by Alexander Nagel provides important comparative evidence. But while there is a good basis for a colour reconstruction, many questions about the relief's original appearance remain. What assumptions are we making as we fill in the gaps? And which assumptions guided the ancient design of a deity resplendent not just in colour, but in multiple colours dazzlingly arrayed?

Polychromy on Hellenistic-Parthian terracottas from Babylonia

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The British Museum has a large collection of Seleucid and Parthian fired clay figurines from Mesopotamia, mostly from Babylonia but some from Nineveh, and deriving either from nineteenth century collections or early twentieth century excavations. Pigment survives on a large number of these and although briefly remarked on in the literature, they have never been examined in detail and few have yet been scientifically analysed. This paper offers a survey of the evidence and sets them in the context of what is analytically known about Parthian polychromy in southern Iraq in the light of published scientific analyses of stuccoes from Uruk/Warka.

Painted sculpture from Parthian Kurdistan.

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This paper reports on the discovery of polychrome sculpture at the site of Qalatga Darband in Iraqi Kurdistan. Excavations being carried out by the British Museum are beginning to reveal a fortified city of the early Parthian period (2nd - 1st centuries BC). At the southern end of the site are the remains of a monumental stone building that was clearly sacked. The destruction layer contains the smashed remains of Hellenistic sculpture. Of particular interest is a substantial part of a seated female alabaster figure, which bears traces of yellow, pink and purple paint. Analysis of these pigments in the department of Scientific Research at the British Museum revealed the use of pigments and their combinations that are in keeping with late classical and Hellenistic painting techniques and materials. In addition, pigment remains were found on the interior of a number of ceramic sherds that were used as palettes. Analysis of these pigments shows that these mirrored some of those found on the polychrome figure.

The site has also yielded other evidence for the adoption of elements from the Hellenistic east Mediterranean tradition, including olive presses and the use of fired clay roof tiles. It is hoped that work in future seasons will enable the connections of this city with these Western traditions to be more accurately established.

New research about polychromy and gilding on Gandharan stone, stucco and clay sculptures

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This contribution will discuss new scientific data resulting from the sampling of the polychrome and gilded stone, stucco and clay sculptures of Gandharan art. This was carried out as part of an ISCR project, conducted in collaboration with the Museum of Oriental Art of Rome (now merged in *Museo delle Civiltà*) and the Italian Archaeological Mission in Pakistan (MAI).

In the last two years, we have had the opportunity to clarify some issues identified in our preliminary research. We are delighted to have collaborated with several European museums of oriental art (Museum Guimet of Paris, Civic Archaeological Museum of Milan, Collection of Oriental Art and the Museum of Oriental Art of Turin), and with the Italian Archaeological Mission in Pakistan, led by Luca Maria Olivieri, and with the Italian Archaeological Mission in Afghanistan, supervised by Anna Filigenzi. We analysed some important polychrome and gilded artefacts in these museums that come from Gandharan sites in Pakistan and Afghanistan. Moreover, we analysed architectural stucco samples, used as decoration of Buddhist buildings in archaeological sites of Swat (Pakistan).

New interesting data about Gandharan stone, stucco and clay sculptures and architectural stucco decorations highlighted the use of various pigments (ochre, blue ultramarine, etc.) and various type of gilding, with different ground layers. Moreover, we carried out gas chromatography and proteomics analysis to verify the presence of binders for pigments and gildings: the results are very interesting with regard to the presence of saccharide materials and proteinaceous materials.

We tried to establish the specific use (or not) of pigments and binders on different sculptural materials (stone, stucco and clay). Moreover, we identified on many stone sculptures the presence of clear traces of a whitish ground layer, whereas the polychromy is not preserved, probably for reasons of natural decay or the application of incorrect cleaning methods post-excavation.

Posters

Analysis of residual polychromy on a group of terracotta sarcophagi coming from Tuscania (Viterbo) stored in the National Archaeological Museum of Florence (MAF)

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The Hellenistic sculptures described in this presentation are part of a group of archaeological finds from Tuscania (Viterbo), stored in the MAF. At the end of 19th and early 20th century, Luigi Adriano Milani, Director of the Royal Archaeological Museum of Florence, started an acquisition programme aimed at increasing the Topographical Museum of Etruria's collection.

At the beginning, objects from the territory of Tuscania were partly shown in the *Tuscanienses-Ferentani* museum gallery and in the garden of the MAF. On November 4th, 1966 a flood heavily damaged the museum and its collections, causing the dismemberment of many contexts, including those from Tuscania. These artefacts, after the disaster, were cleaned, restored and - most of them - moved into the depository of the MAF and to Villa Corsini, where they are currently preserved. The project began at this point, searching for information about the objects and their original context. Some Hellenistic stone sculptures were analysed during some previous collaborations between ICVBC and the MAF. In this case, some terracotta sarcophagi and lids with reclining banqueting figures were studied and turned out to be very interesting from the polychromy point of view. They are a typical funerary production of Tuscania workshops, between the second half of the 3rd and the 2nd – 1st centuries BC.

The sculptures had well-preserved traces of original polychromy. For this reason, they were analysed with portable and totally non-invasive techniques. Imaging techniques (Ultraviolet fluorescence photography - UVf, Visible photography and Visible Induced Luminescence photography - VIL) and single spot techniques (XRF, FORS) were applied. In addition, a portable microscope was used to document the areas analysed and to obtain details of the polychromy traces at higher magnification. On the basis of the non-invasive investigations a sampling campaign was conducted. A few micro-samples were analysed by micro-invasive techniques (FT-IR and XRD) in order to characterise the nature of the superficial deposits and to define the type of terracotta, since the visual inspection highlighted a different colour and matrix. This aspect is still under study.

First evidences from the non-invasive protocol highlighted a traditional colour palette. Pigments identified were yellow and red ochre, Egyptian blue, organic pink lake and manganese black.

Analyses of the ground layers (when present) clearly reveal the presence of calcite or calcite and aragonite, while the surface residues are mainly composed of gypsum.

Communicating ancient polychromies: the Spatial Augmented Reality experience

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In recent years, academics have been ever more interested in the study of the polychromy of ancient works and aware of its value. However, museum audiences are not aware of it, ignoring the fact that the white marble of statues and buildings is not what we can call a stylistic choice but evidence of the passing of time.

The collective imagination that has always considered white as the primary colour of the ancient sculpture now needs to adapt, faced with an interdisciplinary approach that allows a re-evaluation and better appreciation of the elements of ancient sculpture and its decoration, being aware of the importance of polychromy in antiquity. It is therefore vital to use forms of communication that allow to highlight for museum audiences the original coloured appearance of such museum objects that have been studied in detail.

It is important to pay attention to new communication media that have a clear role in showing the final outcomes of the research to the public, a research carried out by more sophisticated means.

Spatial Augmented Reality (S.A.R.) is one of the architectural technologies that lends itself best to such communication experiments in archaeological and museum settings. This is due to its relative user-friendliness and the fact that it can be used by a group, an audience. Archaeological and museum assets are well suited to the use of this technology, because it allows the reconstruction of missing fragments or original colours by overlapping the real and virtual model through the use of matching techniques.

S.A.R.'s technical possibilities and its application in the fields of archaeology and museums create new scenarios for scholars, because it is particularly suitable for restoration projects and digital *anastylosis* and permits the recreation of original colours using different methods of research.

The Glowarp Studio has long since set the goal of using S.A.R. in archaeological and museum settings for communicative purposes and also as a means to enhancing the finds or "reconstructing the absence" by creating ad hoc multimedia contents.

This work discussion starts from the application of S.A.R. on a 3D copy of a fragment of the Parthenon frieze kept at the British Museum, and continues with an hypothesis of reconstruction of the missing part of the frieze of the Ipogeo del Cerbero located in Canosa di Puglia (Bt), Italy. The narration of both these assets is considered difficult because of the particular fragility of the pigments, by the strong visual fragmentation or by the complete lack of pigments.

This paper discusses the potential and limits of S.A.R. technology for visualising ancient polychromy, thus providing interesting perspectives for the use of video mapping.

Two Roman children's sarcophagi with cupids at Villa Corsini

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Two Roman children's sarcophagi from the Uffizi collection, currently located at Villa Corsini at Castello, were analysed with the intention of finding traces of polychromy. Both were produced in Roman urban workshops and their decoration is similar in subject: on the first (inv. 159) cupids are carrying the armour of Ares; on the second (inv. 378), they are racing chariots in the Circus Maximus.

Two different methods were used: (1) the visual, involving macroscopy, technical photography (UV fluorescence, IR reflectography and VIL) and microscopy, and (2) the analytic, involving the removal of pigment samples for further analysis through instrumental and analytical technologies (FT-IR and Raman microscopy).

The sarcophagus decorated with cupids carrying the armour of Ares has revealed the presence of lead white, on the top of which was put a light brown layer, presumably an ochre. On top this layer were further pigments, giving a shade effect to the surfaces.

The sarcophagus with cupids as charioteers has preserved more remnants of colour, some of which visible to the naked eye. Along with the presence of cerussite and red pigments, the analyses have also identified traces of gilding on the harness of one horse and the presence of orangey-yellow (minium + goethite), white, and black colour to render the straw covering of the amphora lost by the cupid acting as *sparsor*.

Colour of the eye: meaning and making

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Representation of eye is extremely important for the understanding of the ancient sculpture although it was forgotten and researched only in the last few years when importance of polychromy was emphasised through the new research. Still, not enough research has been conducted to realise how important was placement of polychrome on the area of the eye and the material and methods methods which were used for that. This paper will try to defend idea that the eye polichromy was vitally important for the providence for mimesis (μίμησις) and for seeing the sculptures as alive, mainly focusing on the late antiquity and early Byzantium. How the eye, and its colour could affect the sculpture will be argumented thought the written examples of writers who sought to explain what they saw in the face and how the eyes helped to achieve mimesis. For this research we will look at the writings of Eusebius which mentions the Constantine sculpture looking towards the heaven. Because the sculpture from Basilica of Maxentius is now preserved we can realise that the whole idea of Constantine looking towards the heavens was created by the representation and orientation of the eye, not the up-head posture which is important points that adds to idea of viewer's focal point on the eyes of the sculpture. Some of the arguments towards this idea will derive from early Byzantine period and the writings of monk Agatias from which it could be concluded that the eye was that brought "feeling of presentness" of the represented. For better understanding of the eyes as a part of the face one should also look at philosophical and religious works which provide us information about what was one seeing in the eye of the human. In order to understand the importance of the eye inside the sculpture and relief, we will also examine the ways in which it was made and put in some of the ivories as a lead part. These especially delicate ivories are interesting if we consider that the great effort was put just to place a lead in the area of the eye which is showing us that eye was important part of the sculpture which provided another layer of meaning to it.

Saturday 10th November, 2018

Session 5 *Chair: Joanne Dyer*

Palmyrene polychromy: investigations of funerary portraits from Palmyra in the collections of the Ny Carlsberg Glyptotek

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The collection of Palmyrene funerary sculptures in the Ny Carlsberg Glyptotek is the largest of its kind outside of Syria. To a large extent, the collection was gathered by brewer Carl Jacobsen through his connections to the Danish consul Løytved in Beirut and the Danish scholar Harald Ingholt, who carried out excavations in Palmyra and Hama in Syria between 1924 and 1938.

The city of Palmyra was surrounded by extensive cemeteries with communal funerary monuments, including tower tombs, underground tombs, and “temple” or “house” tombs, where the deceased were buried in niches (*loculi*), closed with limestone slabs carrying a frontal relief bust of the deceased. This type of funerary portrait was produced over a relatively short time period of ca. 250 years, immediately prior to the destruction of Palmyra by the Roman army in 273 CE.

The funerary sculptures have attracted a lot of scholarly attention since their discovery in the late 19th century. However, with the exception of a single portrait, the so-called Beauty of Palmyra, their polychromy has until now not been the focus of scientific examinations. Although the portraits generally appear white, several carry well-preserved traces of polychromy, including red, yellow, black, white, green, and blue pigments as well as gilding.

The present contribution will present the results of the preliminary investigations of the polychromy of eight palmyrene funerary portraits in the collections of the Ny Carlsberg Glyptotek, selected for their varied traces of original colours. The portraits were examined with VIL imaging, UVF, XRF, and in-situ microscopy as well as elemental analysis.

Mithras' colours

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The National Museum of Rome (9th room of the Museo delle Terme) contains an important collection of Mithraic sculptures, found in the years 1973-75 during an archaeological excavation under the early Christian basilica of Santo Stefano Rotondo on the Caelian hill. The church was built in the 5th century in an area formerly occupied by the barracks of the *Castra Peregrina*, which hosted one of the better preserved cult places of Mithras. The reliefs show many traces of gilding and polychromy, whose best example is the great relief with the killing of the bull by Mithra. The slab, of the late 3rd cent., will be compared from a technical point of view with other polychrome finds of the same provenance and with the stucco fragments of an earlier relief of the same subject, pertaining to the first phase (late 2nd cent.) of the Mithraeum. Among the latter, the head of the god preserving extensive traces of gilding on the skin and violet-red on the Phrygian cap is particularly interesting. An investigation was conducted to define the palette used in this type of sculpture, which is extremely well characterised.

New trends in binder analysis: from the Bronze Age to medieval polychromes through MS based techniques

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Paintings and polychromies are complex systems that often consist of multiple heterogeneous layers, in which pigments, fillers and other inorganic matter are mixed with organic materials. As an effect of the long term exposure to the changeable and sometimes harsh environments where the object is displayed or stored, severe degradation phenomena of the organic binders take place.

Procedures able to maximize the information obtained from the small samples available have been developed in the past years, followed by the systematic study of reference materials and aged mock-ups in order to understand the degradation mechanisms and to find markers for the identification of aged binders. Research on the degradation mechanisms has evidenced that several analytical methods, though able to detect and even identify the non-aged materials, present serious drawbacks when dealing with highly degraded organic binders.

This paper presents research dedicated to improving our understanding of the changes and degradation phenomena of the organic binders present in polychrome objects. The effort made for the development of specific analytical procedures aimed at improving our capacity for the efficient detection and unequivocal and reliable identification of organic binders and the determination of the binder's state of conservation will be presented. The paper will show and discuss results from several samples using a multi-analytical approach based on MS based techniques: from GC/MS to bottom-up proteomics through analytical pyrolysis (EGA/MS, Py/GC/MS, DSP/GC/MS).

Among others results the analysis of polychromes at the Aegean palace of Tel Kabri in Israel (18th century BC), the Mut temple in Sudan (7th century BC), the palace of Apries in Egypt (6th cent. BC), several funerary monuments of ancient Macedonia (5th - 4th cent. BC), Roman house decorations in Pompeii (1st cent. AD), houses in Medinet Madi (2nd cent. AD) in Egypt and the Bamiyan buddhas in Afghanistan (6th cent. AD). The information arising from this study on the use of binders in paintings and polychrome objects across centuries and countries, will be interpreted and exploited contributing decisively to our general understanding of the processes involved in communication and transfer of ideas, materials and technologies in antiquity, and how they have been reinterpreted and adapted in modern times.

From the creation of a database to the first colour *experience*: possible ways to communicate polychromy on ancient sculptures

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"**MannInColours**" is a three-year research project that takes place at the National Archaeological Museum of Naples and concerns the creation of the first database on ancient polychromy of an Italian National Museum. This **database** will organise a large amount of data in a rational and intuitive way, including archival, iconographic and bibliographic information on each object analysed.

The project starts by setting up the digitalisation (by photogrammetry) of a selection of one hundred sculptures belonging to the Farnese Collection, as a preliminary basis; this will allow the creation of 3D models that will be uploaded into the database. In parallel to the photogrammetric campaign we investigate the same sculptures searching for ancient traces of polychromy. Where traces of colours are found, they will be repositioned on their 3D models, using augmented or virtual reality. Thanks to the database it will be possible to see both models, original and coloured (with relating data).

Since one third of the project will be entirely devoted to disseminating the results of our research to the general public, several tasks will be performed to make people aware of this topic: digital and communication strategies will be devoted to the general public, such open **expert-rooms** and finally the implementation of ***experiences***. All the 3D models will converge together to set up inclusive and emotional digital storytelling, that will provide visitors annually wit a hands-on experience. This side of the project is intended to stimulate inclusion, empathy and engagement of a larger number of visitors, thanks to the use of digital technologies and software, never employed to enhance this field of study before.

The polychromy of classical Greek sculpture: reflections on research methodology

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The latest overview of the polychromy of classical Greek sculpture is the relevant chapter in Patrik Reuterswärd's 1960 monograph. Since then, many new observations have been published and a range of advanced technologies have vastly improved our research capabilities and the quality of the data acquired.

Focusing on marble sculpture, it nevertheless remains a fact that the evidence provided by the monuments themselves is poor. There are various reasons for this, among them the use of bronze for free-standing sculpture, the use of marble for sculpture in exposed positions, and a particularly strong unwillingness to accept colour on classical sculpture – leading to heavy cleaning as well as little motivation for investigation.

To make progress in answering a basic research question, namely the character of the relation between the forms and the polychromy of classical marble sculpture, it would therefore seem useful to attempt to establish some qualified hypotheses based on indirect evidence from other, contemporary sources.

A point of departure will be the positioning of visual media within the framework of the concepts of *techné* and *mimesis*, particularly in relation to ancient rhetoric.

Using the 'Ludovisi Throne' as a case study, contemporary literary sources and comparative archaeological material will be mobilised in support of a hypothesis regarding the highly sophisticated interdependence of form and polychromy in high grade classical marble sculpture. Polychromy is seen as an absolute necessity for the sculpture to fulfil its primary, communicative function in its ancient context.

Who is to decide what is legitimate in art? On the friendship between Canova and Quatremère and the question of how to reconstruct ancient sculptural polychromy.

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On 10 June 1818 Quatremère de Quincy wrote to the sculptor Antonio Canova, stating: “I am convinced that the antique would never have had the effect that it has had on public taste over the last fifty years if all the monuments of sculpture had been left in the mutilated state in which artists often prefer to see them.” The letter was one of many exchanged between Canova and Quatremère, sharing ideas on ancient sculpture. Both agreed that ancient marble sculptures were originally somehow polychrome, one working practically from ancient models; the other theoretically.

This paper explores how varying practices of treating marble sculptures during the neoclassical period (late 18th century and early 19th century), from the coloured finish of Canova to the marble texture of Thorvaldsen, were debated and received amongst contemporary critics and commissioners. Regardless of nationality, a lust for white marbles guided sculpture commissions in the early 19th century, and Canova was well aware that not all patrons shared his tinted visions. To the Earl of Cawdor he wrote on 27 March 1817: “I challenge you to look and examine again the two statues of Hebe and Terpsichore, which were not treated with any wash, except that I passed them a brush soaked in sandy water, which can be removed and washed off simply with a sponge.” This treatment with “sandy water” was regularly practiced by Canova to tone down the effects of a freshly carved marble sculpture and accentuate skin from garments. Sometimes he would also add red or yellow pigments to tint sculpted cheeks, skin or hair.

The aim of this paper is to explore what informs the analysis of ancient pigment remains, by relating the symbiotic relationship between neoclassical sculptor and critic to 21st century debates of ancient sculptural polychromy. While data continue to increase, supporting the hypothesis that all ancient marble sculptures were once painted, it remains fragmented. Experiments with painting on marble copies are essential, because they effectively confront the fragment, and hold the potential to unify theoretical and practical approaches to painting on marble sculpture. Yet, ancient ideas of aesthetics continue to be difficult to tackle and often seem guided by personal preferences.

Reconstructing architectural polychromy at ancient Ostia

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How can we present a vivid visualisation of ancient everyday life to a modern audience with the help of architectural polychromy? And in how far should we present reconstructions with architectural polychromy on the basis of hypothetical colour schemes? This paper intends to address these and similar questions for graphical reconstructions of various architectural settings in the ancient harbour city of Rome. The reconstructions will be part of the travelling exhibition *Segregated or Integrated? Living and Dying in the Harbour City of Ostia, 300 BCE – 700 CE*, which is funded by the Academy of Finland and will visit several major cities in Scandinavia. The reconstruction drawings will emphasise architectural polychromy even though, in many cases, the colour schemes are hypothetical and based on contemporary examples recorded in Ostia and elsewhere in the region. The proposed paper aims to shed light on the methods and considerations involved in producing such reconstructions, which will concern both domestic and sacred milieus.

Rendering the original colours of ancient sculptures and architecture in 3d models using experimentation: a cross-cultural and methodological approach

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Although the 3D geometrical reconstruction of sculptures and architecture is already well established, there is still much to do in the area of colour reproduction. The aim of the “Retro-Colour 3D Programme”, supported by Archéovision (2015-2017), was to provide methodological steps to ensure the scientific accuracy of 3D colour models. It would seem that the role of experimentation is essential in order to achieve credible renderings. Furthermore, the experimental approach leads to a better understanding of the creative process – which in itself is worthy – and increases the reliability of the digital reproduction.

In a few words we would summarise the process as: digital acquisition of the archaeological object, geometrical reconstruction (= filling the gaps), colour measurements (of the remains of original polychromy if reliable and of experiments), digital painting using 2D or 3D software, creation of the appropriate lighting to produce a realistic rendering of the reconstructed object.

During the Retro-Colour 3D Programme this process was applied to three different kinds of objects that were selected for their distinct location, size and epoch: the bust of Akhenaten (Louvre, inv. 11076), the triclinium of the house of Neptune and Amphitrite at Herculaneum and the sculpted angel carrying the moon from the tympanum on the Royal Portal of the Cathedral Saint-André of Bordeaux.

The chromatic range of ancient pigments on a marble surface: a digital reconstruction

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This paper presents an experimental approach to ancient polychromy, combining an empirical examination with a digital reconstruction. It attempts to replicate the chromatic range of natural pigments that can be achieved on a marble surface, using the tempera technique.

The presentation will discuss the results of the experiment, which was designed to test the behaviour of several earth and organic pigments on white marble slabs. The experiment took into account various factors, including, but not limited to: the ratio of binding medium to other ingredients used in mixing the paint, the number and thickness of paint layers, the finish of the marble surface (smooth vs. rough), and types of brush bristle used for applying the paint. The results were then replicated using digital tools, striving for the closest possible match with the physical samples in terms of hue and texture, while taking into consideration the chromatic distortions of a digital camera and the screens displaying the outcome.

This experiment is meant to ground future attempts at digital reconstruction of ancient polychromy in a deep and empirical understanding of the material and technique, so that the process of creating a digital reconstruction can be sufficiently transparent, empirically reliable, and properly informed. Moreover, the resulting catalogue of pigment samples and their digital replicas will hopefully serve as an aid for referencing the chromatic range of natural pigments commonly used in antiquity.

The palette of ancient ritual

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While the understanding of ancient painting is often informed by technical analyses, clues as to which pigments were used and where only begin to tell the colourful story of antiquity's polychromy. Beyond simply discovering where pigments remain, it is important to consider how they were applied, with what intention, and why. The relationship between sculptor, painter, and intended audience can begin to frame the picture of how an object may have looked, but such a context rarely accompanies objects with indistinct provenance and vague patina. This loss of context underlies the importance of interdisciplinary investigation with equal weight placed on technical examination, archaeological research, and digitally enabled experimentation.

This case study concerns digital colour interpretations of two objects chosen for an upcoming exhibit at the Yale University Art Gallery, *The Sights & Sounds of Ancient Ritual*, opening 9 November 2018. The first object is a small, incomplete Hellenistic figure of a mourning siren (2001.28.11) and the second an Egyptian relief depiction of Ma'at (1936.45), a fragment from an unknown larger motif. These objects were carved from limestone, contain visible traces of pigments, and have undergone targeted elemental analyses as well as technical imaging.

Structured light scanning was recently undertaken in order to yield high-resolution 3D models upon which to converge a variety of scientific data and propose colour reconstructions. Ongoing collaborations with conservation scientists illuminate invisible remnants of pigments and binding medium. Visual examinations and non-invasive enquiries indicate colour palettes. Conversations with conservators imply how to approximate the appearance of pigments from over 3000 years ago based on contemporary understanding of their components. Research presents analogous depictions and possible purposes of the subjects. Virtual exploration of the surface morphology of the 3D models offers further insight into artistic approaches, including tool kits and methodologies.

Based on these findings, discussions, and interpretations, a cultural heritage digitisation specialist and conservation assistant are using 3D models as tools to contextualise and comprehend scientific data as well as experiment and convey colour. Adopting digital methods of virtually restoring colour on 3D models of objects from antiquity enables implementation of multiple techniques, taking into account complex factors such as geometry, materiality, craftsmanship, interplay of pigment layers and binding medium, etc. The end objective of this digital endeavour is to provide a means of portraying colour within static museum installation and interactive web visualisation.

Aesthetics and narrative of the Greek bronze statues from the Quirinal hill in Rome: an archaeological experiment

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A new investigation of two of the most famous Greek bronze statues preserved from antiquity, the so-called Terme Ruler and the so-called Boxer, was carried out in cooperation with the University Viterbo (XRF), the University Tor Vergata in Rome (Thermography), the conservators of the Roman National Museum (Radiography) and Olympus Italy (Endoscopy). It substantially enriched the in-depth scientific research on the engineering of the statues that had been conducted by Edilberto Formigli and Marco Ferretti in previous decades.

Our recent study on the iconography and narrative intent of both figures postulates that their identification as Amycus (King of Bebrycians) and a Dioscuros (Castor or more probably Pollux)—as already put forward by Phillis Lehman Williams and Rhys Carpenter in AJA 1945—can be cogently proven.

On the basis of new 3D-scans lost-wax forms were printed and prepared for re-engineering copper and stone Inlays of wounds, blood stains, eyes, as well as the decoration and rings on the fingerless boxing gloves of Amycus. The recast bronze copies were subsequently coloured by intentional patination and the application of pigment in asphalt lacquer.

This reconstruction experiment illustrates aspects of historical Bronze polychromy and offers an appropriate approach for a better comprehension of the narrative strategy employed in antiquity, which makes the statue group tell a story.