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Ancient Restoration in Roman Polychromy: Detecting Aesthetic Changes?

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Abstract: Few instances of material evidence for ancient colour restorations have been documented over the last 20 years, during which time the scientific approach to the study of polychromy has been defined. This article presents eight new cases of ancient restoration of colour from the Roman Imperial Age. By combining observations in visible and UV light and video microscopy with a micro-stratigraphic approach, MA-X-ray fluorescence spectroscopy, and contextual archaeological data, we have observed evidence which could suggest an aesthetic change in the use of colour between the 2nd and 4th centuries CE: from polychrome and multitone effects to the use of monochromatic, flat, and uniform colour finishes.

Keywords: sculpture; restoration; Roman polychromy; video microscopy; micro-stratigraphy; MA-XRF imaging

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1. Introduction

The ritual attention to and ordinary maintenance of marble sculptures required frequent restoration of their polychromy. Previous studies have underlined how, in ancient Greek sources, the terms *therapeia*, *kosmesis,* and *epikosmesis* describe the re-styling of statues, detailing the operations of erasure, washing, re-painting, and *ganosis* [1–4]. The repainting is considered an act of *therapeia*. Pliny (*Naturalis Historia*, XXX, 36), for instance, mentions, among the acts of re-styling the Capitoline Jupiter in Rome, the re-painting red of the statues by the censors.

Although little information on these acts recurs in sources from Roman republican and imperial times, these practices must have had some continuity. The Christian apologists of the 2nd–3rd centuries CE (e.g., Minucius Felix, *Octavius*, XXIV, 9) [5] and Arnobius, a century later [6,7], describe with a disparaging point of view (and probably caricaturing the phenomenon) these curative actions towards the statues. A passage by Arnobius, in particular (Arnobius, *Adversus nationes*, VI, 16, 6), underlines how the colour gives the illusion of the vitality of the statue and how this, without human care, vanishes in the rain and through the passage of time. This implicitly shows that the maintenance of the colour on sculptures was a recurring practice during the 4th century CE.

Therefore, these ancient sources suggest that the restoration of colour was probably frequent and commonplace. Despite the extraordinary progress in the scientific study of polychromy [8], video microscopy observations over the past 20 years have documented few cases in which the overlap of opaque and covering painting layers are judged to be ancient colour restorations. In a few cases, the recolouration is documented. These include: a female statuette of the House of Masks of Delos [9], with drapery painted in pink (madder lake) and later gilded; the torso of Asclepius preserved in Dresden, whose himation is painted in red and repainted in pink (madder lake); the Augustus of Prima Porta, in which the yellow layer covers the blue one on the fringes of the military dress [10]; and seven Roman

sarcophagi of a monochromatic phase of lower quality following a polychromatic phase [11]. A slightly different case is offered by the colossal hand found in Aphrodisias [12]: the statue undergoes restoration followed by colouring and gilding, rather than a restoration of the colour. In most sculptures, the analysis underlines the possibility of a stylistic and aesthetic change in the use of colour and leads to stylistic considerations of the dating of the restoration. The exemplary study by B. Bourgeois of the portrait of Berenice II in the Royal Museum of Mariemont revealed multiple stages of polychromy, highlighting at least four phases. The author argues that the third phase in particular, which would involve applying the colour of the eyelashes, eyebrows, and part of the hair, references a style similar to that of the Roman period portraits of the Fayoum, followed by a brown-red paint and without subsequent gilding. [4]. P. Liverani's analysis of the Augustus of Prima Porta suggests that the yellow paint would imitate gilding and could suggest a late Antique restoration, because in this period the number of gilded statues increases [10].

This article proposes to show the results obtained by visual observation in visible and UV light and by video microscopy on an original corpus of eight statues attesting to ancient restorations of polychromy in the Roman Imperial period in order to propose an initial approach to how these restorations of the painting can be a preferential way to study aesthetic changes in Romans' use of colour over time. As observed in previous work [8], the visual examination and the accurate observation of the surviving stratigraphy are, in fact, an indispensable premise for physico-chemical analyses of the pigments, and provide preliminary indications of the original appearance of the statue and of the techniques used. Physico-chemical data are obtained by portable macro X-ray fluorescence spectroscopy on the superficial layer of five statues to prove that the surface layer is a chromatic finish and not an alteration formed as a result of the depositional process of the statues. Pigment identification is not discussed in detail in this paper, but will be detailed in a forthcoming publication for two statues of this set [13].

2. Materials and Methods

The analysed corpus consists of eight Roman statues; five from the Bardo Museum in Tunis (Tunisia), one from the Departmental Museum of Ancient Arles (France), and one from the St. Raymond Museum in Toulouse (France).

The sculptures are briefly presented here in chronological order.

The first is the altar of Apollo (height: 96 cm, MDAA, FAN.1992.357) from the Arles theatre. Commissioned by Augustus between 20 and 10 BCE for the theatre of the city, it was exhibited in its orchestra (Figure 1a,b). Decorated on three faces, it presents, on the front face, Apollo with a missing head, perhaps replaced by that of the emperor, flanked by two laurel trees, while on the proper right side there is a Scythian in the act of sacrifice; Marsyas hangs from a tree on the proper left side. The altar was certainly in use and visible until the 5th century CE, when the theatre was decommissioned. Its discovery dates back to the interventions between 1822 and 1843 [14].

The second is a fragment of a statue of a zither (*cithara*) player (height; 58 cm, MSR, RA172) from the late antique phase of the imperial villa of Chiragan (France) (Figure 1c,d). Considered a Roman copy of the type of the Lycian Apollo of Praxiteles, and compared to the Apollo type of Palazzo Grimani (Venice), it is dated to the 1st–2nd century CE. It was part of a series of statues that decorated the atriums and gardens of the late antique villa, whose last phase of use dates to the 4th century CE [15].

The third piece is a life-size male left leg (height: 57.5 cm, C 1339), discovered in 1915 during the excavations of the Capitol substructure of Thuburbo Maius (Tunisia), dated to 168 CE [16,17] (Figure 1e,f). However, the statues found in the substructures of the temple could have been accumulated here after the building's defunctionalisation at the end of the 4th–beginning of the 5th century CE, and could have originally come from elsewhere. The bare leg, carefully polished, is supported by a pile of weapons. A cloak that falls on a shield decorated with a Gorgon's head and a pair of cnemids can also be identified. The traces of paint on this statue are discussed in previous work, with analytical support using p-XRF [18].



Figure 1. Sculptures studied and their archaeological provenance: (**a**) plan of the theatre of Arles; (**b**) altar of Apollo from the orchestra of the Arles theatre (MDAA, FAN.1992.357); (**c**) plan of the villa of Chiragan (Martres-Tolosane); (**d**) Lycian Apollo (MSR, RA172) from Chiragan; (**e**) plan of Thuburbo Maius; (**f**) warrior's left leg (Bardo museum C. 1339) from the Capitol of Thuburbo Maius; (**g**) female torso (Bardo museum, inv. 01032613) from the summer baths of Thuburbo Maius; (**h**) colossal foot found in Carthage (Bardo museum, inv. 010326345); (**i**) plan of the Odeon of Carthage; (**j**) male torso with a chlamys (Bardo museum, inv. 010326223) from the cisterns of Odeon of Carthage; (**k**) male torso with a pardalis (Bardo museum, inv. 010326222) from the cisterns of Odeon of Carthage; (**l**) plan of the forum of Bulla Regia; (**m**) portrait of Minia Procula from the temple of Apollo of Bulla Regia (Bardo Museum C1020).

The fourth is a female torso (height: 59 cm, 010326 13) from the so-called summer baths of Thuburbo Maius [17,19] (Figure 1e–g). It was discovered during excavations by the Directorate of Antiquities in 1914 and 1915 and subsequently stored together with other statues, which may not necessarily belong to the decoration of the baths.

The fifth sculpture is a male proper right foot (height: 23.5 cm, 01 0326 345) from the Bardo Museum. This foot, meticulously polished and accurately detailed, might be part of a masculine deity or an imperial representation (Figure 1h).

The sixth and seventh statues were discovered in the cisterns of the Odeon in Carthage (Tunisia), dated to the 3rd century CE (Figure 1i): a male torso with chlamys (perhaps Diomedes or Meleagrus for position of the haunch) (height: 91.5 cm, 01 0326 223) (Figure 1l), and a torso with pardalis, probably a satyr or a faun (height 120 cm) (01 0326 222) (Figure 1m). Both statues are dated to the 2nd century CE. The dating of the Odeon is not based on the excavations, but on only a brief allusion in the literary sources. Tertullian (in *De resurrectione carnis*, § 42, 8, a treatise dated around 210 CE) mentions the "very recent" construction of an Odeon in Carthage, suggesting that its construction dates to just before the beginning of third century. Victor de Vita, in 439 CE, references a fire in the neighbourhood of the Odeon, caused by the Vandal invasion, probably marking the end of the use of the building. Having an earlier chronology than the construction of the Odeon—the beginning of 3rd century—the statues originally belonged to another decoration before becoming part of that of the Odeon [20,21].

The eighth is a female portrait of Minia Procula (height: 184 cm, C 1020), a priestess of the late 2nd century CE, whose identity is revealed by the epigraph accompanying the sculpture (Figure 1). The statue was found in the temple of Apollo of Bulla Regia (Tunisia) and must have belonged to its decoration. The temple was excavated in the early 1900s and its construction is attributed to the time of Tiberius, but with an Antonian phase. A series of statues were found in situ, and it has been thought that they were displayed here intentionally. As these statues were not clearly related to the cult of the temple, it has been hypothesized that they were placed here sometime in Late Antiquity in order to create a museum [17,22].

According to the archival documentation of the museums, none of the sculptures have ever been restored after entering the relevant collections, except for the altar of Apollon, which underwent aqueous cleaning.

All sculptures and traces of colour were first observed under the same lighting conditions and with the same capture settings, in a darkroom with a Reskolux UVL 365 LED lamp and with a Dino-lite video microscope (20×–200× magnification, AnMo Electronics Corporation, New Taipei City, Taiwan) under visible and UV light to map the distribution of the traces of colours and to document their stratigraphy. The stratigraphic sequence is analysed according to Harris's principles [23], commonly applied in archaeological excavation, to define different phases of the chromatic finishing. The colour calibration is provided using standard colour charts (Gretag Macbeth ColorChecker®) for the photography and through the internal calibration procedures of the microscope.

In order to obtain a better understanding of the pigments' distribution through elemental maps, XRF (X-ray fluorescence) spectroscopy was used in macro scanning mode (MA-XRF). The XRF scans of the different regions of interest have been acquired by using the CEA translation stage and XRF system [24], made of a Moxtek Magnum X-ray tube (50 kV) (with an Ag anode), and a detector X-123SDD Amptek (25 mm^2) with a resolution of 130 eV at 5.9 keV. The scanning step was set to 0.5 mm or 1 mm, with a dwell time between 300 µs and 1 s. An X-ray tube was set to a voltage of 40 kV and a current of 120 µA. Spectra were treated in batch mode using PyMCA [25], allowing for the separation of the signals from the different chemical elements. Six scans were performed on the objects discussed in this article. All elements indicated were detected by their K-lines, with the exception of Pb, which was detected by L-lines.

3. Results

All the sculptures studied retain multi-layered traces of colour over an extensive surface area. The distribution of all the traces of colour is not described here in detail; only those in which an overlap is attested are considered. The partial preservation of the uppermost layer and the gaps within it allow the underlying layers to be observed. It is, thus, possible to distinguish two phases of colour: the oldest directly applied on the marble, and the subsequent thicker and covering layers applied over the underlying layers of painting. The XRF spectra interpretation had to take into consideration additional peaks, characteristic of buried and altered sculptures, and diffraction peaks from the marble support. The results of the analysis are summarized in Table 1 and are discussed below.

Table 1. Summary of the results obtained from visual observation through white and UV light and video microscopy and MA-XRF. Main elements detected are indicated and an identification of pigments is proposed.

Sculpture	Museum and inv.	Provenance	Date	Colour Layer 1	Colour Layer 2	Chemical Elements	Identification of the Pigments (Layer 2)
Altar of Apollo	MDAA, FAN.1992.357	Arles, theatre	20-10 BCE	Blue, red, orange, violet, yellow, black	Yellow (preparatory layer?) Brown	Pb (Al, Si, K, Ti, Mn, Cl) Fe, Pb	Lead white ($PbCO_3$) Lead white + earths or sandyx ($Pb_3O_4 + Fe_2O_3$)
Lycian Apollo	MSR, RA172	Villa of Chiragan	1st c. CE	Yellow, green, black	White (2 layers) (preparatory layer?) Grey-brown	Fe, Pb	Lead white + earths or sandyx ($Pb_3O_4 + Fe_2O_3$)
Warrior leg	C 1339	Thuburo Maius, Capitol	2nd c. CE	Red, yellow	White (preparatory layer) Blue	Ca, S, Sr (Al, Ti, K, Zn) Cu, Si, Fe (Al, Ti, K, Zn)	Stucco ($CaSO_4 \cdot 2H_2O$) Egyptian blue ($CaCuSi_4O_{10}$) (layer 2)
Female torso	01032613	Thuburbo Maius, summer baths	2nd c. CE	Yellow (coat) Red (tunic) Yellow (hair)	White Brown-purple (coat, tunic, hair)	(see 13)	
Colossal foot	010326345	Carthage	2nd c. CE?	Yellow-red	White Red	(see 13)	
Male torso with chlamys	010326223	Carthage, Odeon	2nd c. CE?	Red, yellow, blue	Yellow	Fe, Pb, Ca (Al, Si, K, Ti, Mn)	Sandyx ($Pb_3O_4 + Fe_2O_3$) or Lead white ($PbCO_3$) + Earths (Fe)
Male torso with pardalis	010326222	Carthage, Odeon	2nd c. CE?	Yellow, red, blue	Yellow	Fe, Pb, (Al, P, Cl Ti, Mn)	Sandyx ($Pb_3O_4 + Fe_2O_3$) or Lead white ($PbCO_3$) + Earths (Fe)
Portrait of Minia Procula	C 1020	Bulla Regia, temple of Apollo	late 2nd c. CE	Red, blue	Yellow		

3.1. Visual and Stratigraphic Analysis

On the altar of Apollo, a yellow layer is visible to the naked eye and covered by a brown paint. They appear, respectively, grey and black under UV illumination. The latter is homogeneously spread over the whole altar without attention to the decorative partitions (Figures 2a–c and 3a). In the gaps of those layers, we can observe by video microscopy a red and orange layer preserved in the background and on the frame (Figure 3b,c). The brown layer covers the red one (Figure 3b,c) that is directly applied onto the marble without preparation (Figure 3d). In the central and lateral faces of the altar, traces of various colours

are preserved in many points (Figure 3e–h). They are directly applied onto the marble: red and orange on the frame, black on the trunk of the laurel tree and on the tree in the scene with Marsyas, different shades of brown on the leaves, yellow on the characters with blue traces, red in the background. As the brown layer covers the other colours in many areas (Figure 2, yellow circles), we can suppose an initial polychrome phase in which the colours were directly applied onto the marble surface, and a second monochromatic phase in which the brown layer was applied over the yellow one.



Figure 2. Altar of Apollo (MDAA, FAN.1992.357). Yellow circles mark the points of analysis in which the superposition of the first and the second phases of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**,**b**) brown paint layer over a yellow layer covering the reliefs (2nd phase) in visible light; (**c**) brown and yellow paint layers appearing, under UV illumination, black and grey, respectively.

The fragment of the Lycian Apollo from Chiragan preserves a white paint layer that is visible to the naked eye, and is partially covered by a grey-brown layer (Figure 4a). The side of the base shows a similar stratigraphy (Figure 4b). The white layer appears as light orange and the grey-brown as black under the UV light (Figure 4b–e). The orange appearance under UV needs further analysis because, in some cases, this aspect is associated with organic pigments [26]. This chromatic finish covers the entire statue without differentiation between various elements (base, supports, legs, attributes). The video microscopy confirms the stratigraphy: the white paint is covered by a grey-brown one (Figure 5a,b). In the gaps of this well-preserved white paint layer, traces of the previous phase of the polychromy are visible directly on the marble: yellow-orange on the foot (Figure 6a), green on the vegetal support on the right (Figure 6b), and black on the pick (Figure 6c). The stratigraphy suggests that the piece first had a polychrome phase, with colour layered directly onto the marble, and a second phase in which it was repainted in white covered (partially or totally) by a grey-brown tone.

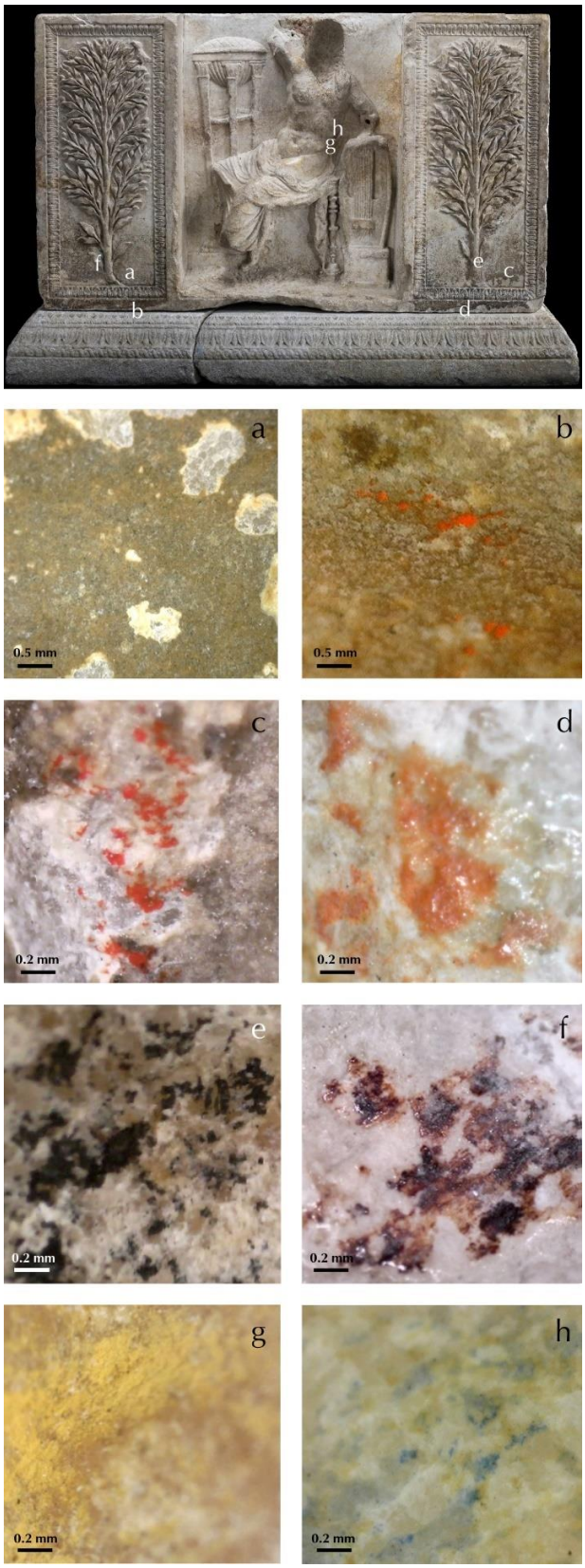

Figure 3. Altar of Apollo (MDAA, FAN.1992.357). Areas where micrographs were acquired are labelled: (**a**) brown paint over a yellow preparatory layer; (**b**,**c**) gaps in the yellow-brown paint layer (2nd phase) in which the red-orange layer is preserved (1st phase); (**d**–**h**) colours observed applied directly onto the marble surface (1st phase).

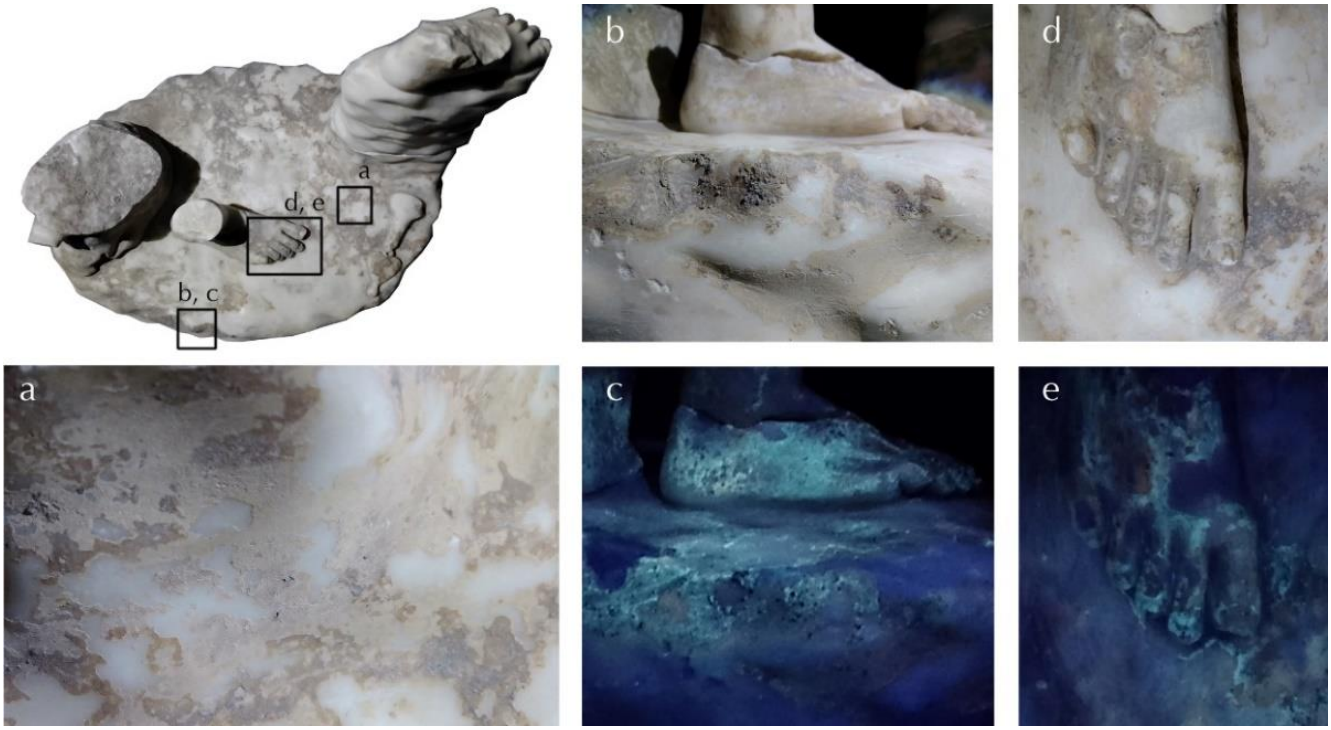

Figure 4. Lycian Apollo (MSR, RA172). Visual observation. Areas where macrographs were acquired are labelled: (**a**) white layer partially covered by a grey one; (**b**–**e**) foot observed in visible and UV illumination showing the distribution of the painting under the accretions.



Figure 5. Lycian Apollo (MSR, RA172). Detail of the areas of the micrographs of the superficial polychromy (2nd phase): (**a**) multi-layered white paint; (**b**) grey-brown paint on the white layer (same scale).

Concerning the warrior's leg, in the background between the weapons and the stand, two phases of painting are observed with the naked eye: an initial one with yellow and red layers, followed by a second phase where a blue layer was applied onto a white preparation layer (Figure 7a,b). The superposition of blue on the red or yellow is observed in different points (Figure 7, blue circles). The video microscopy confirms the stratigraphy (Figure 8), since the blue layer is observed over the white layer, which covers the yellow and red ones. A change in the colour of the background from yellow and red to blue is, thus, observed from the first to the second phase.

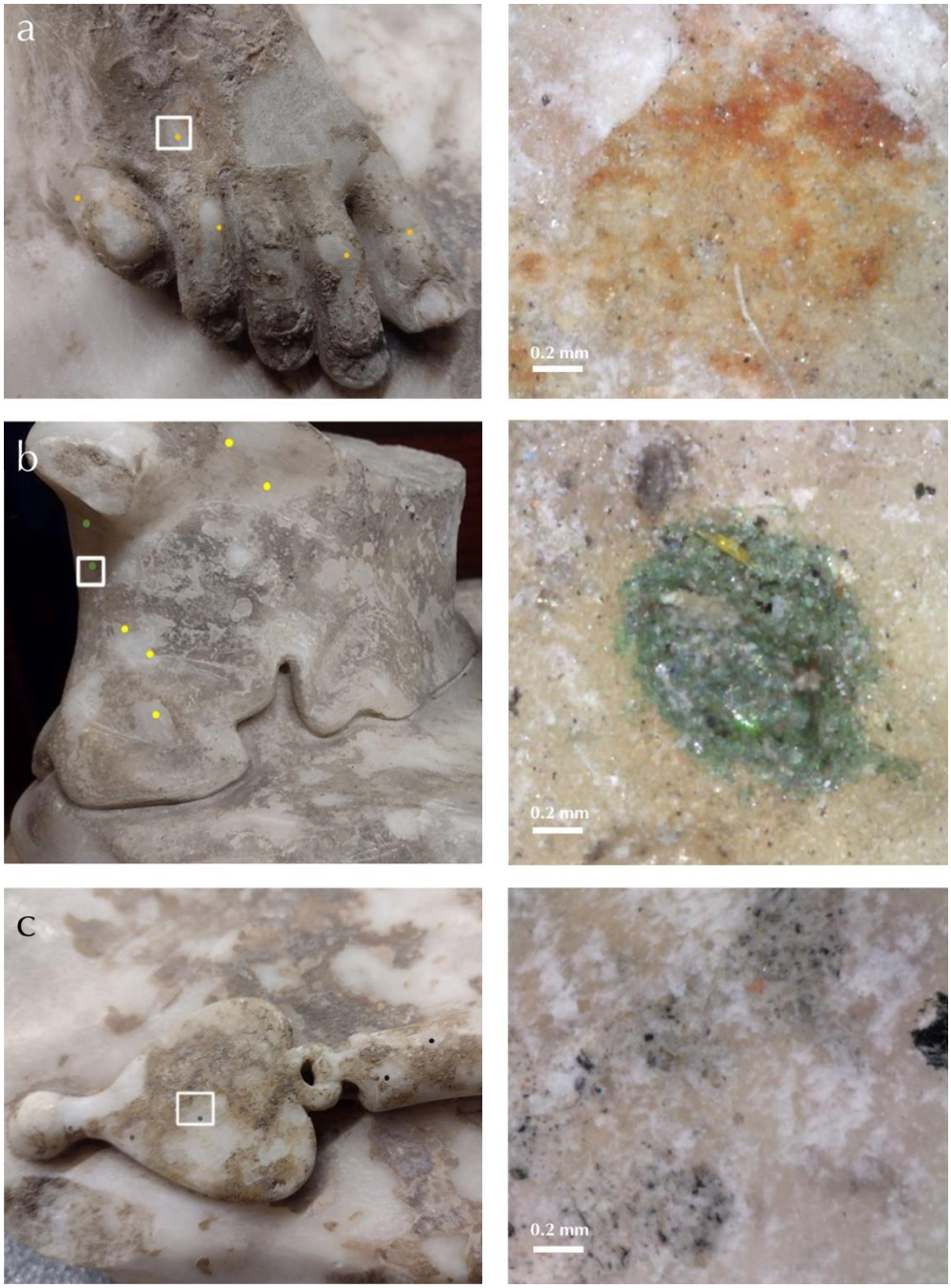

Figure 6. Lycian Apollo (MSR, RA172), colours directly applied onto the marble, observed in the gaps of the uppermost layer. Macrographs (left) with points of analysis (circle) and micrographs (right) showing the colour observed in this point: (**a**) yellow observed in five points on the skin of the foot; (**b**) green observed in seven points of vegetal support; (**c**) grey observed in four points on the pick.

The female torso displays a homogeneous and flat purple-brown layer, visible to the naked eye, superimposed over a yellow layer in the hair and red one in the folds of the tunic and the coat (Figure 9a,b). Observation with video microscopy shows that the purple-brown paint is probably layered over a preparatory layer, which appears white under UV light (Figure 10a,b), and that the yellow paint was applied directly onto the marble. As the purple-brown layer covers the yellow one, we can suppose two phases of polychromy.

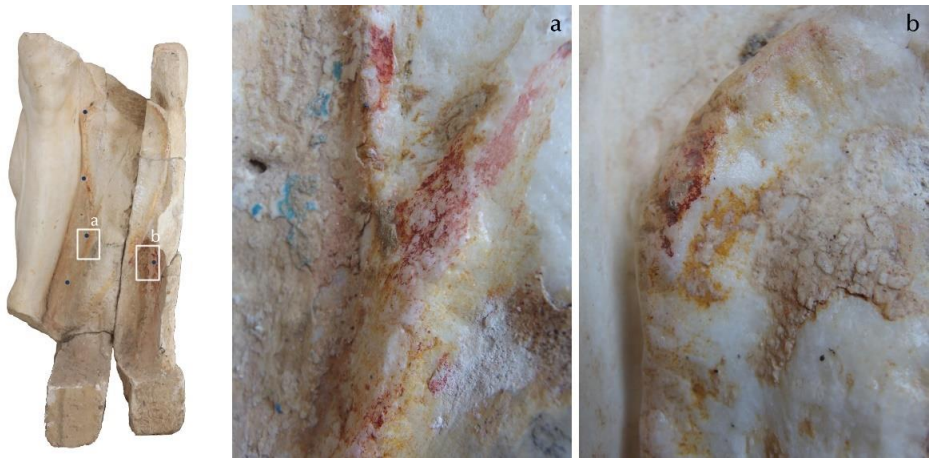

Figure 7. Warrior's left leg (Bardo museum C1339). Blue circles mark the points of analysis in which the superposition of the first and the second phases of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**) blue layer overlaid on the red and yellow layer; (**b**) white layer overlaid on a yellow layer.

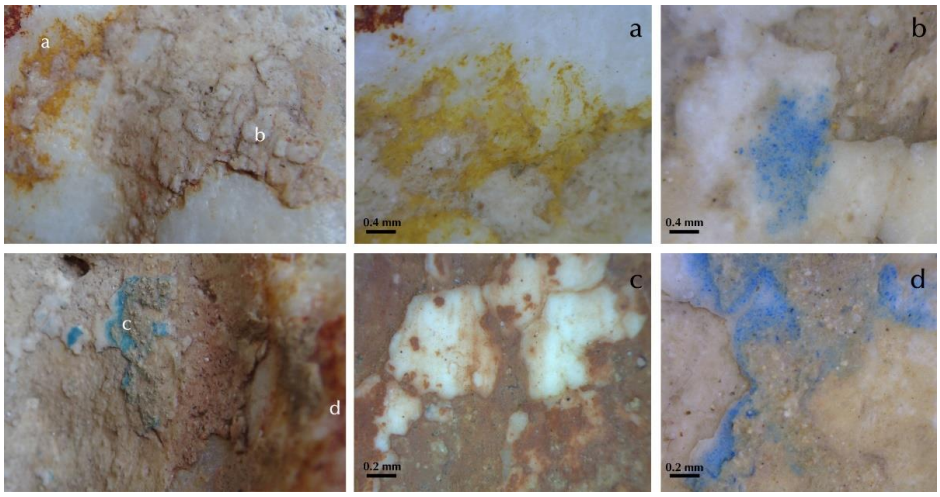

Figure 8. Warrior's left leg (Bardo museum C. 1339). Points where micrographs were acquired are labelled in the macrographs: (**a**) red and yellow layer; (**b**) white layer with blue paint; (**c**) red layer on the marble; (**d**) blue paint layered on white.



Figure 9. Female torso (Bardo museum, inv. 01032613). Yellow circles mark the points in which the superposition of the first and the second phases of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**) purple-brown layer covering a yellow one; (**b**) purple-brown layer covering the red one.

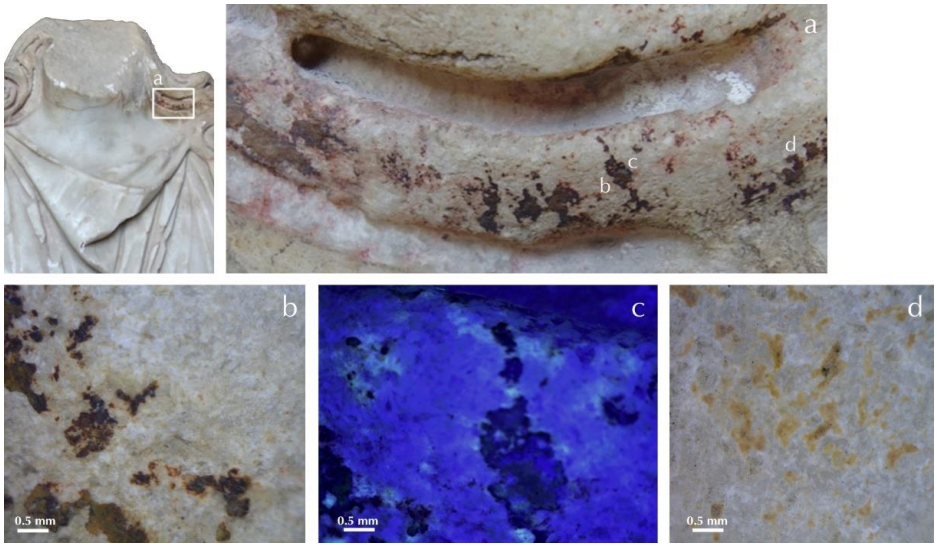

Figure 10. Female torso (Bardo museum, inv. 01032613). Area where macrographs were acquired is indicated: (**a**) detailing point of analysis and points where micrographs were acquired; (**b**) purple-brown layer over a preparation layer; (**c**) preparation layer which appears white in UV light; (**d**) yellow paint directly on the surface of the marble.

Two phases of paint are visible to the naked eye on the male foot from the Bardo Museum, as the superposition of an opaque and covering layer onto a translucent one that was directly applied onto the marble is observed in three points of analysis (Figure 11, yellow circle). This skin displays a yellow layer applied directly onto the marble surface (Figure 11a), onto which a white layer is superimposed. Additionally, a light orange layer is observed on the sole and on the strap of the sandal, overlaid by a deep red layer (Figure 11b,c). The trace of a brushstroke with red retouching can be seen on the side of the sole (Figure 11d). The video microscopy confirms this stratigraphic sequence (Figure 12a,b). In this case, the restoration respects the chromatic rendering of the original phase, but has reinforced the contrast between skin and sandal.

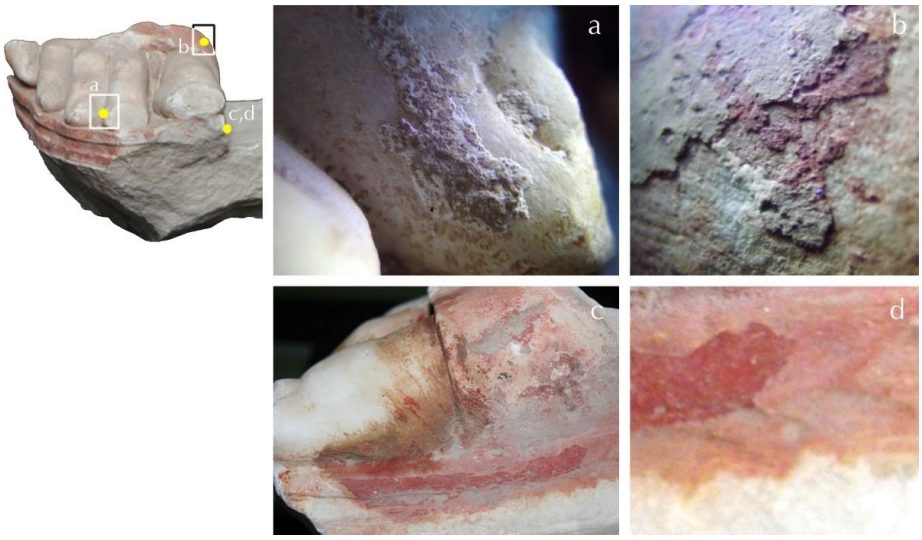

Figure 11. Colossal foot (Bardo museum, inv. 010326345). Yellow circles mark the points in which the superposition of the first phase and second phases of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**) superposition of a white layer over a yellow layer on the skin; (**b**) superposition of a red over an orange layer; (**c**) superposition of red layer on orange and yellow one; (**d**) possible trace of a retouching.

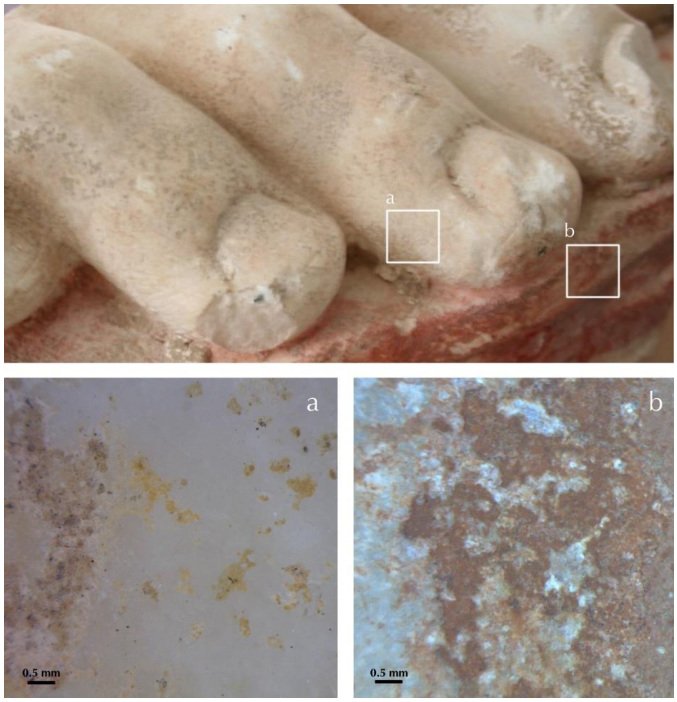

Figure 12. Colossal foot (Bardo museum, inv. 010326345). Areas where micrographs were acquired are labelled: (**a**) superposition of a white layer over a yellow one on the skin; (**b**) superposition of red on orange.

The torso with chlamys is covered by a homogeneous yellow layer on the drapery and on the skin (Figure 13a,b). This layer overlaps, at four points, the red and orange on the chlamys (Figure 13c) and the yellow on the skin. By the video microscopy on the chlamys, the superposition of yellow onto orange and red is documented (Figure 14a–d); also, on the skin, the overlap of yellow onto the yellow-orange is recognised in the gaps of the uppermost paint layer (Figure 14b,c). Some blue points (Figure 14c) are observed in the shaded areas, corresponding to the junction between the chlamys and the body.

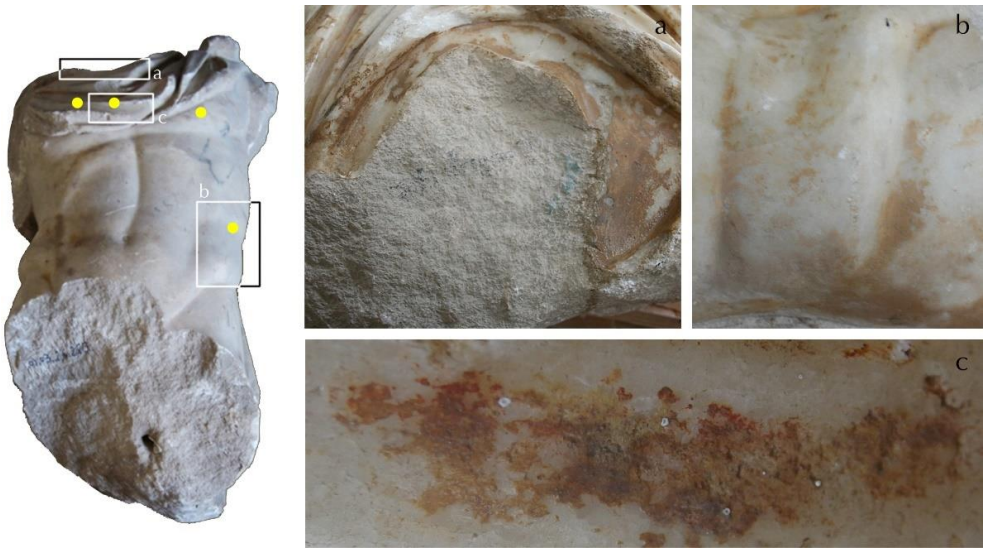

Figure 13. Male torso with a chlamys (Bardo museum, inv. 010326223). Yellow circles mark the points of analysis in which the superposition of the first phase and the second phase of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**) on the skin of neck; (**b**) on the torso; (**c**) on the chlamys, showing the uppermost uniform monochromatic yellow layer.

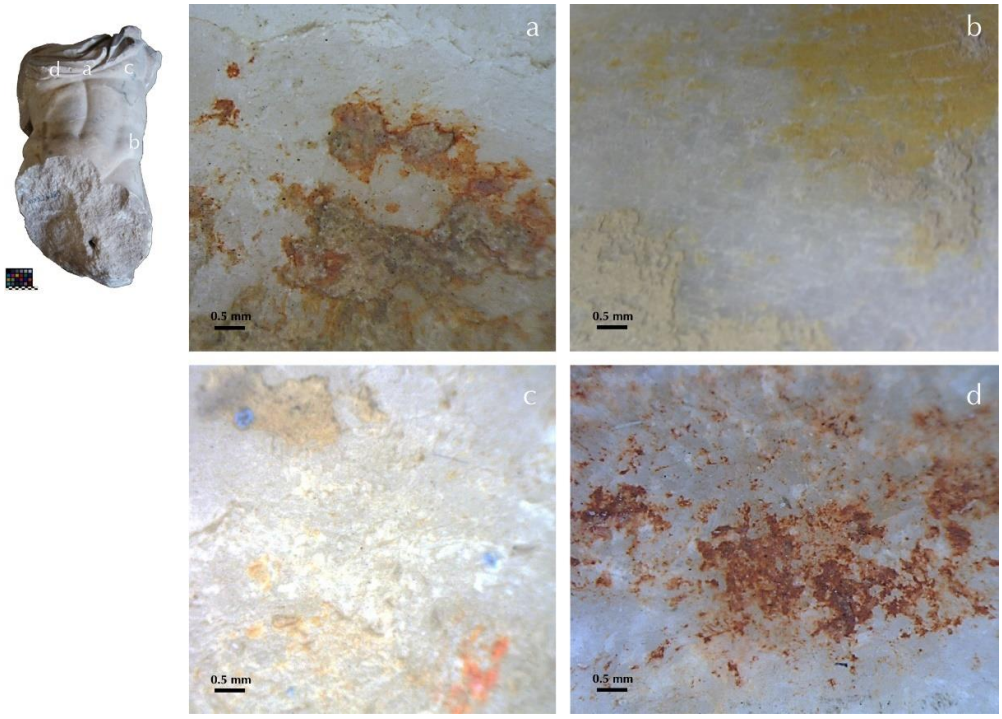

Figure 14. Male torso with a chlamys (Bardo museum, inv. 010326223). Points where micrographs were acquired are labelled: (**a**) yellow layer over orange (in the folds of the chlamys); (**b**) yellow on skin; (**c**) blue, orange, and yellow under the chlamys, observed in the gaps of the uppermost yellow layer; (**d**) red on the folds of the chlamys, observed in the gaps of uppermost yellow layer.

The same treatment can be found on the torso with a pardalis. Applied directly onto the marble surface, the pardalis and the skin, in the pubic area, preserve an orange-red colouring, which is overlaid by a yellow ochre paint (Figure 15a,b). This overlap is visible to the naked eye in many points (Figure 15, yellow circles). The video microscopy confirms the stratigraphy of the paint on the skin and the pardalis (Figure 16c,d) and reveals some blue points (Figure 16c,d) in the shaded areas, corresponding to the junction between the chlamys and the body.



Figure 15. Torso with a pardalis (Bardo museum, inv. 010326222). Circles mark the points of analysis in which the superposition of the first phase and the second phase of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**) yellow and red paint layers on the marble surface in the pubic area; (**b**) yellow superimposed over the red paint on the pardalis.

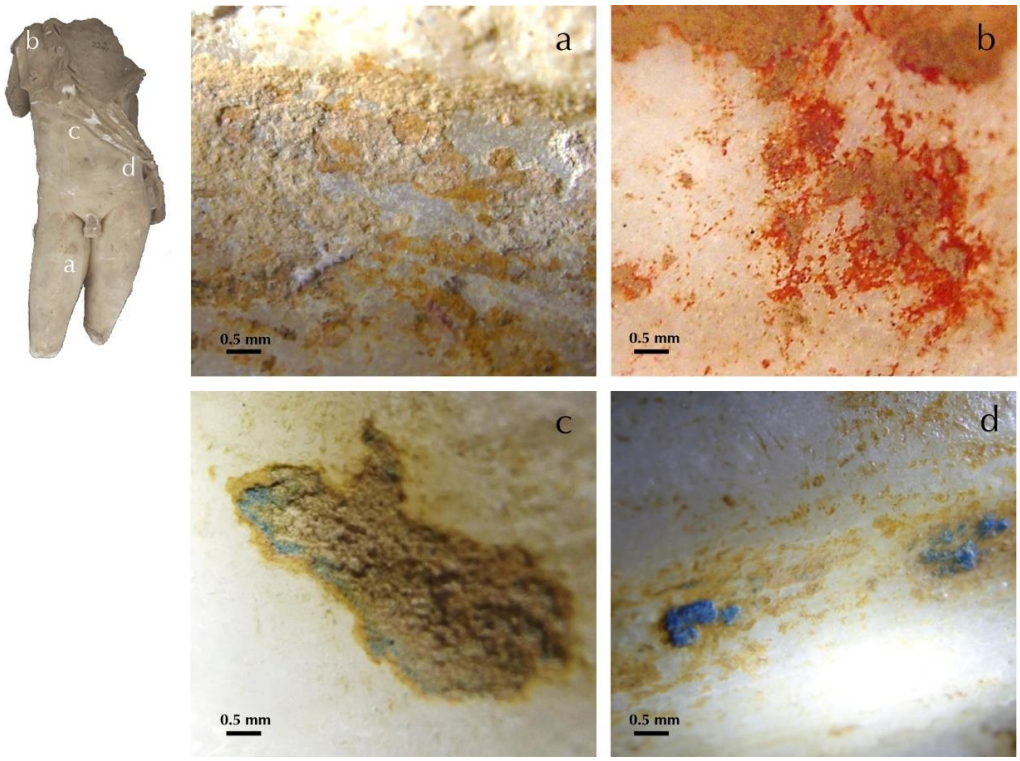

Figure 16. Torso with a pardalis (Bardo museum, inv. 010326222). Points where micrographs were acquired are labelled: (**a**) yellow paint over a brilliant yellow on the skin; (**b**) red on the pardalis; (**c**) blue on the skin under the pardalis; (**d**) blue point on the yellow paint layered onto the marble.

Both statues, coming from the same archaeological context, have a similar treatment, in the form of two successive phases:

1. a first two-tone phase with yellow and red, and blue in the shadow areas, perhaps used to darken the colour;
2. a second homogeneous yellow ochre phase, not respecting the different parts of the statue.

The statue of Minia Procula shows sparse traces of yellow on the skin, the tunic, and the mantle. These overlay a layer of red on the skin of the face (Figure 17a) and on the folds and edges of the cloak (Figure 17b,c). The video microscopy shows that the yellow layer, visible as white under UV illumination (Figure 18a), overlaps a red one on the mantle (Figure 18b) and a blue one on the tunic (Figure 18c).

3.2. Identification of the Pigments in the Superficial Layer

The presence of pigments in the superficial layer has been assessed on five of the sculptures considered (see Table 1). Some elements scattered over the whole surface (Sr, P, Cl) are considered to be contaminants generated by the deposition of the statues or the corrosion of the pigments. However, the detection of lead, lead colocalised with iron, and copper, and the correspondence between visual observation and chemical data, shows an intentional use of colours beyond what is expected from external pollution (accretions or earths).



Figure 17. Portrait of Minia Procula (Bardo Museum C1020); circles mark the points of analysis in which the superposition of the first phase and the second phase of the colour finishing is observed. Areas where macrographs were acquired are labelled: (**a**) brown-red paint on the face; (**b**) yellow superposed over red on the coat; (**c**) yellow and red on the edges and outer folds of the coat.

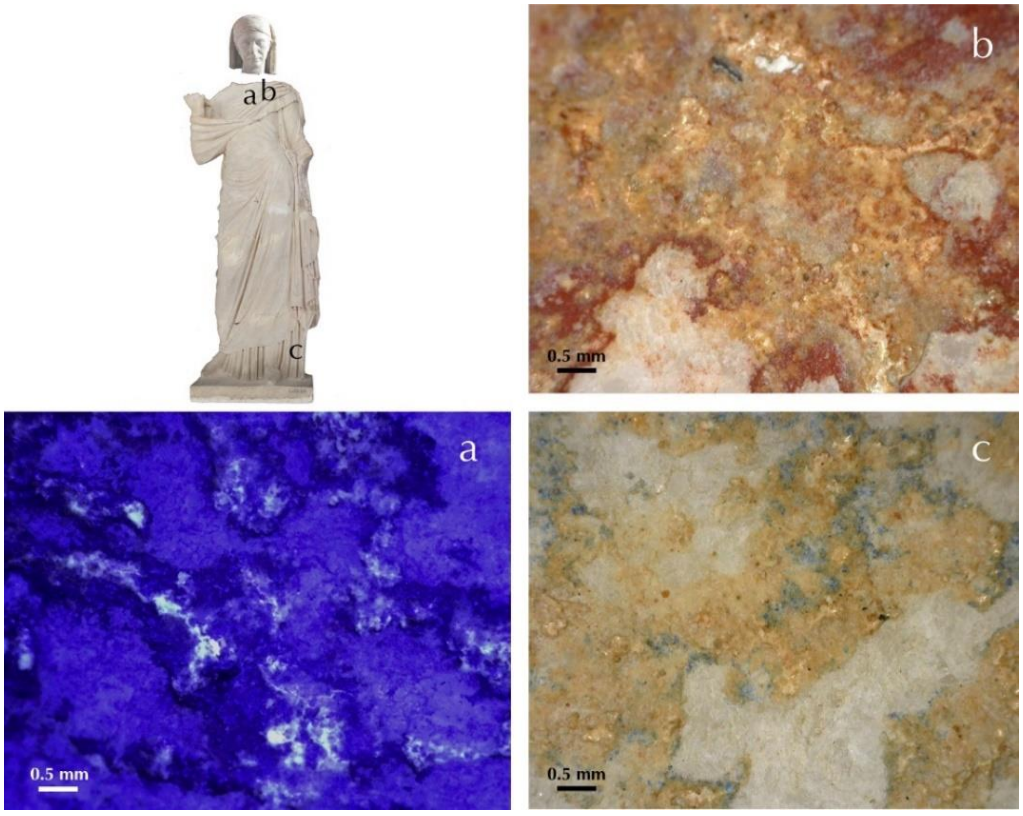

Figure 18. Portrait of Minia Procula (Bardo Museum C1020). Point where micrographs were acquired are labelled: (**a**) red paint layer on the coat under UV illumination and (**b**) under visible light; (**c**) blue painting on the tunic; (**d**) yellow layer, white under UV illumination, is superimposed over a blue layer.

White is used as a preparation layer for the final chromatic application on the altar of Apollo, on the Lycian Apollo (Figure 19a), and on the warrior leg. In the first two cases, it appears yellowish: the lead signal suggests the use of lead white, commonly attested in wall painting and in statuary during the Roman period [27]. On the warrior leg, the presence of sulphur and calcium suggest the use of stucco as a preparatory layer [18].

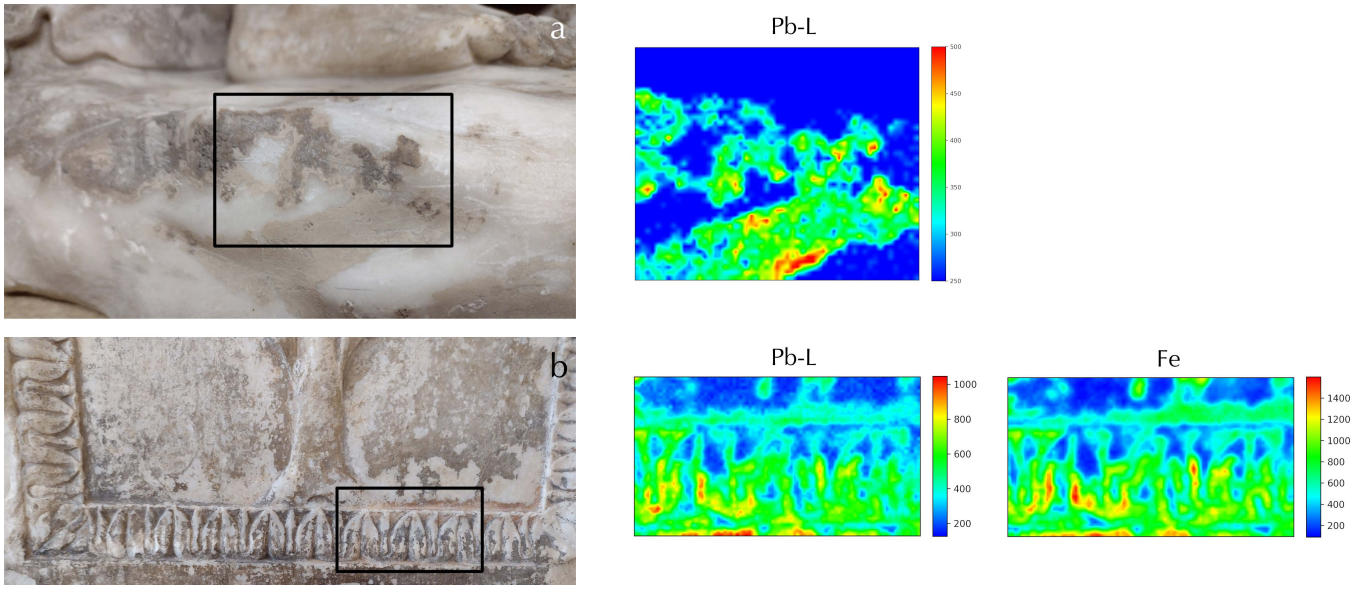

Figure 19. Macrographs of the analysed area and MA-XRF mapping showing the distribution of chemical elements: (**a**) Lycian Apollo (MSR, RA172); (**b**) altar of Apollo (MDAA, FAN.1992.357).

The high content of copper on the blue layer of the warrior leg, colocalised with silicon, indicates the use of Egyptian blue ($CaCuSi_4O_{10}$), commonly used in the Roman Empire [28]. The significant amount of lead and iron is observed in the yellow, and the brown of the most superficial layer is visible in the altar of Apollo and the two torsos. The association of these two elements suggests the use of lead mixed with ochres, or the use of sandyx (Pliny, *Naturalis Historia*, 35, 30, 40) [27,29]. The colocalization of iron and lead is observed by mapping: the distribution of these elements corresponds to the areas where colour was applied (Figure 19b).

4. Discussion

The only previously known case from the Roman Imperial Age documenting a colour restoration earlier than the end of antiquity was the Augustus of Prima Porta [10]. The eight new case studies presented here confirm that, in the Roman Imperial Age, the practices of repainting and maintaining the colour of statues continued to be followed, as attested by the Christian sources during the 2nd–4th century CE. [5–7].

4.1. The Recolouring Technique

By observing the stratigraphy and the material traces of the gestures, it is possible to document, within the limits of a non-invasive investigation, the techniques of recolouring.

In four cases (altar of Apollo, Lycian Apollo, warrior leg and female torso), the application of a white or yellow layer covering the colours of the previous phase could be considered a preparation for the last chromatic phase, covering the previous one and being covered by another layer. A preparatory layer under the superficial finishing is attested also in the female statue of the House of Masks in Delos and the Asclepius in Dresden [9,10]. In three other cases, a coloured layer directly covers the previous one.

4.2. Change and Continuity of Colour Finishing

Reconstructing the final appearance that these restorations were intended to create is limited by the partiality of what has been preserved and the consequent difficulty of considering aesthetic variations.

Even within the still extremely limited dataset, we could suppose that, in six out of eight cases, the restoration marks the transition from a polychromy or trichromy or bichromy to a uniform monochromy, in which the colour covers the sculpture without paying attention to creating differences between the parts of the statue, nor to mark the areas of shadow, marked with different colours or shades in the previous phase.

This phenomenon is observed in the altar of Apollo of Arles theatre, in the Lycian Apollo from Chiragan, in the two male torsos from the Odeon of Carthage, in the statues of Minia Procula from Bulla Regia, and in the female torso of Thuburbo Maius.

On the altar of Apollo of Arles theatre, on the Lycian Apollo from Chiragan, on the two male torsos from the Odeon of Carthage, and on the portrait of Minia Procula from Bulla Regia, the last chromatic phase presents a homogeneous brown, grey, and yellow coating that could imitate bronze, silver, and gold, because metal statues express a particular social status and, more generally, have a prestigious cultural meaning [30]. This seems to confirm what was observed in the late antique restoration of the Augustus of Prima Porta, in which the blue details are covered with yellow, a probable imitation of gilding, according to P. Liverani [10]. Ph. Jockey and Br. Bourgeois [31] highlighted the technique and significance of gilding Hellenistic statues throughout the Delos corpus, showing how marble was a medium for imitating metal and chryselephantine statues. For the Roman period, extensive work on homogeneous collections linked to a territory is lacking; therefore, no general consideration is possible in the current state of research. However, the Greco-Hellenistic practice of imitating, by painting, polychrome statues in bronze and gilded bronze continues in the Roman period and can be confirmed by a growing number of attestations of leaf gilding on marble, as well as imitations of gilding by yellow and red paint (listed in [32]). This tendency respects the attitude already highlighted by Pliny, aiming, through painting "to draw the eye to the material used", rather than "to make oneself known" by imitating the reality, to evoke "the image of one's fortune and not one's own image" (Naturalis Historia, XXXV, II, 1).

More ambiguous is the Apollo from Chiragan. If the grey-brown spots on the white layer are a voluntary effect, the paint would, perhaps, imitate a coloured marble, as in numerous Roman and Late Antique wall paintings [33]. If, on the other hand, the grey-brown layer was originally homogeneous and entirely covering the white one, this could, like the previous sculptures, be an attempt to imitate a metallic effect

The desire to express matter through colour could also be sought in the female torso, on which purple-brown contrasts with the bare marble of the skin, following a search for the imitation of multi-material statues in coloured marble. On the other hand, colour is inextricably associated with matter and its meaning in the ancient world [34], and this reinforces the custom of using colour to express matter or a material quality. The second uniform and monochromatic phase could, in most cases, underline a reduction of the search for the imitation of living reality, as well as a search for illusionism in the imitation of materials, which uses colour in a more flat and uniform way (without nuances and shades)—an important aesthetic change which must be studied and deepened by multiplying the attestations.

The two examples where this change is not observed are the warrior's leg and the colossal foot.

In the first, there is a change in the background of the statue, from yellow and red to blue. The red background was also recognized in the first phase of the altar of Apollo of Arles. The blue background is instead considered by P. Liverani to be typical of the Middle Imperial phase before the transition to a lighter background [10]. A. Anguissola reiterated this finding by studying the colours of the tenons, often blue in the occurrences she reviewed [35].

In the foot, on the other hand, a simple resumption of the previous chromatic rendering is observed with an increase in the contrast between the leather (white) and the sandal (dark red) in the second phase, compared to the first in which the leather and the sandal have a closer colour rendering.

4.3. An Attempt to Date the Restorations

It is difficult to date the second recolouring of the statues; for sure, it cannot be posterior to the defunctionalisation of the sculptures. The archaeological contexts in which these statues were found can, however, provide some indications.

Three statues were found in the buildings for entertainment, namely, the Arles theatre and the Odeon of Carthage, for which archaeological evidence and written records attest to the defunctionalisation of in the 5th century CE. Three others come from religious buildings, the temple of Apollo of Bulla Regia and the Capitol of Thuburbo Maius, which were defunct between the end of the 4th and the 5th century CE, although the attribution of the statues found in the temple of Apollo poses serious doubts [15].

Considering these data, the restorations examined are to be placed between the end of the 2nd century CE, for the older sculptures, and the 4th century CE. This could, therefore, indicate that the taste that imitates the surfaces of other precious materials, including metals, through a monochromatic rendering seems to develop progressively in this range of time. However, only the multiplication of data can confirm this working hypothesis to detect an aesthetic change. Further studies on the identification of the pigments of the identified phases will be able to better clarify the appearance and technique of the polychromies documented here.

5. Conclusions

By documenting eight new cases of ancient colour restoration, this study underlines how the maintenance of the colour of sculpture is practiced during the Roman Imperial period. Between the 2nd and 4th century CE, a monochromatic and uniform finishing covers the polychromies of the previous phases and could show an aesthetic change, of which only an increase of attestations and further investigations can reveal the meaning.

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