

Traces of Polychromies in Roman sculpture: a multi-analytical approach

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Abstract – Recently, some museums started seeing in a new light their collections and searching for overlooked traces of painted colours: one example is the National Archaeological Museum of Aquileia, in north-eastern Italy, a Roman city close to the Adriatic Sea.

Among the sculptures with an easily recognizable polychromy, five were chosen (three statues, a funerary relief and a fragment of architectural decoration), in order to give new and unpublished information about the colours on marble and stone of the Roman Aquileia between the 1st century BC and the 3rd century CE, with the support of a multi-analytical approach (imaging, FORS, Raman and microsamples).

Keywords - Aquileia, Roman sculpture, Polychromy, multi-analytical approach

I. INTRODUCTION

A. The National Archaeological Museum of Aquileia

The National Archaeological Museum of Aquileia was founded in 1882 by the Austro-Hungarian government in the neoclassic Villa Cassis Faraone. It hosts the huge archaeological collection of materials which were found in Aquileia, one of the most important Roman cities in northern Italy and an important episcopal center for the spreading of the Christianity.

The city was founded in 181 BC by the Roman Senatus and, from Augustan Age, it was the capital of the Regio X *Venetia et Histria*, a strategical commercial harbour and a military base, as a bastion for Italy towards east.

The collection of archaeological objects is the product of the excavations, studies, and research about Aquileia from the 18th century onwards [1]. The archaeological activities were at the base of the development of private collections

and only in a second moment the archaeological objects arrived at the museum. The collection of the canon Giandomenico Bertoli, who was born in 1676 and died in 1763, first collector and scholar of the antiquities from Aquileia, was the most important one.

Among the numerous kinds of materials in the museum – mosaics, paintings, ceramic, glass, metal, amber and precious materials – the sculptures are the larger part of the collection [2] and they were never studied for their polychromy before this project of the University of Padua.

B. The polychromy: state of the art

During the last two decades, after the exhibition *Bunte Götter. Die Farbigkeit Antiker Skulptur* (Munich, 2003) [3] the study about polychromy on ancient sculptures and architecture has continued to develop [4].

Many projects started in museums all over Europe, thus revealing the traces of a lost colourful Graeco – Roman world.

Classic sculpture was coloured and gilded. The study of faint traces let us understand that colour played a major role in ancient sculpture, and the original appearance of ancient statues and reliefs should be very different from the classic white we are used to.

However, this kind of research is often dedicated to case-studies in Italy, and not to a whole collection of a museum. In Aquileia, the first step of this project was a census of the traces of polychromy on the entire collection of sculptures.

Moreover, studies about polychromy, as the *Tracking Colour Project* and other projects about polychromy could show, should be multi-disciplinary [5] [6]. In Aquileia, archaeologists and scientists worked together in order to understand a wider range of information: not only the materials of painting and the distribution of colours, but

also the meaning and use in antiquity of those specific colours.

The research about painting on sculptures in Aquileia, in this way, is one of the few multi-disciplinary studies and with a multi-analytical approach, on the whole collection of sculptures in a museum in Italy, and the first one on a collection of objects from the same ancient city.

II. DESCRIPTION OF THE CONTRIBUTION

A. A multidisciplinary protocol

The first steps of this project were:

- preliminary research in the publications about Aquileia, in order to find information about possible colour traces;
- an extensive census of visible colour traces on marble and limestone statues, reliefs, sarcophagi and other objects in the museum and selection of the first case-studies;
- study of archival documents preserved in the museum and referred to the sculptures with actual traces of colors;
- selection of the most significative sculptures with traces of colours, in order to carry out analysis on pigments;
- a preliminary non-invasive multispectral imaging campaign;
- FORS and portable Raman analysis;
- micro-samples for the study of pigments.

B. The sculptures

Five sculptures were selected for non-invasive and micro-invasive analysis.

In Aquileia, from the 1st century BC, there was a wide diffusion of stone objects and a large variety of stone sculptures: among them, there are two heads of Apollo Anzio type (fig. 1) and a goddess, maybe Aphrodite or Diana (fig. 2), and whose similar stylistic features suggest that they could be part of the same sculptural group [7]. They were both selected for the preserved red-yellowish colour of the hair, and the red colour in Apollo's lips.

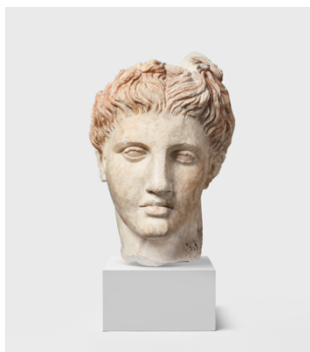


Fig.1. Apollo, end of the 1st century BC - beginning of the 1st century CE .



Fig.2. Detail of a feminine head, end of the 1st century BC - beginning of the 1st century CE.

Among the sculptures depicting members of the high society of Aquileia and referring to classical models and official statuary, the so-called “Navarca” (fig. 3) was selected. This is a sculpture of a naval admiral, dating back to the 1st century BC [8].

It was made for the admiral's funeral monument, following the heroic models of classical Greece. No trace of colour is still visible to the naked eye, but some analyses were carried out in order to check some old data about polychromy in the mantle.



Fig.3. Navarca, 1st century BC

There is also a large collection of limestone sculptures, whose production develops in the 1st century BC: in the collection, there are sculptures and monuments, particularly of funerary use, which reflect local tastes and the influence of the urban repertory, as for the numerous stelae with busts or half statues, dating back to a period spanning from the 1st century CE to the 3rd century CE. Among them, a significant example for polychromy is the so-called stele of Mussa (fig. 4), which is the most problematic object in our analysis. The entire stone is painted in yellow and red, and black was used for Mussa's hair. However, the colours of this stele are not described in the Austro-Hungarian inventory (19th century). On the contrary, the colours of the Apollo's head (fig. 1) are carefully described. So, the analysis on this object were finalized to understand – if possible – whether the polychromy is ancient or modern: examples of modern re-painting on ancient stone and marble objects were often noticed in other museums, and the stele of Mussa could be another case-study of this kind [9].



Fig. 4. Funerary stele of Mussa, 3rd century CE.

Another polychrome example which was selected, is a Roman imperial capital (fig. 5), with a dark red background and the sculptural elements left without colour.



Fig. 5. Roman Imperial capital with red background, detail.

C. Multi-analytical approach

To analyze and compare the visible or not visible traces of the original polychromies, a multi-analytical approach was adopted, combining the preliminary visual analysis and the collection of historical information with a sequence of technical investigations that could shed light on the nature of these pigments and the presence of possible common elements.

According to this strategy, a preliminary whole-surface imaging analysis was conducted by acquiring multispectral images with a modified reflex camera (full range) that allowed shooting in the UV, VIS, IR bands within the range of approximately 340 nm to 1000 nm. Particularly for IR band, filters with central band at 720 nm, 850 nm, and 950 nm were applied. To complete these investigations, it was then decided to also perform a VIL analysis to check for the possible presence of Egyptian blue in these sculptures.

The multispectral images thus acquired were analyzed individually and jointly in the principal component analysis (PCA), where the VIS, UV and IR bands were used.

On the basis of these results, specific areas of interest

were selected, where FORS and portable Raman measurements were carried out to define the characteristics of the pigments on these artworks [10] [11].

At the end only few micro-samples were then taken in specific areas of interest, selected thanks to the results of non-invasive in situ measurements, to obtain more specific and direct information about pigments and painted layers.

III. PRELIMINARY RESULTS

The first case-study is the already mentioned feminine head, maybe of an Aphrodite or Diana (or a Muse), dating back to Augustan age (fig. 2). We do not know the original context of this sculpture and it was considered in previous publications as part of a sculptural group together with the contemporary head of Apollo, due to technical and stylistic features and dimensions. However, the remains of red colour in the feminine head and red traces in the Apollo's hair show some different features, and the feminine head, for example, has some traces of red also on the skin, close to the hair locks (maybe a small portion of the hair was only drawn, and not carved), while the traces of colour on the head of Apollo are only on the hair, although no trace of Egyptian Blue was found on the sculptures, with the exception of a possible trace of blue on Apollo's forehead.

Comparing the details of the hair and the skin of the two heads, through the images obtained by multispectral acquisitions, starting from the visible images (fig. 6), lead to find a different level of basic surface preparation, probably not only in the hair but also in the marble.



Fig. 6. Visible images provided with Nikon D800 Full Range camera using Nikon SB-910 modified Speedlights. On the left: feminine head, on the right: Apollo's head.

FORS analysis showed the complexity of the mixture used for the polychromies in the two heads' hair. The feminine locks and Apollo's hair were painted with a mixture of red ochre, cinnabar and minium (fig. 7): an

expensive mixture which worth to be analysed also through some micro-sampling.

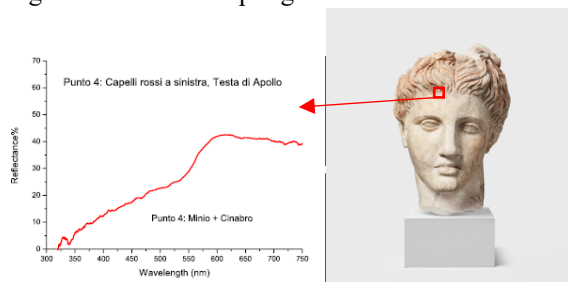


Fig. 7. FORS spectrum of the point n.4 on Apollo's head (minium and cinnabar)

Multispectral imaging allowed to focus the punctual analysis in the mantle of the so-called "Navarca" over its left hand (fig. 8).

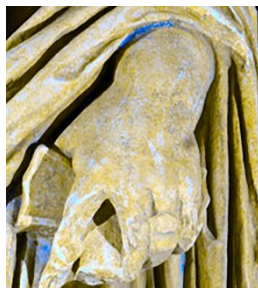


Fig. 8 Identification of pigments in the left hand of Navarca (analysis of VIS and IR images in false colors)

In this area using the FORS we found traces of blue – green colors, probably used to draw shadows.

On the other hand, multispectral imaging does not identify any traces of different colours other than those visible to the naked eye in the capital, which would allow to rule out further polychromies than is visible. A similar use of red and white can be seen in capitals made with coloured marbles, for example in the Museo Nazionale Romano [12].

Red and yellow were used on the stele of Mussa: a deep red was used inside the clypeus, the hair is depicted with black, as well as the eyes, while the skin is covered with red and yellow painting. The extensive and stunning polychromies of this stele, so well preserved, is not well known.

At the first sight, this object can be weird: traces of red (maybe decorations?) are visible on a yellow background on the left bottom part. Red lines on the upper part are not symmetrical. The surface shows an extensive damage, on Mussa's face, and the fractures are completely covered with painting.

Moreover, no information about the colours of this stele are documented in the archival documents of 18th and 19th century.

The example of the so-called Mussa's stele constitutes, through the multispectral imaging, a warning to pay close attention to easy interpretations derived only from visual analysis. The large amount of details emerged during the processing of the data raise doubts about the history and perhaps even the authenticity of the polychromies of this artwork. The revealed traces of colours in the different pictorial layers don't provide any element about the possible earlier decoration apparently lost (fig. 9).



Fig. 9. Principal component analysis (PCA) obtained by VIS, UV and IR bands on the left bottom corner of the stele of Mussa, with a possible previous vegetal decoration.

FORS and other single-point analyses showed on the stele an extensive use of red and yellow ochres, sometimes mixed with minium. Micro-samples were taken to deeper analyze pigments and layers. The polychromy of this stele also suggests the possibility of a modern painting, or a re-painting not clearly recognizable with the naked eye.

IV. CONCLUSIONS

The multi-disciplinary and multi-analytical approach used in this study to analyze traces of polychromies in some artworks of the National Archaeological Museum of Aquileia provided interesting new information about the pigments, details (such as the shadows in the "Navarca") and hypothesis of possible repainting of specific objects (stele of Mussa).

The use of expensive mix of pigments discovered on two studied heads, also provides important information about the high level of commissioning, while the colours revealed on a stone capital showed a tentative imitation – through painting – of the coloured marbles.

This preliminary work on the sculptures of Aquileia shows that this ancient city was brightly coloured and that multi-disciplinary and multi-analytical approaches are fundamental to help in the reconstruction of the original appearance of ancient coloured artworks.

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