ANCIENT SCULPTURE POLYCHROMY

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APRIL 12, 2019

Most sculpture that we have from ancient Greece lacks any sign of colors or pigments. Because of this fact, the casual observer may not even consider that this was not the intended state. However, through scientific research and analysis of the sculptures, and through cross referencing with literary material, we know that this is not the case. Through research we know that practically all sculpture and architecture was brightly colored. We examine some of the scientific methods that are utilized in order to ascertain more insight into the original coloring of a sculpture. This is becomes very useful when most of the pigments would have faded away due to exposure to light.

The first evidence that we have that ancient sculpture had coloring of any form, was from the sculptures that were covered in ash in Pompeii. The ash was able to protect the pigments from the harmful effects of sunlight. Because of this the pigments of these sculptures were preserved significantly better than any those used on previously discovered sculptures. This makes it clear that the sunlight is a significantly harmful factor when it comes to pigment preservation.

Many of the early attempts at the prediction of the colorization of the sculpture and architecture, was done before many of the scientific techniques that are now used today were known. This means that most of those reconstructions were primarily based on the antithetical preferences of the historian attempting the reconstruction. These reconstructions only accounted for a few bits of evidence that was available at the time. The primary evidence was if color was clearly visible on the sculpture, if it was not, then it was up to the historian to decide what color should be placed there.

As more methods scientific methods of determining the colorization or the pigment of sculptures were developed, the accuracy of the reconstructions began to converge to the ground truth of how it may have been originally painted. We will go though all of the methods that are used commonly now in order to assist in the determination of the color if not the pigments for ancient sculpture.

Visual Analysis This is a very simplistic method of analysis for the determination of pigments present on a sculpture. It simply involves visually looking at different portions of the sculpture. This can either be done by eye, or by using tools for optical enhancement, such as a microscope. My looking at what remains of sculpture, then dependent on how well the sculpture was preserved, it can be possible to visually identify colors.

We will describe this process of visual analysis, using the example of the Peplos Kore from the Acropolis(539BCE) shown in figure 1. By simply looking at this image of the sculpture, it can clearly be seen that the hair coloring is not the same as the coloring of the underlying medium. It is also evident that the hair has a

FIGURE 1. Peplos Kore, displaying the ability to use visual analysis on ancient Greek sculpture.

reddish hue. This would fairly directly indicate that the hair was originally colored red, and though exposure to radiation, it has faded to where it is now.

Raking Light This is a method that involves shining light from a very sharp angle, almost parallel to the surface of the sculpture. This method is used to pick up on the radiation resistance of different pigments, and colors. Anything exposed to solar radiation will get damaged over time, some materials will get damaged faster than others. Having a paint over the marble, acts like a shield, protecting from the solar radiation. So instead of the marble getting damaged, the paint gets damaged instead. This means that there will be a raised portion, where the paint was weathered away instead of the marble. This is depicted in figure 2.

This method becomes very useful to determine where different pigments were on a sculpture, and to ascertain the location of the transitions between them. Since each pigment would protect the underlying medium different amounts, each pigment would leave a different sized "bump" on the sculpture. There is little to gain about the actual color using this method, but it does allow for knowing where the different colors start and end.

By shining a light almost perpendicular to the surface of the sculpture it is possible to see these microscopic ridges on the surface of the sculpture. This process is clearly depicted in figure 3. It can be seen that the parts of the sculpture that face the light source will be emphasized, and the parts of the sculpture that face away

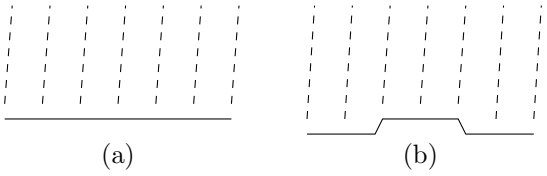

FIGURE 2. Demonstrating the process of solar radiation wearing through the marble surface, where the center segment is protected by some pigment. Over time smooth surfaces of (a) will develop bumps like the surface of (b).

from the source will be obscured in shadow. This allows the distinction between different surfaces, that may be impossible to visually see without the enhancement resultant from the shadows and highlights.

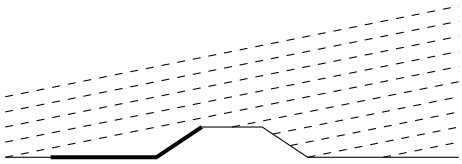

FIGURE 3. Demonstrating how using raking light will cast shadows caused by small ridges on the surface of a material. This allows for the determination of where pigments would have been present.

This method of raking light does not provide researchers will too much information about what pigments were actually present on a sculpture, but it does help in the determination of the regions of different pigments. Thus if a pigment is determined anywhere in the region, it is reasonable to believe that that pigment was used for the entirety of the region.

FIGURE 4. Raking light on a wall, emphasizing the brush strokes in the painting process. This can be used in a similar manner on ancient sculpture.