

New opportunities in archaeology from in situ material scientific characterization

Philippe Walter, *Class VI, EASA; Sorbonne Université, CNRS, Laboratoire d'Archéologie Moléculaire et Structurale (LAMS), Paris, France*
(philippe.walter@sorbonne-universite.fr)

Research on ancient materials, whatever they may be, requires first of all considering that they were developed by artists and craftsmen using often complex techniques and at a given moment in their career. What was produced one year may not be so later. We can now attempt to reconstruct the steps in the creation of paintings and other artworks by studying the evolution of the practices in synthesizing and preparing pigments and in formulating paint matter. Their understanding requires taking into account or reconstructing the mechanisms of chemical, physical and microbiological alterations. This field of interdisciplinary research, called sometimes technical art history, has been developed over the past ten years thanks to new technologies of physicochemical analysis and scientific observation, but also because specialists from all disciplines relating to material sciences and humanities accept to combine their methods and their data to consider the creative gesture differently.

Chemical imaging techniques are increasingly used for the study of paintings in order to supplement the traditional scientific images obtained by radiography, infrared reflectography and fluorescence under ultraviolet light. Non-invasive, they allow the acquisition of a large number of spatial and chemical data, the interpretation of which opens up many perspectives for looking at works of art differently. Chemical maps obtained by X-ray fluorescence spectrometry revealed the distribution of pigments from the detection of the elements that compose them. Such an analysis of the representation of Medusa present on the shield of Achilles in the frieze of the treasury of Siphnos, at Delphi (Greece), revealed traces of colors, which are absolutely no longer visible today, masked by encrustations and marble alterations that have occurred since the construction of the monument at the end of the 6th century BC. Lead materializes the iris of the eyes which had the power to petrify any mortal who looked at them. Copper, most likely associated with green pigment from microscopic observations of the stone's surface, is present in the hair and forms the intertwining serpents well known in other depictions of the Gorgon. These painted lines continue on non-sculpted parts of the shield and demonstrate that color have been used to complete the relief and that painters and sculptors should work together when making such artworks.

The possibility of analyzing the constituents of artworks in a non-invasive way and in-situ offers today the possibility to carry out new researches in the field of the history of art.



(Left) Chemical map of lead (green), iron (red) and copper (blue) showing the distribution of remains of pigments on the Medusa head. (Right) picture of the marble sculpture, Delphi, Greece.

Bibliography:

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