

Master-hand Attributions of Classical Greek Sculptors by 3D-Analysis at Olympia - Some Preliminary Remarks

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1. The subject and the problem

The sculptural decoration of the temple of Zeus at Olympia is nowadays generally considered as one of the most important and most magnificent works of ancient Greek art. The fragments have been thoroughly studied since their discovery in the 1880's, but they still pose some important questions. Perhaps the most difficult and the most distressing problem regards the identity of the master(s) of these works. Despite the high artistic quality and their excellent workmanship, nobody really knows, who the sculptor (or the sculptors) of these pieces actually was (were) and where he (they) came from.

2. Previous research

Classical archaeologists realized very early that the only available ancient literary source (Pausanias' "Description of Greece", Book 5, Chapter 10, 7) is most likely to be unreliable and have tried since more than a century to identify the "Olympia master" with a local, an Athenian, a Spartan, North-Peloponnesian, Parian or other sculptor, but practically everybody arrived at different solutions. [Her87; Hol00; Kyr06] All the traditional methods have already been tried to solve the problem, but none has proved to yield convincing results. Even the basic question, whether there was one single master or several different ones, remained controversial.

3. Methodology

In order to identify the origins of the so-called "Olympia master", it is intended to escape the inherent difficulties of the hitherto used tools (photographs, plaster casts) by analysing 3D models. The aim is not only to solve an old and important question of art history, but at the same time, to elaborate a tool-kit, which can be applied to any other set of sculptural masterpieces and will enable identification of master hands in general.

3.1 The Morelli method

The method of detecting master-hands in different works of art by observing idiosyncrasies in the rendering of small details has been developed by Giovanni Morelli during the 19th century and is commonly referred to as master-hand attribution [Vak01]. Sir J. D. Beazley first used this method to identify attic black-figure and red-figure vase-painters, afterwards he applied this method to Etruscan vase-painting too. His attributions are nowadays

generally accepted and they revolutionized our understanding of ancient Greek art.

Since the human eye can not automatically and reliably extract characteristic features from 3D objects and photographs can not faithfully reproduce three-dimensional details (Figure 1), the use of the Morellian attribution method in the analysis of three-dimensional art was rather limited so far. [Lan27; Fre69; Wal87]



Figure 1. Two ancient heads (left: "Ares Borghese"; right: "Doryphoros") and their profiles compared. The striking similarities of the profiles are not readily discernible for the human eye, neither in the photographs, nor in reality.

Personal impressions and subjectivity (naturally inherent in connoisseurship) played a much greater role in these cases than in the analysis of two-dimensional art and due to the limitations of traditional photographic documentation, it was impossible to demonstrate the attributions as convincingly as in the case of vase-painting. The obvious biological and technological constraints may, however, be overcome by using virtual 3D models produced by 3D scanning.

3.2 The new approach: the Morelli method in 3D

The basic idea is to start from two commonly accepted and fully justified assumptions of the Morelli method:

(1) that unconscious idiosyncrasies in the rendering of frequently occurring anatomical and other details do exist;

(2) that the trained human eye is capable of detecting these traits in 2D, i.e. one can distinguish the individual characteristics of different artistic personalities.

Assuming in addition on the basis of the available evidence (cf. e.g. Figure 1) that similar idiosyncrasies exist not only in two-dimensional but also in three-dimensional art, even if they can not always be identified by ordinary

human observers, one can conclude that the detection of master-hands in three-dimensional art simply requires the extraction of reliable and thus (in contrast e.g. with normal photographs) really comparable 2D images from the existing 3D data.

This task is perfectly feasible on the present technological level, and in this way, i.e. by comparing 2D images (either by trained human observers or by some special software) it will be possible to detect the idiosyncrasies in any pieces of sculpture made by the same individual.

This inherent possibility of the 3D models has practically not been realized yet. The 3D analysis proposed here will concentrate not on technological features, which might equally be detected without 3D models, but on the stylistic idiosyncrasies (proportions, special renderings of individual anatomical or other features), which will become recognizable through the systematic extraction of certain 2D patterns.

4. Implementation

Different profile drawings or slices will be produced from the comparable parts of the figures (in most cases the heads) and these 2D images will be compared like vase-paintings to each other by human observers or by some softwares (in order to express the degrees of similarity in an exact way). Profile drawings were only made sporadically so far (mainly for practical reasons), but can easily be produced from 3D models and as Figure 1 clearly shows, they are likely to reveal many details, which would be hard to detect otherwise.

This methodology will be tested and elaborated first on contemporary pieces of sculpture, where the sculptor is known with absolute certainty and then applied to ancient works of art in three consecutive stages.

The well-preserved frieze of the Siphnian treasury at Delphi (dating ca. 530-525 BC.) will be scanned and analysed, because in this case there is a sculptor's signature preserved on the frieze, stating that some parts or figures were made by the same artist. [Viv02]

Afterwards, the analysis of „Olympia sculptures“ has to determine, whether the statues and metopes were made or designed by a single man/workshop or by two or more different ones.

The last step involves the scanning and analysis of nearly contemporary Greek sculptures (from large size marble works to small-scale terracotta and bronze figurines) with known proveniencies. The analysis of their stylistic details and the comparison of these results with those obtained at the sculptures of the temple of Zeus could point to the localisation of the „Olympia master“ sculptor.

5. Conclusion

Pausanias, a Greek traveler during the 2nd century AD has described the temple of Zeus at Olympia in detail and recorded the opinion of his local guides concerning the master sculptors of the pediments as follows:

“The sculptures in the front pediment are by Paeonius, who came from Mende in Thrace; those in the back pediment are by Alcamenes, a contemporary of Pheidias, ranking next after him for skill as a sculptor.” (“Description of Greece”, Book 5, Chapter 10, 7; English Translation by W.H.S. Jones, Cambridge (MA), 1918.)

These ancient attributions are usually and most plausibly considered as erroneous [Mou04], but modern scholarship was equally unable to suggest better ones. Even if the names of the sculptors will most probably remain unknown, the methodology of 3D analysis outlined above will at least enable us to determine their places of origin. In addition, the method can be applied afterwards to other similar problems and will contribute to our understanding of sculpture in general.

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