

The “Kouroi of Atalanti”: Limestone Funerary Statues and Grave Stele from the Cemetery of Ancient Opous (Atalanti): Preliminary Study, Analysis and Investigation of the Composition, Variety and Possible Sources of Limestone of a New Locrian Sculpture Workshop

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Abstract Of exceptional importance for Central Greece and for the art of Archaic sculpture in general, considering their scarcity, are the funerary limestone statues that came to light by the Ephorate of Antiquities of Phthiotida and Evrytania at the east fringes of Atalanti, at the end of 2018. Statues are only part of the wider monumental landscape of the unknown organized ancient cemetery, a small part of which was unearthed at the east edge of Opous (Atalanti), the capital of ancient Locris. Additionally, during the excavation, which is still in progress, 15 tombs have been investigated, most of them undisturbed. These contained single adult and infant burials, accompanied by plentiful and significant artefacts, such as terracotta figurines, bronze vessels and mirrors, as well as silver and glass jewels, dated from the 6th to the 2nd century B.C. The cemetery is still under study, yet unpublished, and the current article is the first preliminary report for the mainly life-sized limestone statues and grave stele. The exceptional and innovative stylistic features of the statues and the unique way of their standing indicates that they were created by an unknown Locrian Sculpture Workshop that was active in the region –according to our current knowledge- from the 6th to the mid.- 5th century B.C. Analyses have been carried out in order to investigate the diversity of the limestone composition from which sculptures and grave stele were made, to identify further distinct groups with different chemical composition and finally to locate possible quarries or regions of East Locris that functioned as the sources of limestone extraction. New technology equipment applied in order to identify specific characteristics of the limestone statues and grave stelae. The 3D measurements of the statues were performed on a Shining 3D Einscan 2X 3D Scanner. The scanner was set up to acquire in, Feature-only Rapid Mode with a resolution of 0.2mm. For post processing, quality option was selected. XRF in-situ measurements were carried out in order to investigate the diversity of the limestone composition from which sculptures and grave stele were made. We identified distinct groups with different chemical composition and after a useful comparison with XRF data from 9 different regions of East Locris we found the possible provenance of the sources of limestone extraction.

Keywords Kouroi of Atalanti, 3D scanning, Provenance

1. Introduction

The modern town of Atalanti is located in the eastern part of Locris, a rather narrow zone of Mainland Greece, among the Euboean Gulf, Phokis and Boeotia. It is built at the foothills of Chlomos Mountain, where ancient Opous, the

capital of Locris, flourished during ancient times.

The discovery of the funerary limestone statues is of exceptional importance for Central Greece and for the art of Archaic sculpture in general, in terms of their typology and scarcity. The first statue was discovered by a local farmer at the east fringes of Atalanti, during the end of 2018 [1-2] who kindly informed the Ephorate of Antiquities of Phthiotis and Evrytania, which then undertook the excavation of this area (Figure 1).

The excavations in the area proved to be fruitful, since three more parts of life-sized limestone statues were brought to light, alongside a statue base, four parts of limestone grave stele and one part of the organized eastern cemetery of

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ancient Opous. The excavation is still in progress and the excavation material remains to be conserved and studied.



Figure 1. The limestone statues known as the kouros of Atalanti

The lack of monumental Archaic sculpture production in Phthiotis [3], with an exception of a small group of crude poros statues from ancient Halai [4], makes this discovery important as it is still largely unknown to modern scholarship. The concentration of the sculptures in different places over the ancient cemetery, in combination with the prototype stylistic features and the different chronological horizon ranging from the 6th century B. C to the first half of 5th century B.C., indicates the existence of a local monumental sculpture workshop, which, according to the available excavation data, produced works of art made from poros, a raw material which is abundant in the region of Locris.

The necessity to identify the specific characteristics of the Locrian workshop and the possible sources of limestone extraction led to the application of scientific studies, conducted by Professor Theodoros Ganetsos. The present collaboration with the University of West Attica involved the investigation of the chemical composition of the five poros statues and the four poros grave stele using XRF and RAMAN spectroscopy. Archaeometric methods were combined with 3D digitization of the five sculptures, in order to identify stylistic features that were not visible with the naked eye.

2. The Limestone Sculptures Known as “The Kouros of Atalanti”

I. Fragmentary statue of Hercules, Atalanti Archaeological Museum, inv. no. L 1776, (Figure 2).

Dimensions: height 1.22 m, width 0.43 m.
Limestone (poros).

The life-size poros statue belongs to the type of Hercules, which preserves the head and the entire body down to the lower part of the thighs. The hands are missing and the state of preservation of the face and body is not good. The bearded figure stands strictly frontal, with the left leg extended “in the type of kouros”. Its uniqueness lies on the fact that the three quarter of the body is presented in-the-round, while the rear surface of the statue is flat in the upper part, having an integral rectangular socle for placement into an unknown monument or pediment. 3D digitization of the statue confirmed our original hypothesis, that it may be a statue of Hercules, as the high resolution brought to light the front legs of the lion skin tied in the center of the chest, its tail, which is formed behind the right buttock of the statue. Concerning the part of the head, we can easily distinguish the head of the lion skin, while the lower jaw of the animal is embossed, on both sides of the neck of the statue. The absence of ears, which were replaced by a rectangular groove on the right and an oval on the left, remains enigmatic. (It may be related to inlay material of some kind, or it belonged to a larger statue group). Stylistically, it bears some affinities with another unique work, deriving from a Boeotian workshop; the grave stele of “Kitylos and Dermys” from Tanagra displayed at the National Archaeological Museum of Athens [5].



Figure 2. Fragmentary statue of Hercules, first quarter of the 6th century BC

The unique and stylistically impressive statue of Hercules is probably among the earliest samples of the monumental Archaic sculpture, depicting the popular hero-demigod that must be dated to a post-Daedalic period, possibly in the first quarter of the 6th century BC. Stylistic evidence that supports this chronology includes the particularly pronounced protrusion of the chest, the imbalance of the body parts with the relatively short upper torso [6].

II. Fragmentary statue of a “kouros”, Atalanti Archaeological Museum, inv. no. L 1777, (Figure 3).

Dimensions: height 0.82 m, width 0.29 m.
Limestone (poros).

The statue depicts a male figure, which is preserved from the lumbar to the tibia. It was discovered alongside the statue of Hercules and it may belong to the same statue group, due to the presence of the integral rectangular socle, as in the case of Hercules. The male figure stands in frontal position with the left leg extended. The bad preservation and the corrosion

of the limestone do not allow further observations. However, a date of the statue in the early or middle Archaic period is considered possible.



Figure 3. Fragmentary statue of a “kouros”, early to middle archaic period

III. Fragmentary statue of a kouros, Atalanti Archaeological Museum, inv. no. L 1781, (Figure 4).

Dimensions: height 0.95 m, width 0.50 m.

Whitish Limestone (poros).



Figure 4. Fragmentary statue of a kouros, last quarter of the 6th century B.C.

The statue of the life-sized kouros preserved from the base of the neck to the thighs is the better preserved in comparison to the other statues. The naked young man stands frontally with the left leg slightly extended. His arms are broken but they would be positioned parallel to the body, resting on the thighs, where traces of attachment are preserved.

The anatomic details and the muscularity of the body are rendered with plasticity and slight engraving. The toned chest muscles are depicted in relief as well as the projecting collar bones. The shallow chest sulcus starts from the base of the neck to the ‘linea alba’ and reaches the navel. The chest outline is displayed as an open arch, while the abdominal muscles are formed symmetrically on both sides of the white line. The pubic villus is rendered in a stylized way with sharp

arched ends. On the back side the groove of the spine is displayed with a relatively deep engraved line that continues between the buttocks. The incised area of the sacrum is also stylized. The sculpture has an unusual integral block on the back side of the thighs, just below the buttocks, which is also visible on the front between the thighs. This kind of exceptional standing seems to be an innovative stylistic feature of the Locrian workshop. Based on the stylistic features [7] referred previously, the kouros can be dated to the last quarter of the 6th c. B.C. The plinth discovered close to the statue may be related to it.

IV. Fragmentary torso of a male statue, Atalanti Archaeological Museum, inv. no. L 1775, (Figure 5).

Dimensions: height 0.86 m, width 0.52 m.

Whitish Limestone (poros).

The torso of the naked male statue L1775 is the first sculpture discovered by the farmer. It is preserved from the cavity of the neck to the upper part of the thighs. The front side of the statue is significantly corroded and the skin of the limestone is partially exfoliated. On the other side, the preservation of the rear part of the statue is much better, apart from the deep incision from the right shoulder to the armpit. Its weight is standing on the left leg, while the slightly relaxed right leg comes forward. The preserved part of the arms is attached to the body and the missing part would probably be attached to the thighs. The natural arrangement of the statue, as well as the artist’s effort for the realistic depiction of each anatomic detail of the figure, is obvious. On the front side the fleshy abdomen is rendered with plasticity and defined low by the inguinal grooves that bend sideways. On the back side the buttocks are rendered firmly and the individual muscularity of the body is displayed with soft contour. The uneven placement of the buttocks in combination with the slight elevation of the right shoulder, indicates the lopsided standing of the body on the stretched left leg, and at the same time the slight relaxation of the right side, creating the well-known at art of sculpture, posture of ‘contrapposto’ [8]. The coexistence of early stylistic features, such as the thighs joining high, with later ones, such as the contrapposto stance, suggests a date in the second quarter of the 5th Century B.C. This would make the work one of the latest coming from the Locrian workshop, based on the evidence available.



Figure 5. Fragment of an over natural sized kouros

V. Fragment of an over natural sized kouros, Atalanti Archaeological Museum, inv. no. L 1783, (Figure 6).

Dimensions: height 0.39 m, width 0.38 m.

White Limestone (poros).

In addition, among the sculptures mentioned a broken part of buttocks of a sculpture, which probably belongs to an over natural sized kouros and was built in a burial precinct in the upper layer of the cemetery, should be included.



Figure 6. Fragmentary torso of a male statue, second quarter of the 5th century B.C.

VI. Fragment of a grave stele, Atalanti Archaeological Museum, inv. no. L 1778.

Dimensions: height 0.53 m, width 0.26 m, depth 0.17 m.

Limestone (poros).

Decoration: part of a palmette.

VII. Fragment of a grave stele, Atalanti Archaeological Museum, inv. no. L 1779.

Dimensions: height 0.205 m, width 0.27 m, depth 0.135 m.

Limestone (poros). Decoration: relief band.

IX. Fragment of a grave stele, Atalanti Archaeological Museum, inv. no. L 1780.

Dimensions: height 0.30 m, width 0.29 m, depth 0.17 m.

Limestone (poros).

Decoration: Locrian type in the shape of a kline.

X. Grave stele, Atalanti Archaeological Museum, inv. no. L 1786.

Dimensions: height 0.705 m, width 0.46 m, depth 0.16 m.

Limestone (poros).

Decoration: Locrian type in the shape of a kline.

The four fragments of grave stelae made of poros stone under study here, came also from the same cemetery. None of them was found in situ but rather in the upper strata of the cemetery, or reused in later burials. A good example of the latter is stele L 1786, which had been used as a cover of a burial pithos dating to the 2nd century. B. C. (Figure 7). They belong to common types, either crowned by a palmette

or pediment, or in the shape of a kline [9], that are well-documented in the region of Locris [3].



Figure 7. The limestone grave stele reused as a cover of a burial pithos

3. 3D Scanning the Statue

The limestone sculptures known as “The kouroi of Atalanti” were 3D scanned with a EinScan Pro 2X Plus (Shining 3D Tech. Co., Ltd.) using Shining Software according to the manufacturer’s recommendations. The time required to 3D scan skull was approx. 10-15 minutes and the time required for post processing 2 hours. A feature – only rapid mode with a resolution of 0.2mm was used (figure 8). In scanning software settings, the Quality mode was enabled for post processing and also manufacturer’s CAD software was used to further clean minor errors (figure 9).

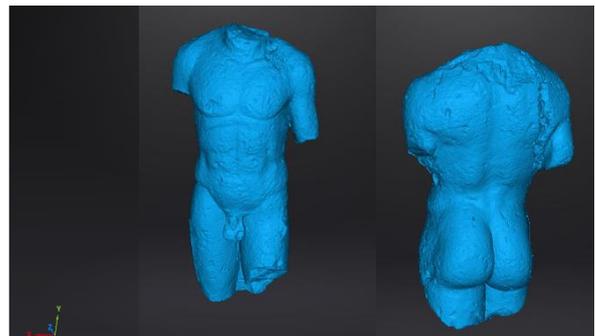


Figure 8. Results of 3D scanning in natural size kouros

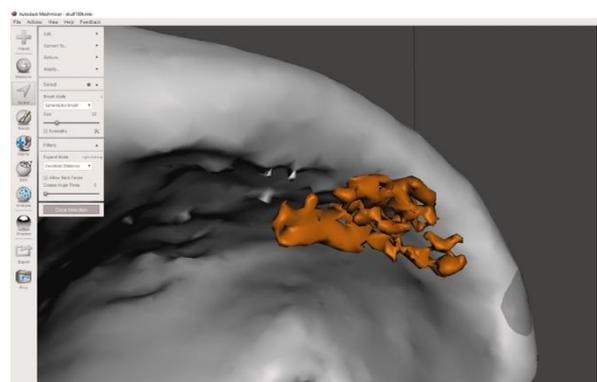


Figure 9. Cleaning minor errors in 3D scanning procedure

4. XRF Analyses

Table 1. Results of Ca and Fe for archaeological samples

Sample code	element	percentage	Error
4833 	Ca	98.04	0.88
	Fe	1.67	0.15
4834 	Ca	96.03	0.92
	Fe	2.91	0.18
	Mn	0.39	0.17
4835 	Ca	95.72	0.89
	Fe	3.68	0.20
	Mn	0.42	0.16
4836 	Ca	97.58	0.87
	Fe	1.97	0.16
4837 	Ca	94.55	0.94
	Fe	4.40	0.22
4838 	Ca	99.36	0.81
	Fe	0.33	0.11
4839 	Ca	99.64	0.81
	Fe	0.13	0.01
4840 	Ca	98.05	0.87
	Fe	1.09	0.13
4841 	Ca	99.63	0.81
	Fe	0.13	0.01

Table 2. XRF results of Ca and Fe for different quarries

Localities	Elements	Error
Arkitsa 1 – Kondyli	Ca 98.58 (0.85)	Fe 1.05 (0.13)
Arkitsa 2 - Plateia	Ca 98.24 (0.84)	Fe 1.45 (0.14)
Akritsa 3 – Ag. Nikolaos	Ca 99.60 (0.77)	Fe 0.35 (0.11)
Arkitsa 4 - Mpyornias	Ca 99.13 (1.28)	Fe 1.17 (0.22)
Theologos 5 - OSMAES	Ca 99.47 (0.80)	0
Megaplatanos 6 - Geromosxos	Ca 99.67 (0.78)	Fe 0.21 (0.10)
Kyrtoni 7 - Palaiopyrgos	Ca 97.93 (0.98)	Fe 1.84 (0.16)
Atalanti 8 – Ag. Anargyroi	Ca 99.79 (0.76)	0
Atalanti 9 - Kastraki	Ca 99.28 (0.82)	Fe 0.41 (0.12)

In this work an XRF non-destructive analysis was conducted in order to identify the chemical composition of limestone of “The kouroi of Atalanti” and be compare with data of XRF from different sources of East Locris for provenance investigation (tables 1 and 2, figure 10).

For the quantitative and qualitative determination of chemical elements of the examined limestones a Thermo

Scientific Niton XLP XRF analyzer was used with an Am-241 source and a solid-state detector. For the data acquisition a built-in software was used and measurements were saved as Unicode ASCII file format being compatible for further analysis with specialized software. Before measurements the built-in shutter calibration was applied along with soil calibration.

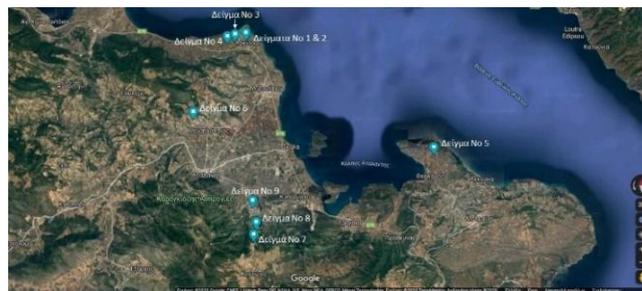


Figure 10. Different sources (quarries) of raw material collected for the purposes of this work

5. Conclusions

The following conclusions can be drawn from the 3D scanning procedure of this study:

- 3D scanning and 3D printing can be a very useful technology for preserving and disseminating specimens in the field of archaeology.
- Can help museums and archaeologists get more value from current specimens.
- Very quick to digitize, using a streamlined solution such as that available from Shining3D where both 3D scanner and 3D printer are made by the same company might accelerate procedure and help avoid PROBLEMS (file translation, 3D printer setup).

Also, XRF in-situ measurements were carried out in order to investigate the diversity of the limestone composition from which sculptures and grave stela were made. We identified distinct groups with different chemical compositions and after a useful comparison with XRF data from 9 different regions of East Locris we found the possible provenance of the sources of limestone extraction for the sample codes of Table 1: 4839 (L.1781, Figure 4), 4841 (L. 1775, Figure 6). The absence of Fe and the concentration of Ca in these two statues are closer to the chemical composition of the locations Atalanti 8-Ag. Anargyroi and Theologos 5-OSMAES (Table 2). An ancient quarry of limestone (poros) is mentioned in earlier studies [10,11] among other quarries of Phthiotis in the locality in this study No 5 “Theologos 5-OSMAES” where the examined sample 5 was collected. The quarry is located in the north part of the city of ancient Alai, where in our days the village of St. Ioannis Theologos of Malesina stands. In earlier studies the record name “Quarry 3” [11] has been described as an outdoor type of limestone quarry. Furthermore, the chemical composition of the Hercules’ statue, sample code 4840 of Table 1 (L1776, Figure 2) that contains Ca 98.05, Fe 1.09 is

close enough to the sample collected and examined from the Locality Arkitsa 1-Kondyli (Ca 98.58, Fe 1.05).

In addition, the high concentration of Fe (1.97 to 3.68) in three of the five examined grave stelae and the existence of Mn in the samples, leads to the conclusion, at this preliminary study, that more samples of limestone need to be collected from the region for further examination. As grave stelae were works of mass production and very common for each burial, in contrast with the sculptures, sources of limestone should probably be investigated closer to the city of ancient Opous in future studies.

Concluding, at this preliminary study which is going to be enriched in the future with more samples and measurements, the initial hypothesis about the use of local material for sculptures is confirmed and furthermore we have the identification of a new Lokris workshop for monumental sculpture, active during 6th c. B.C. and first half of 5th c B.C., which uses different types of limestone from local sources, depending on the type of the sculpture.

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