

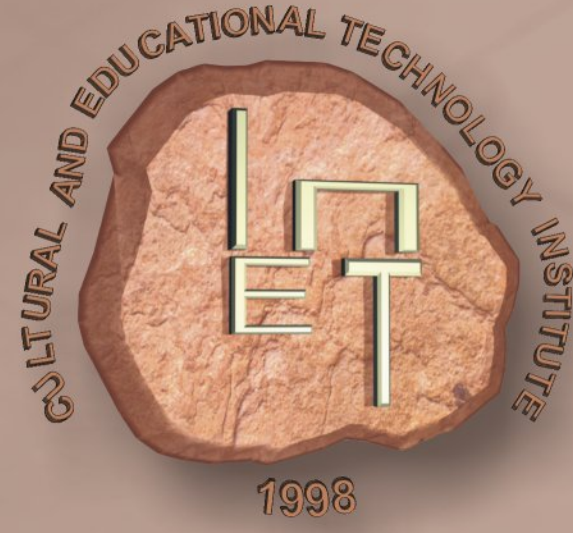
THE ANCIENT SETTLEMENT AT KARABOURNAKI: THE RESULTS OF THE CORINTHIAN AND CORINTHIAN TYPE POTTERY ANALYSIS

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INTRODUCTION

Karabournaki is located on the edge of a peninsula in the center of the Thermaic Gulf. The site preserves the remains of a settlement placed on the top of a low mound, with its cemeteries extended in the surrounding area and the ancient harbor to reach the lower part of the mound. Karabournaki should be related to ancient Therma mentioned by the literary sources as the most important settlement before the establishment of Thessaloniki. Current excavations unearth the residential area that along the houses preserves ceramic and metal workshops, providing important information for life in Macedonia during late Geometric, Archaic and early Classical periods. The site preserves a great number of ceramics, local and imported, in a remarkable quantity as well as quality. The material evidence demonstrates that during the Archaic period, Karabournaki was a commercial and distribution point and a meeting place of influences from the East and the West.



Views of the area of Karabournaki

POTTERY

A major category of pottery unearthed in the settlement is the Corinthian. Although the earliest examples date in middle Protocorinthian, the Corinthian presence in Karabournaki becomes clear since the last quarter of the 7th c. B.C. and throughout the 6th c. B.C. All known shapes of the Corinthian production are represented with an emphasis on perfume and symposium vases as well as on less common shapes. A more careful though archaeological examination and study indicate that the category should be divided in three groups:

- **Group A:** Corinthian imports.
- **Group B:** Corinthianizing pottery, meaning close imitations of good quality in shape and technique, carrying black-figured decoration. They could be products of one workshop located in a nearby Corinthian colony.
- **Group C:** Imitations with particularly linear decoration, that can be considered local productions in the area of the Thermaic gulf with Corinthian influence.



Group A

Group B

Group C



Fragmentary neck amphora K95.323 Fragmentary oinochoe K97.1675
Examples of Group B

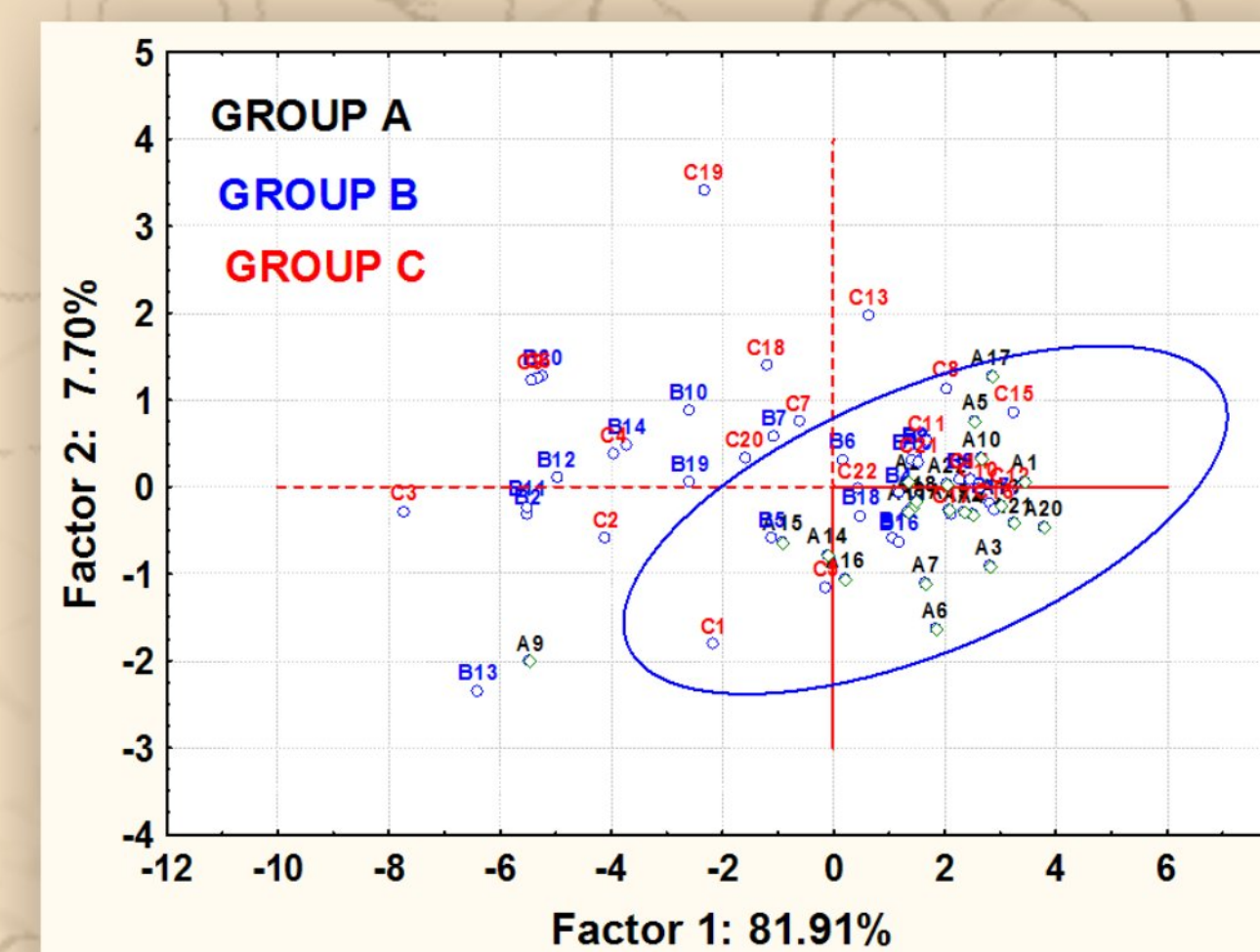
ARCHAEOLOGICAL QUESTIONS

In order to supplement and confirm the assumptions coming out the archaeological research, it has been employed the possibilities offered by Archaeometry. The main axis of questions is as follows:

- To confirm the archaeological categorization and identification based on chemical elemental analysis.
- To check the homogeneity of the three groups.
- To check any possible clay relation between the three groups.
- To identify if there are any compositional differences between the three groups that imply the different origin of the clay.

ARCHAEOMETRIC STUDY

A significant number of pottery fragments (64) are studied by micro X-ray Fluorescence Spectroscopy (μ -XRF). The μ -XRF data are interpreted with suitable multivariate statistical exploratory tools such as Principal Component Analysis (PCA) and Discriminant analysis (DA). The interpretation of the archaeological hypothesis in combination with the archaeometrical results reveal useful data indicating imitations and local productions of a major category of imported pottery in Karabournaki, the Corinthian.



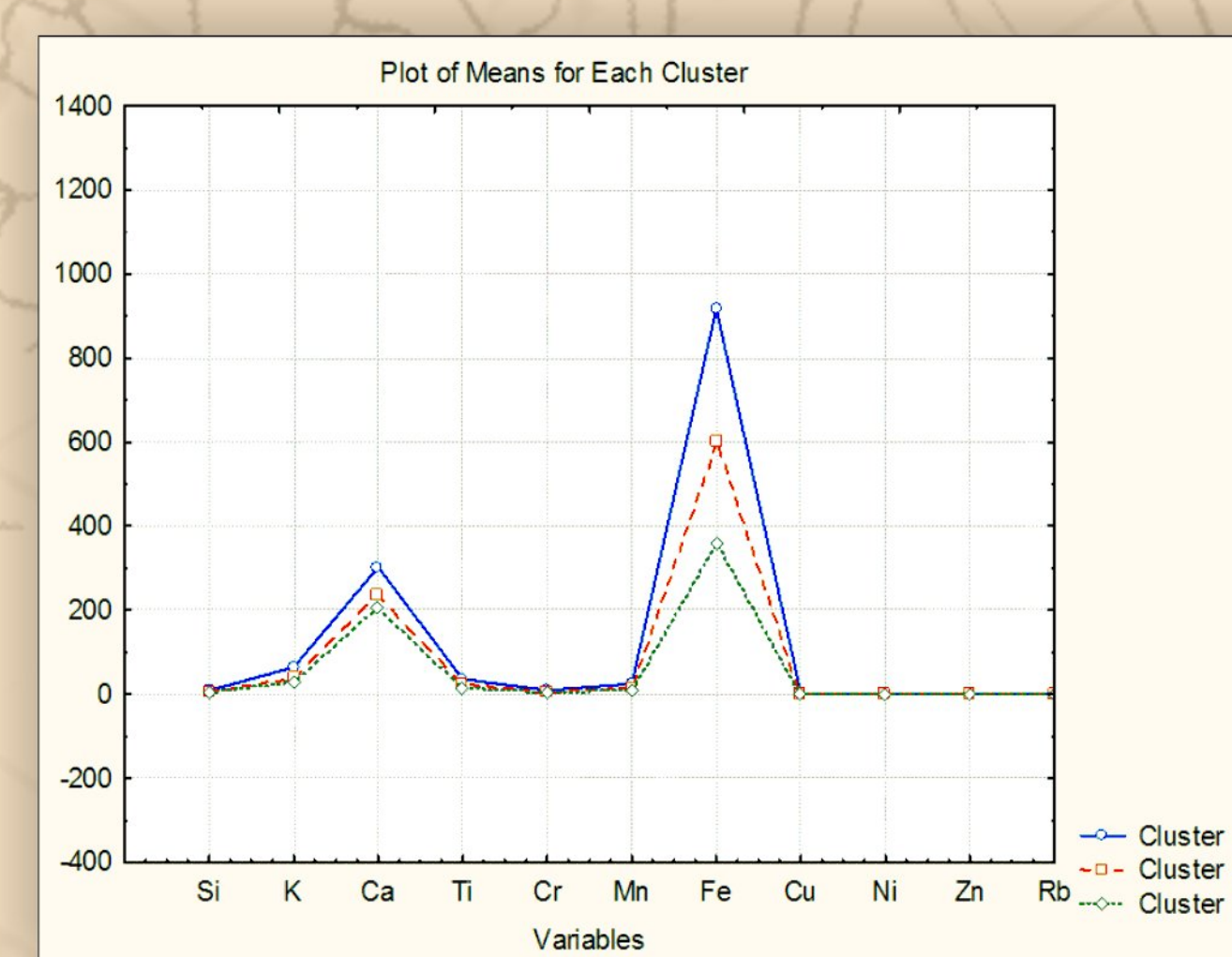
Principal Component analysis for the three groups, presenting the discrimination of the samples.

gro up	percent correct	A p=0.3333	B p=0.3333	C p=0.3333
A	86.36	19	3	0
B	60.00	6	12	2
C	72.72	3	3	16
Tot al	73.43	28	18	18

Discriminant analysis of the analyzed samples

- Group A seems to have greater homogeneity, enhancing the archaeological aspect of their Corinthian provenance.
- With the exception of one sample, all other samples belong to Group A with a confidence of 95%.
- Many samples of group B and C are included in the ellipse of 95% confidence, implying that they could belong to Group A. A more careful archaeological examination and classification of these samples could be useful.

- The quality of representation is up to 89,61% (81,91% +7,70%).
- The total archaeological classification is confirmed for up to 73,43%.
- Three samples of Group A seem to belong to Group B.
- Six samples of Group B seem to belong to Group A, and two to Group C.
- Three samples of Group C seem to belong to Group A and another three to Group B. All above exceptions could be re-examined by archaeological means in order to evaluate the possibility of different categorization.



K-Means Clustering of the analyzed samples

CLUSTER 1	CLUSTER 2	CLUSTER 3
Samples Distances	Samples Distances	Samples Distances
A9 32.67	A14 23.89	A1 28.86
B2 15.63	A15 8.25	A2 16.52
B11 11.99	A16 27.85	A3 16.10
B12 18.94	B5 9.22	A4 11.11
B13 49.85	B6 25.76	A5 21.70
B14 23.39	B7 16.34	A6 26.12
B19 41.28	B10 46.15	A7 27.04
B20 27.96	C1 53.68	A8 12.73
C2 18.77	C5 40.10	A10 16.12
C3 59.54	C7 8.24	A11 9.16
C4 30.58	C18 30.01	A12 12.24
C6 19.84	C19 48.48	A13 22.61
C9 29.87	C20 6.46	A17 30.37
	C22 31.70	A18 18.57
		A19 10.18
		A20 36.07
		A21 15.70
		A22 9.27
		B1 21.49
		B3 19.43
		B4 30.38
		B8 7.79
		B9 23.88
		B15 19.42
		B16 23.10
		B17 16.35
		B18 36.11
		C8 23.58
		C10 8.60
		C11 12.23
		C12 35.84
		C13 28.53
		C14 12.13
		C15 26.80
		C16 24.22
		C17 9.06
		C21 22.08

- Through the K-Means Clustering Analysis it was shown that the samples differentiated in groups in two principal elements (Ca and Fe) and in two secondary elements (Ti and K).
- K-Means Clustering reveals that cluster 3 contains most of the samples of group A representing the increased homogeneity of group A. The other two groups are spread through all the three clusters.

CONCLUSIONS

- Group A shows the greater homogeneity (86-90%), indicating that the Corinthian imports are distinguished from the other two groups.
- Homogeneity to a certain extent was shown also in Group C (72.72%) and Group B (60%), confirming the archaeological distinction into three groups.
- All three groups reveal distinct similarities concerning vase shapes and decoration with notable preference on sympotic vessels and animal friezes respectively
- Based on the archaeometric study, some samples concerning their archaeological categorization will be re-examined.
- A more clear categorization of the Corinthian and Corinthian type material is now possible.

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