

**ΕΝΤΥΠΟ ΥΠΟΒΟΛΗΣ ΤΕΛΙΚΗΣ ΕΚΘΕΣΗΣ ΕΡΕΥΝΗΤΙΚΟΥ ΕΡΓΟΥ ΜΕ
ΧΡΗΜΑΤΟΔΟΤΗΣΗ ΑΠΟ ΤΟ «ΙΔΡΥΜΑ Α.Γ. ΛΕΒΕΝΤΗ»**

Μ Ε Ρ Ο Σ Α	
A.1. ΓΕΝΙΚΑ ΣΤΟΙΧΕΙΑ ΕΡΓΟΥ	
Τίτλος Έργου	<i>MEANING (acronym): “From the metalliferous sources to the citadel complex of Ancient Paphos: archaeo-environmental analysis of the mining and the built environment”</i>
Συντονιστής Έργου	<i>Maria Iacovou</i>
Ημερομηνία Έναρξης Έργου	<i>May 2017</i>
Ημερομηνία Λήξης Έργου	<i>May 2019</i>
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Μ Ε Ρ Ο Σ Β

Περίληψη (500 λέξεις), Στόχοι και Χρονοδιάγραμμα (όπως περιγράφονται στην Πρόταση)

Παρατίθεται περίληψη της ερευνητικής πρότασης και αναφέρονται επιγραμματικά οι **στόχοι** της παρούσας και το χρονοδιάγραμμα της ερευνητικής πρότασης.

ABSTRACT:

Major methodological advances in the archaeology of Cyprus in recent years have rendered it a prominent field of research concerning Mediterranean island cultures. State-of-the-art archaeo-environmental projects have been successfully carried out on Prehistoric and Bronze Age sites enhancing our understanding of the island's socio-economic structure to the end of the second millennium BC. The same, however, cannot be said of the first millennium BC. Few field projects of this period have focused on the collection and treatment of archaeo-environmental data that can provide evidence on the political economy and the administrative system of the Cypriot 'kingdoms'.

A rare opportunity to explore the resource exploitation strategies and the networking pattern of one of the Iron Age polities is now provided by the unexpected discovery in 2014-2015 of an industrial and storage complex in the context of the *Palaepaphos Urban Landscape Project (PULP)*. Since 2006, *PULP* has been carrying out intensive landscape analysis, in combination with short-term targeted excavations. Constructed at the end of the 6th century BC, the monumental complex extends over 65m next to a poorly known edifice, identified since the 1950s as a royal residence. Both are situated on the north side of the citadel of Hadjiabdoulla, the easternmost plateau within the urban landscape of Ancient Paphos.

Instead of proceeding at fast pace to expose this impressive complex, whose stone-built units are preserved to a height of 1.50-1.80m, we have redefined the priorities of the excavation schedule so that they may comply with the requirements of a holistic archaeo-environmental project and the need to document and maintain a fine scale record of the depositional history of each unit. Besides ensuring the proper collection of organic and inorganic materials, especially from below the collapsed roofs that have sealed most of the units, industrial and other residues from production areas and storerooms will also be analysed with particular reference to the metal and timber resources of the Paphos hinterland. *PULP's* continuing survey of slag heaps in the long abandoned metalliferous area of Paphos on the southwestern fringe of the Troodos forest has allowed us to argue that copper procurement and, most likely, also shipbuilding may have been the main industries of the city-state of Paphos. This model can now be tested through a collaborative project that will bring together a group of specialists, all of whom have pledged their commitment to the project.

RESEARCH GOALS of *MEANING* in the context of *Studies in Pre-Modern Economies and the Palaeo-Environment*

- (a) *The political economy of the city-state of Paphos*: study of the economic and administrative system of a Cypriot polity in the Cypro-Classical period. The polity's reliance on agriculture, the level of its investment in metallic and timber resources and the management of industrial and agricultural products for export.
- (b) *The establishment of a long-term field school and training ground for Environmental Archaeology and Palaeoeconomy*: the Hadjiabdoulla citadel complex and the man-made tumulus of *Laona* will be transformed into an active field school, where students and young scholars will receive

training in state-of-the art methods of field work and will be exposed to new approaches regarding the treatment of material remains.

TIME-TABLE and Tasks:

Both goals were served by the same set of actions and the same group of special scientists. In the course of the 24-month long period of the project all tasks were implemented by three distinct but closely related and collaborating teams:

(a) *the Built Environment team,*

(b) *the Storage Amphorae team*

(c) *the Mining Environment team (Paphos Forest slag heaps).*

(a) **The Built Environment team** (Leader: Dr. T. Karkanias)

Study of sediment and soil micromorphology with analysis of thin sections from Laona and Hadjiabdoulla (Myrsini Gouma).

Sorting, selection and cataloguing of bio-archaeological and archaeo-botanical macro-data (Anaya Sarpaki); anthracological study of carbon samples (Maria Ntinou.)

Starch and phytolith sampling for micro-data analysis from units excavated up to 2018 (Calla McNamee and Georgia Tsartsidou).

Mudbrick petrography study (Marta Lorenzon).

(b) **The Storage Amphorae team** (Leader: Prof. A. Marangou)

Provenance and dating of amphora fragments collected during the 2009-2018 field seasons from distinct units. Chrono-stratigraphic analysis per unit to determine the use-pattern and the economic focus of the industrial-storage complex before (5th-4th centuries) and after (3rd-2nd centuries) the Ptolemaic takeover of 300BC and the termination of the autonomous city-state of Paphos.

(c) **The Mining Environment team (Paphos Forest slag heaps)** (Leader: Prof. V. Kassianidou)

Treatment of slag samples collected from the excavated units of the citadel and samples collected from the Paphos Forest slag heaps to be used for the production of thin sections and for lead isotope analysis to provide evidence for the procurement of copper from the Paphos Forest cupriferous zone in antiquity and to determine whether the city-state of Paphos was exploiting regional deposits of copper and timber.

In order to achieve the above tasks, MEANING was organized in six Work Packages (WP 1-6) as follows:

WP1: Project management; WP2: Dissemination; WP3: Archaeo-environmental analyses; WP4: Amphorae study; WP5: Mining environment study; WP6: Geographical Information System analysis.

Βαθμός Υλοποίησης των στόχων και Αιτιολόγηση τυχόν αποκλίσεων από τους αρχικούς στόχους

Καταγράφεται ο βαθμός υλοποίησης των στόχων, τυχόν αποκλίσεις από τους αρχικούς στόχους και αιτιολόγηση αυτών των αποκλίσεων.

WP1: Project management:

The PC submitted MEANING's interim report on 22/4/2018. Following the kick-off meeting that took place in the ARU (Spring 2017), the PC made several trips to the Wiener Lab in Athens after each field season (2017-2018) to work with the special scientists of *the Built Environment team*. The PC ensured the timely submission of their interim and final reports. The *Storage amphorae* leader submitted her report at the end of each field season. A delay occurred only in the case of the *Mining Environment team's* final report because the European laboratory that had undertaken the lead isotope analysis of slag samples was unable to submit the results in time. The PC ensured that Project leaders and Special Scientists acted as field trainers and mentors; students and young researchers were actively involved in the majority of the tasks.

High quality deliverables were received from all three teams. The individual reports contain insightful and often unexpected and surprising information on the palaeo-environment and the palaeo-economy of the polity of Ancient Paphos. These reports are in many respects ground-breaking especially because they have laid the foundations on which a multi-disciplinary, long-term archaeo-environmental project - the first in Cyprus as regards historical archaeology - can continue to expand. Despite the fact that MEANING was officially over in May 2019, the PC used her annual research grant to ensure continuity of collaboration with the special scientists based on the most urgent needs that arose from the discovery of pristine data during the 2019 summer field season. The next stage in the political economy studies of the island's city-states will be promoted with the integration and comparative study of the analysed data within a wider Cypriot and Mediterranean data platform. By the project's end-date, the PC has succeeded in exceeding the minimum number of peer reviewed publications and presentations in international conferences.

WP2: Dissemination:

A twofold dissemination strategy: (a) scientific dissemination with respect to the study of the economic system of the city-state of Paphos, and (b) transfer of knowledge to students and young researchers:

- A. **Scientific dissemination of the project:** submission of papers in peer reviewed journals and conference proceedings; presentations/lectures in annual meetings, etc.

Papers published in peer-reviewed periodicals:

1. Marta Lorenzon and Maria Iacovou 2019, "The Palaepaphos-Laona rampart. A pilot study on earthen architecture and construction technology in Cyprus", *Journal of Archaeological Science Reports* 23 (2019), 348-361 [<https://doi.org/10.1016/j.jasrep.2018.11.004>. Accepted 5 November 2018. Available online 15 November 2018]
2. Maria Iacovou 2019, "Palaepaphos: Unlocking the Landscape Context of the Sanctuary of the Cypriot Goddess", *Open Archaeology* 5 (2019), 204-234 [<https://doi.org/10.1515/opar-2019-0015> Received February 28, 2019; accepted May 17, 2019].
3. Maria Iacovou and Artemis Karnava 2019: "An administrative *ostrakon* from Kouklia-Hadjabdoulla", *Cahier du Centre d'Études Chypriotes* 49 [pp].
4. Maria Iacovou and Demetra Mylona 2019: "Purple dye Production under royal management Evidence from the Cypro-Classical citadel of Ancient Paphos", *Cahier du Centre d'Études Chypriotes* 49 [pp].

International conferences

In 2018, the PC presented different aspects of the project in three international conferences:

- (a) in the AIAC in Bonn in May 2018: “From the Hinterland to the Coastal Landscape: the political economy of a Cypriot central place”,
- (b) in the CAA in Limassol in June 2018: Macro- and micro-scale documentation in the context of the Palaepaphos Urban Landscape Project,
- (c) in the “Digital Humanities and Ritual Space” in Rethymnon in October 2018: “Recovering the landscape context of the sanctuary of the Paphian goddess in the landscape of the polity of Ancient Paphos”.

International Workshop: When in the course of the MEANING project, a huge quantity of purple shells were discovered in the Hadjiabdoulla complex, the PC sought the collaboration of the INSTAP Study Center for East Crete for the scientific treatment of the assemblage. In order to disseminate knowledge of this important discovery, which identifies Ancient Paphos as a porphyra production center in the Classical period, the PC organised with INSTAP, *The Porphyra International Workshop*, which was hosted in the ARU in November 2019 and was sponsored by the A.G. Leventis Foundation.

Chapters In multi-authored volumes (Greek)

M. Iaconou 2017: « Ο τύμβος της Λαόνας στην Παλαίπαφο. Από την αναγνώριση στη μέθοδο διερεύνησης », in V. Vlachou, A. Gadolou (ed.), *ΤΕΡΨΙΣ. Studies in Mediterranean Archaeology in Honour of Nota Kourou, CREA-Patrimoine Études d'archéologie* 10, Brussels, p. 317-330.

M. Iaconou 2017: « Αποτυπώματα μιας χαμένης μνήμης: νέα δεδομένα για την πολιτεία της αρχαίας Πάφου », in N. Parademetriou, M. Toli (eds.), *Αρχαία Κύπρος. Πρόσφατες εξελίξεις στην αρχαιολογία της ανατολικής Μεσογείου*, Athens, p. 189-214.

Presentations/Lectures

The PC presented the project in the Annual lecture of the Greek Archaeological Committee of the United Kingdom (GACUK), at King's College, London on 14/11/2017 (in the presence of Mr Anastasios Leventis): **“Political economy, state formation and urbanism in the land of Ancient Paphos (PULP 2006-2017)”**.

- The PC presented Year 1 of the project in the context of the Annual Workshop of the Archaeological Research Unit on 10/2/2018 (in the presence of the Director of the Leventis Foundation, Dr Ch. Bakirtzis): **“Παλαίπαφος 2017 και MEANING. Ερευνητικό Πρόγραμμα Α. Γ. Λεβέντη Πανεπιστημίου Κύπρου”**.
- The PC presented a holistic review of the Palaepaphos project in the Cypro-American Archaeological Research Institute (CAARI) in Nicosia on 19/4/2018: **“Palaepaphos 2006-2017: From a landscape analysis project to urban mega-monuments”**
- The PC presented Year 2 of the project in the context of the Annual Workshop of the Archaeological Research Unit on 15/2/2019: **“Προκαταρκτικά δεδομένα για το αρχαιο-περιβάλλον και τους κτιστάδες της πολιτείας της Αρχαίας Πάφου”**.
- Dr Takis Karkanas, Director, Malcolm H. Wiener Archaeo-environmental Laboratory, ASCSA, lectured in the ARU (25/2/2019): **“Τέχνη και τεχνική της κατασκευής του τύμβου της Λαόνας: μια μικροστρωματογραφική προσέγγιση”**.

- **MEANING website project:** <https://ucy.ac.cy/pulp/meaning>;

For a wider international 'audience' we established the MEANING website as a separate layer in PULP's continuously upgraded and amended website, <https://ucy.ac.cy/pulp/> where, besides annual reporting on the results of the field campaigns, we have been hosting distinct layers on projects related to PULP (e.g. ARIEL).

(B) Transfer of knowledge to students and young researchers:

MEANING's second primary goal, the establishment of a long-term field school and training ground for Environmental Archaeology and the study of Palaeoeconomy, was met with success largely thanks to a generous offer of the Department of Antiquities, Cyprus: in 2017, PULP's team was granted permission to make use of a restored traditional house (next door to the Palaepaphos-Kouklia Museum), which is only one kilometre away from the excavation grounds. We immediately proceeded to establish a **laboratory for macroscopic data-handling and ceramic studies training centre**. We assigned special functions to each of the three areas framing the large internal courtyard and initiated a multi-faceted recording and training programme, whose implementation will continue for as long as PULP is active in Palaepaphos.

Area 1: Laboratory for the macroscopic treatment and recording of organic data under the guidance and training of archaeobotanist, Dr Anaya Sarpaki. All carbon samples that have now been studied by M. Ntinou were collected and catalogued in *Area 1*. Also, *Area 1* was used for the collection and analysis (after water floatation) of the 430 kilos of purple-dye shells discovered in Unit 2 of the Hadjiabdoulla complex, whose study was completed during the 2019 field season by Dr D. Mylona (special scientist added to the PULP project in 2017 via the PC's collaboration with the INSTAP Study Center for East Crete). All the above activity was achieved with the daily contribution of the students who participate in PULP's field seasons. For the study of bones, the PC also funded (through her annual research grant) two research visits by osteologist Dr Voula Tritsaroli.

Area 2: Storeroom, where all the amphora fragments were sorted, identified and catalogued by students under the guidance of Prof. A. Marangou.

Area 3: Pottery management and recording area; headed by post-doctoral researcher Dr Anna Georgiadou, who provides training and pottery drawing lessons to students.

Area 4 (outdoors): Besides being used during day-time for water floatation and pottery handling (washing-drying-spreading), the courtyard was employed in the evenings for specialised seminars with the use of a portable power-point presentation facility. Evening seminars were conducted weekly by special scientists (A. Sarpaki, M. Ntinou, M. Gouma, G. Tsartsidou, V. Tritsaroli and D. Mylona) and were attended by all the members of the field team.

In this field school, where the the above-mentioned special scientists taught "Best practice" with respect to handling different types of data and sampling methodologies, first in the excavation grounds and then in the lab, young scholars received an inspirational training on material remains. The success of the **field-school** goal is evident in the specializations chosen by five (so far) UC student-members of PULP, for their Master and Doctoral studies: **archaeo-botany** (Maria Roussou doctoral candidate in the Musée National d'Histoire Naturelle, Paris), **human osteology** (Fotini Constantinou, Faculty of Archaeology, Leiden University), **artefact conservation** (Raphael Evzonas, Master of Science in

Conservation at U. Cardiff), **archaeological sciences** (Christiana Kelepeshi, MSc University of Oxford); MA thesis on the distribution of **Phoenician amphorae** in Cyprus (Varvara Stivarou, Department of History and Archaeology, UC). Evidently, the 24-month investment in the MEANING project has enriched the local pool of young Cypriot archaeo-scientists. For many years to come, there will be primary data from the citadel landscape of Ancient Paphos and the Paphos Mining region, which they will be able to use for their research projects and doctoral dissertations.

WP3: Soil micromorphology and archaeo-environmental analyses: Leader Dr. T. Karkanas

Main objectives: the study of sediment and soil micromorphology; botanical and anthracological analyses; phytolith and starch extraction analysis; mud-brick analysis.

Task 3.1: Micromorphological study by M. Gouma.

The site formation study has provided significant data pertaining to the transformation of the landscape by human agents. Based on Gouma's final report on the "MICROMORPHOLOGICAL STUDY AT THE SITES OF HADJIABDULLAH AND LAONA, PALAIPAPHOS", the PC with T. Karkanas and M. Gouma, are preparing to submit to a peer reviewed journal in 2020, "The Palaepaphos-Laona tumulus construction process: excavation method and micro-morphological analysis".

Task 3.2: Botanical and anthracological analyses (Dr A. Sarpaki and Dr M. Ntinou); phytoliths and starch extraction analyses (Dr C. McNamee and Dr G. Tsartsidou)

Despite the fact that the organic data collected in the course of a decade of excavations on Hadjiabdoulla (2009-2019) will require many more seasons of sorting, the work achieved by A. Sarpaki with the assistance of our students, has provided unexpectedly rich results: the palaeo-environmental analyses have associated the use of the purpose-built complex under excavation at Hadjiabdoulla with the processing of agricultural products (primarily olive oil), the effective establishment of specialised industries (purple dye extraction), and the storage of local surpluses and imported stables (e.g. wine amphorae). M. Ntinou's detailed report on the **wood charcoal** samples from "**Hadjiabdullah, Pera Vasa, Agios Georgios Emnon**" has provided rare palaeo-climatic nodes, has isolated evidence in relation to the pruning of olive tree plantations, and has identified a rich floral landscape of fruit- and forest-trees as well as shrubs.

The reports of C. McNamee and G. Tsartsidou on the microscopic analyses of starch and phytoliths respectively have concluded that the slow and long-term abandonment process of the complex has led to the contamination of the deposits left in storage vessels, drains and other containers. Although neither found secure evidence for the storage of cultivated wheat/cereals in any of the excavated units, independently of each other, they both reported that all samples contained phytoliths of palm trees. This surprising discovery requires the treatment of a larger collection of samples and, ideally, confirmation provided by carbonized material, before it can be stated with certainty that palm trees were actually present in the landscape of Ancient Paphos.

Task 3.3: Study of Mudbricks and plasters (Leader: Marta Lorenzon)

Dr Lorenzon conducted macroscopic and geochemical analysis of the Laona fortress mudbricks. The petrographic analysis was extremely successful; it provided valuable evidence on the mudbrick recipes and the construction techniques. The results were jointly published with the PC in a prestigious peer-reviewed journal. Furthermore, in 2019, Lorenzon rejoined the PULP project via an ERASMUS exchange

programme and continued the collection of mudbrick, wall plaster and terrazzo samples from the Hadjiabdoulla complex. Lorenzon has recently received a research grant that will allow her to finance the analyses of the samples in the Wiener Laboratory. It has been agreed with the PC that the results will be announced in the context of a new study on “Plasters and terrazzo analyses from the Palaepaphos-Hadjiabdoulla Complex”.

WP4: Amphorae study: Leader Dr A. Marangou

Prof. Marangou worked on the project during the 2017 and 2018 field seasons. Her final report records (Excel file) 745 amphorae fragments from the Hadjiabdoulla complex by Unit and stratum; she has classified them as local or imported and she has identified their provenance and the chronological range of their production. The chronology of the amphorae stretches from the 7th century BC to the end of the 2nd BC, and the provenance of the imported amphorae covers the better part of the Mediterranean coasts - the Levantine coast, South Syria and North Africa-Carthage - and especially the Aegean (Samos-Miletos, Mende, Rhodes, Kos, Chios. Postdoctoral researchers Stella Diakou and Athos Agapiou undertook the **chrono-stratigraphic analysis** of Units 1 and 3 (from where almost all the fragments were recovered) with the development of an **amphorae micro-GIS programme** and a relational data-base, in which all amphora fragments have been entered; thematic maps have also been delivered. The two Units had only one use-layer (Floor) but the analysis has shown that the deposition of the fragments in the excavation strata does not support a bottom-up chronological sequence (from the Archaic to the Classical to the more recent Ptolemaic periods). Nevertheless, the provenance of the 5th-4th-century BC imported wine amphorae reveals for the first time the Paphian dynasty's commercial networks in the Mediterranean. Surprisingly, however, even after the abolition of the local dynasty by Ptolemy Soter circa 300 BC, a wealth of imported amphorae continued to be received and stored in the Hadjiabdoulla complex. This opens a new chapter in the little-known economic and political history of the early Ptolemaic period (3rd century BC) in Cyprus.

WP5: Mining environment study Leader: Prof. V. Kassianidou

WP5 was dedicated to the study of the archaeometallurgy of the region. The Leader's final report, which includes 7 Appendices, should be considered the first foundational study on the exploitation of metallic resources in the Paphos cupriferous zone of the Troodos. It is introduced with reference to a detailed recording of the ancient slag heaps within the cupriferous area of the Paphos district, which had been conducted by PULP in advance of the MEANING project. The main tasks were as follows:

- (a) Collection of samples of slag and other metallurgical debris from two of the largest slag heaps: Pevkos Pera Vasa and Agios Georgios Emnon; **chemical** analysis by Dr Andreas Charalambous and **microscopical** study by Dimitrios Ioannidis (PhD candidate).
- (b) The small assemblage of archaeometallurgical finds (slag and metal) from PULP's excavations at Laona and Hadjiabdullah were also included in the above studies.
- (c) Samples of charcoal collected from the two slag heaps and charcoals from the excavations studied by Dr Maria Ntinou (above, under WP3) confirmed that the preferred species of wood used as fuel was pine (*Pinus Brutus*).
- (d) Samples of charcoal from (three) slag heaps have been radiocarbon-dated providing an insight as to the date of some of the slag deposits. It has been confirmed that most, if not all, of the large slag heaps in the Paphos Forest date to the Late Roman period. This is not to say that mining did not take place there in the earlier periods. All mining regions of Cyprus face the same problem because the extent of the extraction process in Late Antiquity has buried the evidence of earlier exploitation.
- (e) To identify the **fingerprint of copper produced in the Paphos region**, samples of slag from all four sites were sent for **Lead Isotope analysis** (European lab in Belgium). The comparative material corpus from the monuments under excavation is still extremely limited but the results are promising: they suggest that metal was imported to the polity of Paphos from neighbouring regions (Kalavassos and Solea). Also, the analysis has identified for the first time the remains of an iron smithy within the confines of the industrial quarter of Hadjiabdoulla.

WP6: Geographical Information System analysis.

Macroscale spatial GIS study: Prof. M. Iacovou and Dr. A. Agapiou

Spatial and macro-landscape analysis has been carried out in the hydrological basin of Paphos in relation to the cupriferous foothills of the Troodos as part of the survey for the documentation of slag heaps. Global Positioning Systems (GPS) have been used to document the exact geolocation and position of the sampled slag heaps within the catchment area (hydrological basin) of Paphos. Thematic maps have been produced and were made available to WP5 (samples below).

Microscale spatial GIS study: Prof. M. Iacovou and Dr. S. Diakou and Dr. A. Agapiou

Following the submission of Final Reports, microscale spatial GIS analyses have been carried out in relation to the tasks of WP3 (Soil micromorphology and archaeo-environmental analyses) and WP4 (Amphorae study and distribution). Thematic maps are now available and they have been shared with the Special Scientists (samples below).

Καταγραφή Παραδοτέων και βαθμός υλοποίησής τους

	1	2	3	4	5
1. WP1 Project management	<input type="checkbox"/>				
2. WP2: Dissemination Πλήρης (5)					

	1	2	3	4	5
3. WP3: Πλήρης (5)	<input type="checkbox"/>				

	1	2	3	4	5
4. WP4: Πλήρης (5)	<input type="checkbox"/>				

	1	2	3	4	5
5. WP5: Πλήρης (5)	<input type="checkbox"/>				

	1	2	3	4	5
6. WP6: Πλήρης (5)	<input type="checkbox"/>				

Δεν Ολοκληρώθηκε (1) Ελλιπής (2) Ικανοποιητικά (3) Σχεδόν πλήρης (4) Πλήρης (5)

Μ Ε Ρ Ο Σ Γ

ΠΑΡΑΡΤΗΜΑ

Επισυνάπτονται οποιεσδήποτε επιπλέον πληροφορίες αναφορικά με το ερευνητικό έργο, οι οποίες θεωρούνται απαραίτητες.





