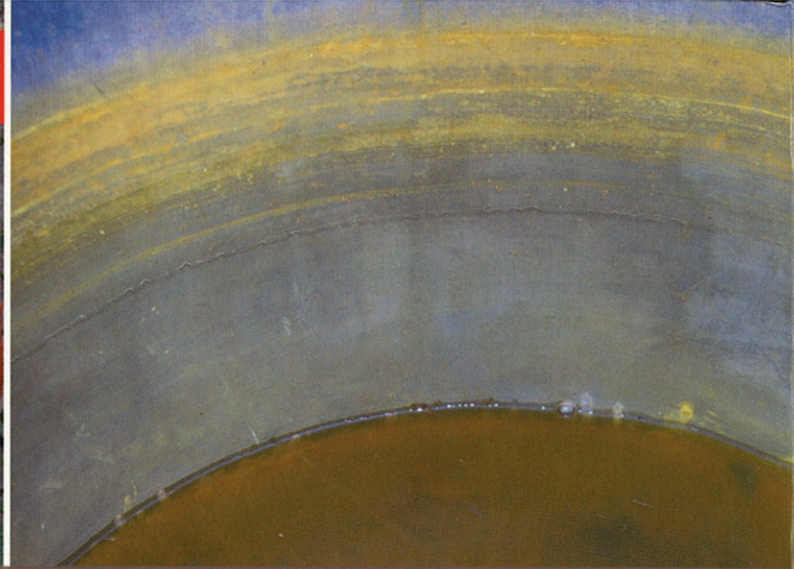


PURPUREAE VESTES II



VESTIDOS, TEXTILES Y TINTES

Estudios sobre la producción de bienes de consumo en la Antigüedad

C. Alfaro, L. Karali, eds.



PUV

VESTIDOS, TEXTILES Y TINTES

*Estudios sobre la producción de bienes
de consumo en la Antigüedad*

PURPUREAE VESTES II
Textiles and Dyes in Antiquity

VESTIDOS, TEXTILES Y TINTES

*Estudios sobre la producción de bienes
de consumo en la Antigüedad*

**Actas del II Symposium Internacional sobre Textiles
y Tintes del Mediterráneo en el mundo antiguo
(Atenas, 24 al 26 de noviembre, 2005)**

C. Alfaro y L. Karali, eds.

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Henri van Effenterre
in memoriam

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INTRODUCCIÓN

En este volumen publicamos los trabajos presentados en el 2nd *INTERNATIONAL SYMPOSIUM ON TEXTILES AND DYES IN THE ANCIENT MEDITERRANEAN WORLD*. Esta reunión tuvo lugar en la sede de la Universidad de Atenas durante los días 24-26 de Noviembre del año 2005. La organización de dicho evento corrió a cargo de las Universidades de Atenas y de Valencia y recibió la colaboración inestimable de la Federación Griega de Amigos de los Museos (presidida por L. de Chaves).

Hemos contado con el apoyo de las siguientes personas que formaron parte del Comité de Organización y del Comité Científico: M. Charitatos (Director de los Archivos Históricos Griegos), A. Delivorrias (Director del Museo Benaki), D. Konstantios (Director del Museo Cristiano y Bizantino), M. Skoullou (Profesor de Química del Medio Ambiente, Universidad de Atenas), J. Will-Badieritaki (Profesor de la Facultad de Filosofía, Universidad de Atenas), D. Cardon (Université Lumière II, Lyon), B. Costa (Museu Arqueològic d'Eivissa i Formentera), J. Ramón (Consell Insular d'Eivissa i Formentera), J. P. Wild (Profesor de la Universidad de Manchester) y A. Wilson (Profesor de la Universidad de Oxford). La Secretaría del Congreso estuvo a cargo de Estíbaliz Tébar (Departamento de Historia Antigua de la Universidad de Valencia) y E. Spyropoulou (Departamento de Arqueología e Historia del Arte, Universidad de Atenas). Deseamos también agradecer el apoyo logístico de l'École Française d'Athènes y de su director durante el período de preparación de este Symposium.

La buena acogida de la publicación de las Actas del I *Symposium* celebrado en Ibiza en el año 2002 tituladas *PURPUREAE VESTES. Textiles y Tintes del Mediterráneo en época romana*, nos ha llevado a seguir la sugerencia de nuestro colega Philippe Borgard, cuando propuso en Atenas mantener este título para el volumen que presentamos hoy y para los que pudieran continuar apareciendo en el futuro. Creímos que se trataba de una idea espléndida ya que desde el principio nuestra intención había sido la de crear un nuevo foro de intercambio científico en el ámbito del estudio de los textiles antiguos que estuviera centrado en los países ribereños del Mediterráneo.

En esta ocasión contamos con un elenco de trabajos que ofrecen al lector una visión cronológica más amplia que en el primer volumen. Los temas tratados arrancan en época minoica, con nuevos e importantes hallazgos, y llegan hasta el Bajo Imperio romano. Novedades y revisiones generales de los estudios textiles en esta amplia área de conocimiento se alternan armónicamente. Los trabajos constituyen un importante paso adelante en el camino de la revisión que actualmente se viene haciendo en esta materia. Sus conclusiones permiten ahondar en la historia de un sistema de producción múltiple que alcanzó en la Antigüedad una gran importancia económica a lo largo y ancho del *Mare Nostrum*. Son muchas las publicaciones que recientemente han salido a la luz y que pretenden dar una visión histórica de la producción de la vestimenta antigua haciendo uso únicamente de las fuentes tradicionales (sustancialmente textos clásicos e iconografía). Sin embargo, nuestro objetivo ha sido y es, sin dejar de lado estas fuentes tradicionales, llegar a generar conclusiones históricas partiendo del análisis de las bases reales de una tecnología muy compleja. Su estudio requiere constantemente una puesta al día de los sistemas de análisis y una búsqueda de nuevas metodologías.

Durante el tiempo de preparación de este libro se tomó la decisión de añadir a la edición un reportaje, en formato DVD, que mostrara de manera clara y accesible cómo se puede preparar el tinte púrpura a partir del *murex trunculus*. Las numerosas experimentaciones realizadas desde el Renacimiento hasta nuestros días para lograr la reconstrucción de este difícil proceso han sido muy numerosas: Colonna en el siglo xvi, W. Cole en la segunda

mitad del xvii, Reamur y Canals i Martí a comienzos y finales del siglo xviii respectivamente, Lacaze Dautiers a mediados del xix, o Doumet a finales del siglo pasado, por no citar más que los más importantes, son magníficos precedentes que conocemos a través de lecturas. Pero hemos creído que sería interesante disponer de una versión filmada que permitiera observar perfectamente la evolución del líquido purpúrgeno bajo los efectos del tiempo y de la luz. En esta ocasión, los autores del experimento, Inge Boesken Kanold y Rolf Haubricht, sin pretender lo que podríamos llamar una «reconstrucción experimental fiel al proceso antiguo», nos muestran los pasos necesarios para que el baño de tintura obtenido a partir de animales vivos sea efectivo en el tintado de fibras. Para una mejor comprensión puede leerse su texto explicativo, que aparece en las páginas 253 y ss.

Nuestros objetivos para el futuro inmediato pasan por la organización de un próximo Simposio en la ciudad de Nápoles en otoño de 2008. Los esfuerzos conjuntos del Centro Camille Jullian (Aix-en-Provence), de la Universidad Federico II de Nápoles, del Centro Jean Bérard de esa misma ciudad y de la Universidad de Valencia esperamos que hagan posible la tercera reunión científica sobre estos temas.

Para la publicación de este volumen hemos contado con el soporte económico de varias instituciones académicas: el Ministerio de Educación y Ciencia español a través del Proyecto de Investigación (Ref. HUM2004-01984HIST), la Universidad de Valencia, a través de su Servicio de Publicaciones; el Departamento de Historia de la Antigüedad y de la Cultura Escrita de dicha Universidad, el Hellenic Center for Research and Conservation of Archaeological Textiles (ARTEX) de Atenas y el Consell Insular d'Eivissa i Formentera. Nos gustaría expresar nuestro agradecimiento a todos ellos.

CARMEN ALFARO

INTRODUCTION

In this volume we are publishing the studies presented at the 2nd *INTERNATIONAL SYMPOSIUM ON TEXTILES AND DYES IN THE ANCIENT MEDITERRANEAN WORLD*, which was held in the main building of the University of Athens on 24th-26th November 2005. This event was jointly organised by the University of Athens and the University of Valencia, along with the inestimable help of the Hellenic Federation of the Friends of Museums (Presided by L. de Chaves).

We have received the support of the following people on the Organising Committee and the Scientific Committee: M. Charitatos (Director of Hellenic Historical Archives), A. Delivorrias (Director of the Benaki Museum), D. Konstantios (Director of the Christian and Byzantine Museum), M. Skoullou (Professor of Environmental Chemistry, University of Athens), J. Will-Badieritaki (Professor of the Faculty of Philosophy, University of Athens), D. Cardon (Université Lumière II, Lyon), B. Costa (Archaeological Museum of Ibiza and Formentera), J. Ramón (Island Council of Ibiza and Formentera), J. P. Wild (Professor of the Manchester University) and A. Wilson (Professor of the Archaeology of the Roman Provinces at Oxford University). The Secretariat of the Congress was headed by Estíbaliz Tébar (Department of Ancient History, University of Valencia) and E. Spyropoulou (Department of Archaeology and History of Art, University of Athens). We also wish to express our appreciation for the logistical support provided by the École Française d'Athènes and its headmaster during the preparations for this Symposium.

The warm welcome received by the publication of the proceedings of the 1st Symposium held in Ibiza in 2002 as *PURPUREAE VESTES. Textiles and Dyes in the Mediterranean during the Roman Era* led us to heed the suggestion of our colleague, Philippe Borgard, when he proposed in Athens that we keep the same title for the volume we are presenting herewith and for other volumes that might be issued in the future. We thought it was a splendid idea given the fact that from the start, the overarching intention has been to create a new forum for scientific exchange in the field of studying ancient textiles that was focused on the countries bordered by the Mediterranean.

On this occasion, we present a set of studies that offers the reader a broader chronology that encompasses everything from the Minoan period, with important new finds, to the Later Roman Empire. New finds and general revisions of studies on textiles in this broad area appear side by side. The studies are a major step forward in the revision of what has been done in this field. Their conclusions enable us to delve further into the history of a multifaceted production system that achieved a prominent role in the economies of the ancient world throughout the entire Mediterranean. Recently, there have been many publications that strive to furnish a historical vision of the production of ancient clothing solely using traditional sources (primarily classical texts and iconography). However, without neglecting the classical sources, our goal has been and continues to be to generate historical conclusions based on the analysis of real and highly complex technology. Studying this requires constant updates in the systems of analysis and a quest for new methodologies.

While this book was in preparation, a decision was taken to add a documentary, in DVD format, showing in a clear and easily understandable way how purple dye can be made from *murex trunculus*. Many scholars, from the Renaissance to the present day, have carried out numerous experiments in an attempt to reconstruct this difficult process: Colonna in the 16th century. W. Cole in the second half of the 17th century, Reamur and Canals i Martí in the early and late 18th century respectively, Lacaze Dautiers in the mid-19th century and Doumet at the end of the last century, to mention just the most important. These are magnificent precedents which we know about through

reading. However, we thought it would be useful to have a filmed version that would make it possible to see clearly the evolution of the purple liquid under the effects of time and light. On this occasion, without attempting what we might call an «experimental reconstruction faithful to the ancient process», the authors of the experiment, Inge Boesken Kanold and Rolf Haubricht, show us the necessary steps for the dyes bath obtained from live animals to be effective in dyeing fibres. For a better understanding of this process, an explanatory text is provided on pp. 253 and following.

Our future goals include organising the forthcoming symposium to be held in the city of Naples in autumn 2008. The joint efforts of the Camille Jullian Center (Aix-en-Provence), the Federico II University of Naples, the Jean Bérard Centre in the same city and the University of Valencia aim to make the third scientific gathering on these issues possible.

Support for the publication of this volume came from the following academics institutions: the Spanish Ministry of Education and Science through its research project with the reference number HUM2004-01984HIST; from the University of Valencia through its Publications Service; from the same university's Department of Ancient History and Written Culture; from the Hellenic Centre for Research and Conservation of Archaeological Textiles (ARTEX) in Athens, and the Consell Insular d'Eivissa i Formentera. We would like to express our gratitude to all of them for their support.

CARMEN ALFARO

TEXTILE INDUSTRY INDICATORS IN MINOAN WORK AREAS: PROBLEMS OF TYPOLOGY AND INTERPRETATION*

*Maria Emanuela Alberti***

1. Identifying textile work areas in Minoan contexts: some problems

IDENTIFYING textile work areas is not an easy task, particularly since material evidence of each phase and activity of fibre processing should be taken into account. In recent years, many scholars have suggested general solutions, outlining an array of indicators a variety of suitable interpretative grids.¹ The aim of this paper is to sketch a preliminary picture of the relevant characteristics of Minoan textile work areas as well as the main attested archaeological indicators of textile production. Moreover, the available evidence will lead us to some insights on the scale and organization of this production.

When examining Minoan work areas, we should bear in mind that most of the contexts are multi-purpose, dedicated to various domestic activities and/or the processing of food-stuffs. (MILITELLO 2000: 314). A large part of the archaeological assemblage is, consequently, multi-purpose, potentially used in many productive cycles: querns, pounder-grinders, mortars, pestles, cooking pots and simple basins, not to mention installations such as work-benches or paved floors. There are, in addition, more specialized pieces of equipment, items like spindle-whorls and loom-

weights for textile making, or shallow and spouted press-beds for olive pressing. The coexistence of indicators of various activities in the same area occurs on a regular basis, thus suggesting a genuine mixed use of space in antiquity. In this context, the documented textile activities are only one of the productive processes carried out in the work areas under consideration.

2. Textile industry indicators. Initial review and typological assessment

Each step of textile production has its own indicators, but not every step is equally documented in the Minoan archaeological record. The present work aims not only to review the available evidence, but also to propose a preliminary typological classification and a tentative comparison between various scales of production.²

The sample used for this analysis is quite small and dates, for the most part, to the Neopalatial period. Many others sites could have probably been included, but, being an introductory attempt at analysing such indicators, the corpus of sites was necessarily limited. (Fig. 1).³

* I present here some results and insights of the work I have conducted for my Ph.D. thesis on textile fibre processing in Bronze Age Crete. First of all, I wish to thank the University of Udine, the Scuola Archeologica Italiana di Atene and Metaxia Tsiopoulou with the ΚΔ' Εφορεία Π.Κ.Α of Ayios Nikolaos for their help during my research. Many thanks also to Caitlin Verfenstein for checking the English text.

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¹ BARBER 1991; MONAGHAN 2000; for Roman times, see also USCATESCU 1994, pp. 164f, tab. 1-2. See also EVELY 1988 and TOURNAVITOU 1988.

² Therefore, the evidence will be simply outlined with its main characteristics. For a detailed review, see EVELY 1993-2000, 485-511, fig. 200-204. See also CARINGTON SMITH 1975; TZACHILI 1997; MILITELLO 2001.

³ At the present, the Minoan sites or contexts I have thoroughly examined are: Myrtos Phournou Koryphi (EMII); Malia Palace, Room XXVIII (MMIII?); Knossos Palace, Vat Room (LMI); Archanes-Phourni, Building 4 (LMIA); Vathypetro (LMIB); Gournia, «Palace» (LMI);

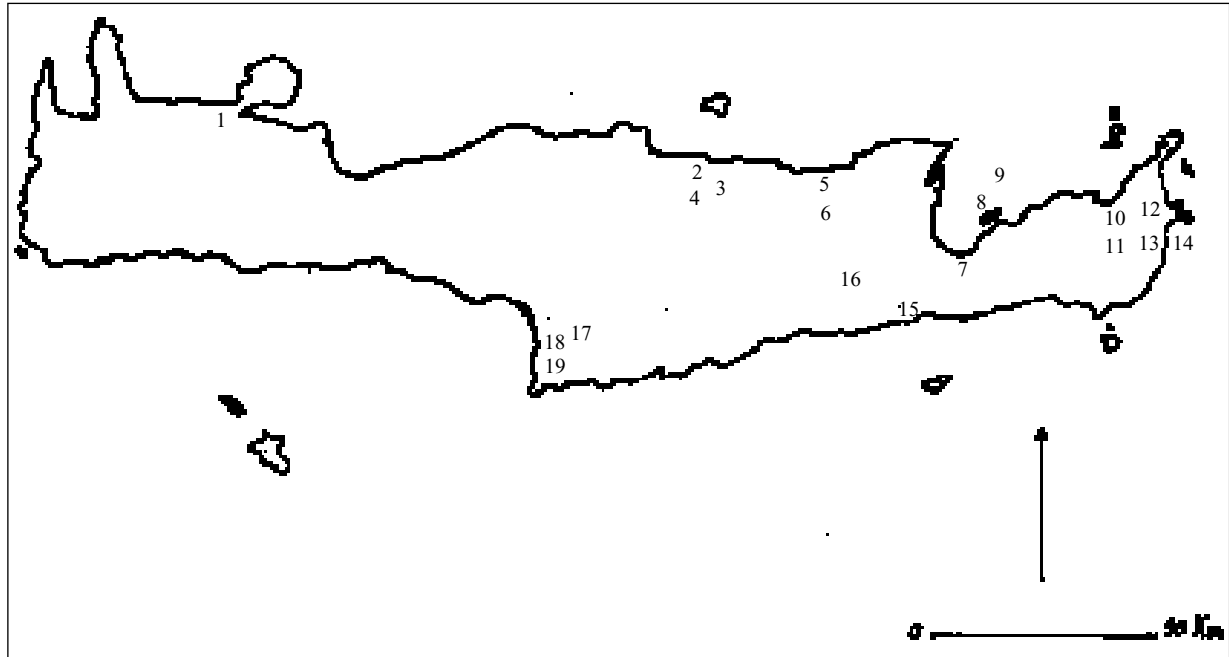


Fig. 1. BA Crete: first sample of sites with textile evidence.

1) Chania; 2) Knossos; 3) Archans; 4) Vathypetro; 5) Malia; 6) Karphi; 7) Gournia; 8) Pseira; 9) Mochlos; 10) Petras; 11) Tourtoul; 12) Palaikastro; 13) Epano Zakros; 14) Kato Zakros; 15) Myrtos; 16) Kato Syme; 17) Phaestos; 18) Haghia Triada; 19) Kommos.

2) a - *Harvesting the fibres.*

Wool fibres were most probably harvested by hand-plucking, therefore no tools or other material remains appear in the archaeological evidence. In some cases, an indirect indication of harvesting is provided in the mortality patterns recorded in the faunal record. The interpretation of such evidence, however, is often problematic and few faunal studies are fully published.⁴

If we admit the use of shearing in such an early period, then we should perhaps take into account a long knife from the Artisans' Quarter at Mochlos.⁵

2) b - *Combing.*

As far as combing is concerned, the evidence is

almost nonexistent. No certain attestation of appropriate combs is documented, and we can not exclude the possibility that the operation was accomplished by hand, without the assistance of tool of any sort.

2) c - *Dyeing and mordanting.*

Theoretically, dyeing and mordanting operations are primarily documented by chemical traces of dye-components or mordants in the vats. Some indirect assumptions, however, can also be inferred by the presence of vats, jars or cooking pots, hearths and stone tools.

Unfortunately, chemical analyses are extremely rare in the available literature. The presence of colouring substances is occasionally mentioned, but general-

Mochlos, Artisans' Quarter and Chalinomouri (LMIB); Petras, House II (LMIB); Palaikastro, Building 6-EN87 (MMIIB-LMIA) and Building 4 (LMIIIA2-B); Kato Zakro, town and Palace (MMIII-LMIB); Epano Zakro (LMIA-B); Tourtoul-Prophitis Ilias (LMIA); Chalara/Phaistos, LMIB House; Kommos, various houses of the town (MMIB-LMIIIA2/B); Knossos Unexplored Mansion (LMII); Kastelli Chanià, House I (LMI) and Room O (LMIIB2/C). Some other contexts were only partially considered: Knossos Palace, Loomweights Basement (MMII); Malia, Quartier Mu (MMII), Maison Z β and Maison Z γ (MMIII-LMI); Haghia Triada, «Royal Villa» (LMI), Complesso della Mazza di Breccia (LMIB) and Casa delle Sfere Fittili (LMI); Knossos, houses on the Acropolis (LMIA) and of the Stratigraphical Museum Excavations (LMIB); Pseira, Building BS/BV (LMIB); Palaikastro, Block E (LMI-II); Karphi (LMIIC late). I include here only some of the published vat-and-jar systems: Archanes-Phourni, Building 4; Choiromandres; Kato Zakro, House A and House E (Hogarth's excavations), House A, House B, House Δ and House Z (Platon's excavations); Palaikastro, EN.87, B.37 and perhaps N.14; Tourtoul-Prophitis Ilias, E sector; Vathypetro, Room 40. For a more complete list, see KOPAKA - PLATON 1993; PALMER 1994, 18-19.

⁴ In most cases, mortality patterns do not show any significant clusters. See, for example, Myrtos Phournou Koryphi (EMII; WARREN 1972, 318-320) and Mochlos (LMIB; *Mochlos IC*, 118-121); at Haghia Triada, on the other hand, animals were generally killed in an adult age, and hypothetically were therefore exploited mainly for wool (mainly LMI; WILKENS 1996).

⁵ *Mochlos IC*, 50, fig. 20, pl. 15, IC.277.

ly without any further specifications. In some contexts, the association of such substances with basins and loomweights can suggest dyeing operations, but can not prove them. Either hematite or red ochre is attested in Rooms 72-81 at Myrtos Phournou Koryphi (EMIIB). The presence of unspecified colouring substance in the fill is recorded in Building 4 at Archanes Phourni (LMI). A lamp with bright red powder and a similarly stained pestle were found in the Knossos Unexplored Mansion (LMII) and, perhaps, had been used for colour preparation.⁶

The presence of probable mordanting substances is even more doubtful. In Rooms 16-17 at Myrtos Phournou Koryphi, a pithos containing a fine, white earth was found: was this some kind of *creta fullonica*? Traces of phosphates are documented at Kommos, in Room 11 of the House of the Snake Tube (LMII-III B), in the soil close to a liquid discharging feature.⁷

2) d – *Washing the fibres or fulling the cloth.*

Fortunately, more data are available on washing operations, probably for washing fibres or fulling cloths as well as simple washing. The relevant indicators in this case are: traces of lanoline and the presence of tools and installations for liquid processing and discharging facilities.

2) d.1 – *Traces of animal fat.*

Traces of animal fats have been found in a basin in Room 59 at Myrtos Phournou Koryphi (EMIIB). The identification as lanoline is tempting but in no way certain (WARREN 1972: 53f, 330).

2) d.2 – *Tools and installations for liquid processing.*

Among the typical Minoan domestic assemblage, washing tools and basic washing facilities are quite common and occur in small numbers in each household.

2) d.2.i – *Basins.*

Clay basins (λεκάνας, ληνοί, *tubs, basins, vats*) and stone basins (γούρνες) are the most common washing tools. It is beyond the scope of this analysis to construct a formal typology here, but it will prove instructive to pay attention to the presence or absence of a pouring device. Spouted basins are to some extent

more specialized than the simple non spouted versions, even if the shape itself is essentially multi-purpose.

2) d.2.ii – *Containing/processing facilities.*

Many kinds of vats and sinks are suitable for washing and liquid processing. At present, we can distinguish:

– Built stone vat/basin and drain: probably used mainly for washing (e.g. Room 29 of the «Palace» at Gournia, LMI)

– Vat-and-jar system (ληνός/*collecteur*): quite widespread in «villas» and large urban houses – these were probably used mainly for wine-making, but other concurrent uses can not be ruled out (e.g. Room 40 at Vathypetro, LMIB)

– Vats in external open areas: for multiple use (e.g. the external court at Chalara/Phaistos, LMIB and Court 1 at Vathypetro, LMIB).⁸

2) d.2.iii – *Fixed structures.*

It is important to note, when looking at fixed features suitable for washing, that work surfaces, floors and benches are often paved or plastered and drainage systems are widely attested in Minoan households.

2) d.2.iv – *Discharging facilities.*⁹

Waste water discharging facilities are also very important. They can point to large-scale washing operations and, perhaps, fibres processing. After an initial review, we can isolate the following types:

– Slab with drain (e.g. Oblique House, House with the Snake Tube and House X at Kommos, from LMIB to LMIIIA2/B).

– Shallow spouted clay basin and drain (e.g. Building 4 at Palaikastro, LMIII).¹⁰

– Shallow stone basin and drain (e.g. Room 40 at Vathypetro, LMIB).¹¹

2) e – *Stone tools.*

Various stone tools can be used to prepare dyeing substances, mordants and developers. Unfortunately, most previous publications are not very detailed. Recently, the situation has been made better with the examination of the evidence from the Unexplored

⁶ WARREN 1972, pp. 63-5, 75 (Myrtos Phournou Koryphi); DELIYIANNI 1995, pp. 191-2; *Archanes 1997*, p. 225 (Archanes); *MUM*, 43 (Knossos Unexplored Mansion).

⁷ WARREN 1972, pp. 30-33 (Myrtos Phournou Koryphi); *Kommos 1.2*, p. 205 (Kommos repeated?).

⁸ SOLES 1991, pp. 63-4 (Gournia); *Archanes 1991*, p. 17, fig. 7 (Vathypetro, Room 40); PALIO 2001, p. 281, fig. 33 (Chalara); KOPAKA-PLATON 1993, 41, fig. 5 (Vathypetro, Court 1).

⁹ These installations can be related to the so-called «toilets» or «lavatories», where the main feature is a drain opening in an impermeable floor, but where any stone or clay collecting facility seems lacking. The evidence has recently been reviewed by Isabelle Bradfer-Burdet (BRADFER-BURDET 2006): though their definition is somewhat problematic, these «toilets» are probably multi-purpose installations.

¹⁰ See also the flat drain plates from the LMIB Artisans' Quarter at Mochlos (*Mochlos IC*, 19, IC.15 and IC.18).

¹¹ *Kommos 1.2*, pp. 59-69, 202-206, pls. 2.94, 2.95, 3.128 and 5.13; SHAW 1993 (Kommos); MACGILLIVRAY et al. 1989, pp. 429-432, fig. 10 (Palaikastro); *Archanes 1991*, 17, fig. 7 (Vathypetro).

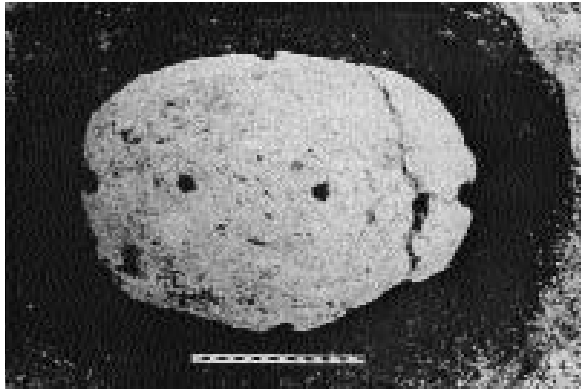


Fig. 2. “Warp-stand” from Room 2 of Building B of the Artisans’ Quarter at Mochlos (LMIB). (*Mochlos IA*, pl. 21 B reproduced with the permission of J. Soler).

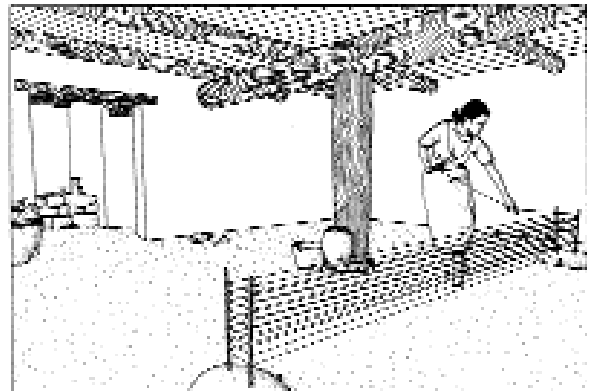


Fig. 3. Warping in Building B of the Artisans’ Quarter at Mochlos (LMIB). Possible reconstruction (*Mochlos IA*, fig. 39, reproduced with the permission of J. Soler).

Mansion of Knossos (Doniert Evely), Kommos (Harriet Blitzer), and the «Artisans’ Quarter» of Mochlos (Tristan Carter).¹²

2) f – Spinning.

The archaeological indicators for spinning activities are spindles, spindle-whorls and spinning bowls.

2) f.1 – Spindles.

With the likely exception of a fragmentary ivory rod from a tomb at Phaistos, there do not seem to be any certain attestations of spindles.¹³

2) f.2 – Spindle-whorls.

As is well known, spindle-whorls in Minoan Crete are chiefly attested during the Early Bronze Age and LMIIIC. In the present sample, which includes, for the most part, Neopalatial sites, they are quite rare and occur only at Myrtos Phournou Koryphi (EMIIB), in Houses Zβ and Zγ at Malia (MMIII-LMI), at Gournia (MMIII-LMI), in House Delta at Kato Zakros (LMI? LMIIIA2/B?), in post-LMII levels of the Knossos Unexplored Mansion and in Room O at Chania (LM

IIIB2/C and IIIC).¹⁴ One of the most important clusters of the Post-palatial period comes from Karphi (LMIIIC late).¹⁵ However, the so-called «conuli» have been claimed to be suitable spindle-whorls as well.¹⁶

2) f.3 – Spinning bowls.

Spinning bowls too are sparsely documented. One of the earliest examples is from Myrtos Phournou Koryphi (EMIIB), with later examples appearing at Myrtos-Pyrgos (MMII-III), the Acropolis houses at Knossos (LMIA) and the Complesso della Mazza di Breccia at Haghia Triada (LMIB). Five small spinning bowls and a spinning pot were found in the Artisans’ Quarter at Mochlos (LMIB). Other items are known from the tombs of the Mesara and from Archanes, but none are from definite productive contexts.¹⁷

2) g - Weaving:

The main indicators for weaving activities recovered in Minoan contexts are quite obviously loomweights.¹⁸ It should be noted here, though, that a distinctive kind of object from the «Artisans’ Quarter»

¹² MUM, 223-260; *Kommos I.1*, 403-535; *Mochlos IC*, 61-107.

¹³ EVELY 1993-2000, p. 496; SAVIGNONI 1904, p. 584, No. 1, fig. 33. The rod is broken at one end and measures 22 cm of length. It contains another rod of bronze. On «prestige» distaffs and spindles from the Aegean, Near East and Italy, see BORGNA 2003. For other kinds of tools, such as spindle-hooks or spindle stands, the evidence is uncertain (EVELY 1993-2000, p. 496).

¹⁴ General remarks in EVELY 1993-2000, p. 496. WARREN 1972, pp. 52-6, 63-5, 75, 215, 246-7, pl. 77, fig. 99-100 (Myrtos Phournou Koryphi); DESHAYES - DESSENNE 1959, p. 73, No. 3 (Malia); BOYD HAWES 1908, p. 32, pl. III, C.7 (Gournia); PLATON 1963, p. 165 (Kato Zakros); MUM, pl. 231, No. 13, and 232, bottom (Knossos); *GSE II*, 81-87 (Chania).

¹⁵ At Karphi, more than 90 spindle-whorls have been recorded: cylindrical exemplars tend to be in clay, conical in stone (*Karphi*, p. 129-131).

¹⁶ ANDERSSON - NOSCH 2003, pp. 202-203; *contra* EVELY 1993-2000, p. 496.

¹⁷ General remarks in BARBER 1991, pp. 73-77. WARREN 1972, p. 207, fig. 91 and pl. 68 B, P701 (Myrtos Phournou Koryphi); CADOGAN 1977-78, p. 74 (Myrtos-Pyrgos); *KN Acropolis*, p. 49, fig. 35, V.233 (Knossos); MILITELLO 2000, p. 318 (Haghia Triada); *Mochlos IA*, p. 94 (Mochlos); XANTHOUDIDES 1924, p. 78, pl. XLII, No. 5033 (Drakones tholoi, Mesara, MMI?); LEMBESI 1970, p. 269, pl. 378δ (Epano Archanes, MMIIIA). Two probable spindle-whorls are mentioned from Building BS/BV at Pseira (*Pseira III*, pp. 205-029, LMIB).

¹⁸ The evidence for shuttles is dubious (BARBER 1991, p. 107).

at Mochlos, interpreted by the excavators as a «warp-stands», has recently been published and possibly adds to our body of evidence for weaving.

2) g.1 – «Warp-stands» (Fig. 2-3).

Numerous fragments of this unusual object were found in Building B of the Artisans' Quarter at Mochlos (LMIB), with one complete example coming from the floor of Room 2 as well. In the same room, the excavators also found loomweights, basins, querns, pounders and cooking pots. The «warp-stand» is a clay, bun-shaped object, slightly elongated and not heavily fired. The surface is smooth, while the bottom is flat and rough. It measures 37 by 43 cm and has four holes along the perimeter, to fix the object onto the floor, and two larger holes on the top, to hold the rods for warping. Obviously, the identification as a «warp-stand» is hypothetical.¹⁹

2) g. 2 – Loom-weights (Fig. 4-6).

Loom-weights are common in Minoan contexts, being found, as Doniert Evely states, «... almost anywhere at any period. [...] their broad distribution argues that textile-production was part of near-enough every household's daily economy throughout the Bronze Age. The scale and organization of this cannot, however, be so readily assessed».²⁰ In most cases, loomweights are found in the upper part of the fill of collapsed structures, most likely suggesting that weaving activities or, at least, loom-weight storage, took place on the upper floor of Minoan houses.²¹

As is well-known, the most popular shapes of Minoan loom-weights are: discoid (disc-shaped, lentoid), spherical, cubic/parallelepiped and cylindrical. During Neopalatial times, the range of shapes becomes wider and includes pyramidal and conical items. These shapes occur in every context, in different proportions according to site and chronological period, but more work is needed to understand these chronological and geographical variations. Typical mixed assemblages are those of Myrtos Phournou Koryphi (EMII), Kommos (LMI-III) and Malia (MMIII/LMI) (Fig. 4).²² It is worth noting that, in Kommos, the major concentrations of loomweights dating to LMI-II and LMII-III A1 were found in the House with the Snake Tube and in House X respectively, thus apparently

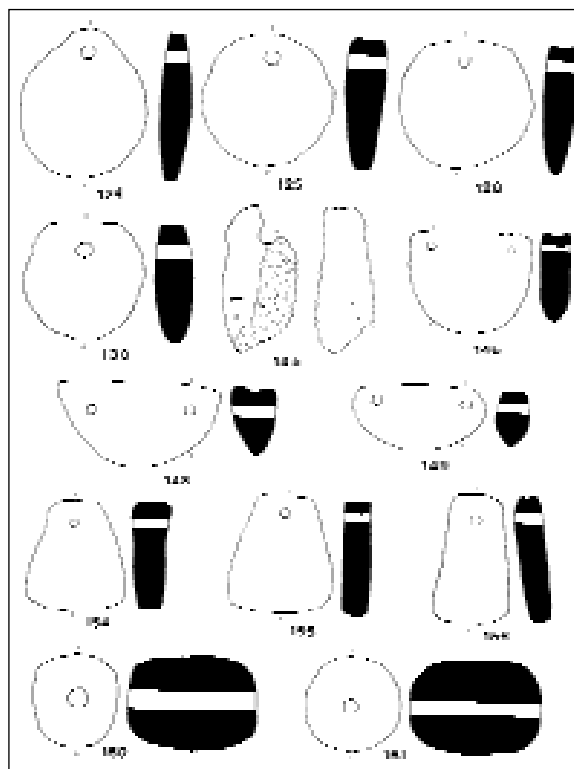


Fig. 4. Mixed loomweights from Kommos (LMI-III) (*Kommos I.2*, pl. 4.5, reproduced with the permission of J. Shaw and M. Shaw).

connected with structures having a slab-and-drain discharging device.²³

2) g. 2.i – Discoid loom-weights.

Discoid weights are so widely attested that they have been considered a «token» of Minoan civilization, especially considering their diffusion outside Crete in the islands and centres of the Anatolian coast.²⁴ Their shape varies from round to oval/piriform. Recently, for the Artisans' Quarter at Mochlos, a further subdivision was proposed: elliptical, rounded and disc-shaped. In this way, shape and mass variations seem to match better. Some weights are grooved on the top, while others, even from within the same set, are not. The meaning and function of such a feature has been variously discussed, but no satisfactory answer has yet been provided.²⁵

¹⁹ Mochlos IA, p. 65f, IC.60, fig. 39 and pl. 21B.

²⁰ EVELY 1993-2000, p. 494. Nevertheless, some remarks on problems of scale and organization will be presented below. See *Ibidem*, pp. 498-504. See also BARBER 1991, pp. 92-113 and 387-390; MILITELLO 2000, pp. 316-318, and n. 46.

²¹ As it has been clarified by the findings from the West House of Akrotiri, Thera (LCI) (TZACHILI 1990).

²² WARREN 1972, pp. 212, 220-2, fig. 96, pls. 73-4, (Myrtos Phournou Koryphi); *Kommos I.2*, pls. 3.125 and 4.5; *Kommos I.1*, p. 469, pp. 546-550 (Kommos); DEASHAYES - DESSENNE 1959, p. 73, No. 2, pl. XXII, 2-3 (Malia, Maison Zβ and Maison Zγ).

²³ *Kommos I.2*, Tab. 4.1, pp. 249-262.

²⁴ Especially Akrotiri, Troy and Miletus. See TZACHILI 1990; NIEMEIER 1998-99 and 2005; GUZOWSKA - BECKS 2005.

²⁵ BARBER 1991, 105; *Pseira III*, 103; EVELY 1993-2000, 502. According to EVELY 1993-2000, 498, their masses range from 100 to 200 g.

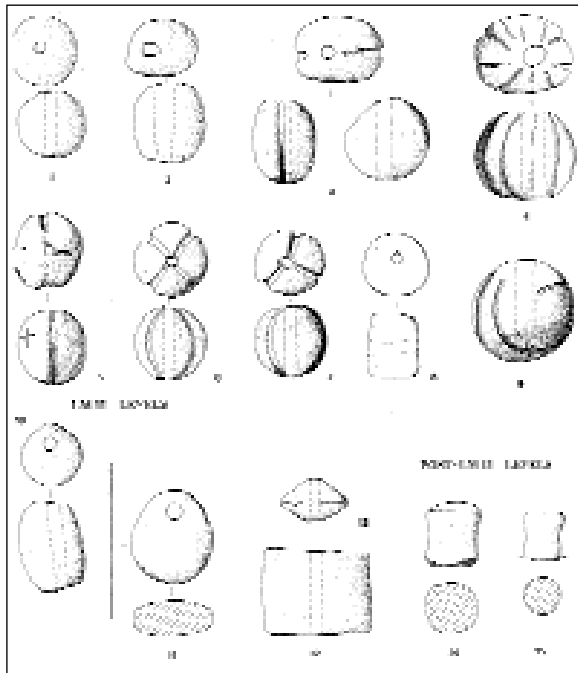


Fig. 5. Spherical loomweights (LMII levels) and spools (post-LMII levels) from the Unexplored Mansion at Knossos (MUM, pl. 231, reproduced with the permission of the British School of Athens).

2) g. 2.ii – *Spherical loom-weights* (Fig. 5).

Spherical weights are quite common and widespread too. Their floruit is during the LM period, when their shape varies from truly globular, to ovoids, depressed spheres and on to piriform. They can be

simple or grooved. They are particularly present in Central Crete, at Knossos, Archanes, Vathypetro, Phaestos and Ayia Triada, but also appear in Chania, Malia, Palaikastro and Kato Syme. Interestingly, they seem to comprise most of the major concentration of loomweights attested in Minoan Crete.²⁶

2) g. 2.iii – *Cubes and Spools* (Fig. 5).

Cubes are often very neatly prepared and weigh between 70 and 250 g. They seem to be more common in Eastern Crete.²⁷

Spool (or reel) weights are also attested, often unbaked or only lightly baked, particularly during the Pre- and Post-palatial periods, when they «re-emerge in a different guise [...] as part of a wider Aegean manifestation» (EVELY 1993-2000: 502). They are documented, for example, in the EB I-II necropolis of Ayia Photia and then at Knossos (several spots, LMIII-B-C), Palaikastro (LMIII-C) and Karphi (LMIII late).²⁸

2) g. 2.iv – *Mass differentiation*.

In spite of numerous attempts to interpret mass variations among loomweights, and although some subdivisions among single sets have been detected, a general rule is not easy to define. According to the analyses available for major groups of loomweights, most of them range from ca. 60/70 g to ca. 300/310 g, clustering between ca 200 and 300-g. There are some weights, on the other hand, that concentrate between 300 and 500-g. There is even a heavier range, from 500 up to 700-g. This broad and simple division, however, can not fully express the real picture of mass articulation.²⁹

In Building BS/BV at Pseira (or Plateia Building), almost all the thirty-nine weights are discoid (*Pseira III*, 99-110, with an articulated typology; LMIB). Among the weights from the Artisans' Quarter at Mochlos, the elliptical exemplars are more numerous and heavier, followed by rounded and then by discoid loomweights (*Mochlos IC*, 28-33, fig. 10-12, pls. 6-7).

²⁶ According to EVELY 1993-2000, p. 498, their masses range from 100 to 700 g. For various contexts at Knossos, see: *PM I*, pp. 248-270 (Knossos, Loom-weights Basement, MMII); *KN Acropolis*, Deposit F, pp. 13-17, pp. 44-51, pp. 61-65, fig. 12, and fig. 44 (Knossos, Acropolis, LMIA); WARREN 1980-81, pp. 85-6, fig. 42, Nos. 4-5 (Knossos, Stratigraphical Museum Excavations, LMIB); *MUM*, pp. 247-9, pls. 36, b-e, 223, a,e, 231, Nos. 1-10 (Knossos, Unexplored Mansion, mainly LMII). For the other sites, see: LEVI-CARINCI 1988, 288 (Phaestos, MM); POURSAT 1996, p. 111 (Malia, Quartier Mu, MMII); LEMBESI 1983, pp. 365-6, pl. 247 β, γ, (Kato Syme, MMIII-LMI); *Archanes 1991*, p. 87, fig. 62 (Archanes Phourni, Building 4, LMIA); MARINATOS 1952, p. 597, fig. 7 (Vathypetro, LMIB); HALBHERR et alii 1977, pp. 265-269, fig. 179 (Haghia Triada, Casa delle Sfere Fittili, LM); MILITELLO 2000, p. 329, fig. 5-6 (Haghia Triada, Complesso della Mazza di Breccia, LMIB); HALLAGER - TZEDAKIS 1978; HALLAGER - TZEDAKIS 1984, p. 5, fig. 2,3 (Chania, Kastelli, House I, LMIB); DEASHAYES - DESSENNE 1959, fig. 2-3 (Malia, Maison Zβ and Maison Zγ, MMIII-LMI); *PK III*, 207 (Palaikastro, Block E: two large hoards, one of spherical weights, the other of cubic weights; LMI-II). They are also attested during EMII at Myrtos Phournou Koryphi (see note 25) and Vasiliki (*Ergon* 1980, p. 45, fig. 100, where they are recorded in «large number»).

²⁷ EVELY 1993-2000, p. 498. Cubes are attested at Vasiliki (EM), Chamaizi (MMI), Palaikastro (MM-LM) and Kato Zakro (MM-LMI). See note 27 (Palaikastro).

²⁸ DAVARAS 1971, p. 396, fig. 2 (Ayia Photia, EMI-II); *MUM*, pl. 231, Nos. 14-15 (Knossos, post-LMII levels); WARREN 1982-83, p. 85, fig. 58 (Knossos, Stratigraphical Museum Excavations, LMIII-C); *PK VI*, 305 (Palaikastro, LMIII-C); *Karphi*, 131, No. 695 (Karphi, LMIII late). However, «The identification is not above suspicion» (EVELY 1993-2000, p. 498).

²⁹ Among the loom-weights from the Acropolis of Knossos (LMIA), it is possible to separate a major group at 170-220 g, from two other groups at pp. 130-150 and 280-310 g. (EVELY 1993-2000, p. 502; but differently WARREN 1980-81, pp. 85-6). Most of the exemplars from the Stratigraphical Museum Excavations of Knossos (LMIB) range between 100 and 280 g. (EVELY 1993-2000, p. 502). In the Complesso della Mazza di Breccia at Haghia Triada (LMIB), a group of loom-weights clusters at 200-300 g, while the others weigh more than 500 g (MILITELLO 2000, 317). The loom-weights from the Artisans' Quarter at Mochlos (LMIB) have been separated in elliptical, at 150-270 g, rounded, at 80-160 g, and discoid, at 60-70 g. (*Mochlos IC*, 28-33). For the set from Room N of the Knossos Unexplored Mansion, the rough distribution by weight gives sets at 200-250 g, 350-450 g and up to 700 g. (EVELY 1993-2000, p. 502).

2) g. 2.v – *Loom-weights major concentrations* (Fig. 6).

It is worth noting that, despite the high frequency of loomweights in domestic assemblages, major concentrations (i.e. large quantities of loomweights being found together) are quite rare: more than four hundred come from the Loom-Weight Basement of the Knossos Palace (MMIIB); eighty from the upper floor of the «Royal Villa» at Haghia Triada (LMI); sixty-three from the Artisans' Quarter of Mochlos (LMIB); fifty-two from the Knossos Acropolis houses (Room 1 and neighbouring areas; LMIA); seventy-nine from the North House of the Stratigraphical Museum Excavations at Knossos (LMIB); forty-six from Building 4 at Archanes Phourni (LMI), forty-nine from Building B of the «Artisans' Quarter» at Mochlos (LMIB); forty-two from House I at Kastelli Chania (LMI); thirty-nine from Building BS/BV at Pseira (LMIB); «dozens» from Vathypetro (LMIB); more than seventy from Block E at Palaikastro (E 36-43, LMI-II), and more than a hundred from the Knossos Unexplored Mansion (LMII).³⁰ In most cases, in excavation reports the exact number is lacking, and it is simply said that «many» loomweights were found. It is also important to point out that the great majority of these concentrations are composed of spherical loomweights.

3. Identifying Minoan textile work areas: building an interpretative grid

As has been noted, the identification of textile work areas depends on a series of indicators and, as Doniert Evely states, «Combination improve the chances».³¹ Therefore, after reviewing the most common indicators occurring in the Minoan archaeological record, we should try to build an interpretative grid with them. Two different parameters must be considered: the functional specialization on one hand, and the quantity of the attestations, on the other. In this way, the grid will express both the specialization and the intensity and scale of the working activities.

3) a – Functional specialization.

First of all, for each context, the presence of the following indicators of functional specialization has to be verified:³²



Fig. 6. Loomweight hoard in Room N of the Unexplored Mansion at Knossos (LMII) (*MUM*, pl. 36 e, reproduced with the permission of the British School of Athens).

- 1) dye-stuffs;
- 2) mordants or other chemical substances;
- 3) «serial - particular» installations for liquid processing (rows of vats);
- 4) other particular installations for liquid processing (slab and drain, stone build vat and drain);
- 5) domestic equipment for large-scale liquid processing (vat-and jar system);
- 6) domestic equipment for medium- and small-scale liquid processing (vats, basins, drains, paved or plastered areas);
- 7) detail of the basins (real vats with bottom spout, spouted basins, simple basins, stone basins);
- 8) typical domestic assemblage (cooking and storage vessels, stone tools, hearths, etc.);
- 9) proper textile tools (spindles, spinning bowls, spindle-whorls, loom-weights);
- 10) other.

3)b – *Quantity, intensity and scale.*

We should also verify some quantitative parameters, such as:

- a) complexity and surface of the considered buildings;
- b) number of the productive areas;
- c) amount of the particular or large-scale equipment for liquid processing;
- d) amount of the domestic small- or medium-scale equipment for liquid processing;
- e) number of the textile tools.

³⁰ See note 26 (Pseira). For Haghia Triada, see WATROUS 1984, p. 126 and n. 27.

³¹ EVELY 1993-2000, pp. 550-1. See also ALBERTI 2007 a and note 1.

³² «[...] uno strumento specializzato è uno strumento prodotto e utilizzato con un'unica funzione tecnologica [...]» (VIDALE 1992, p. 30).

Indicators		Groups of sites					
		I	II	III	IV	V	VI
1	Dyeing	x					
2	Washing, mordents		x				
3	“Serial” installations			x			
4	Particular installations		x		x		
5	Large scale liquid processing equipment	x	x	x	x	x	
6	Medium and small scale liquid processing equipment	x	x	x	xx	x	
7	Number basins/ <i>gournes</i>	various (1-10)	various (1-3)	various (1-3)	3 +	<3	
8	Domestic tools	xx	xx	x	xx	x	x
9	Textile tools	xx	xx	x	xx	x	x
10	Other	x	x	xx	x	x	x
11	Surface (mq)	various	<200	300 +	200-400	100-300	<200

Tab. 1. Groups of sites and archaeological indicators.

4. The groups of sites: specialization and scale

4) a – *The groups of sites* (Tab. 1).

According to various combinations of indicators, the sites of the sample can be separated into six different groups (I-VI). The six groups can be outlined as follows:

Group I – These contexts have traces of colouring substances, equipment for large- and medium-scale liquid processing, often in large number, and abundant domestic and textile tools. The number of loomweights suggests the use of at least two looms at the same time. Generally, buildings are quite large, often more than 200-m². The combination of dye-stuffs, liquid processing facilities and textile tools points to dyeing and weaving activities, though not exclusively. Building B in the Mochlos Artisans’ Quarter stands out for the quantity of basins, γούρνες and domestic and productive equipment found within.³³

Group II – In the second group are included those sites with chemical traces of detergents or probable

residues of wool washing (animal fat), equipment for large- and medium-scale liquid processing, often in large number, and abundant domestic and textile tools. In these sites, the washing of fibres or clothes can be suggested, but, as has been mentioned above, the evidence is far from clear.³⁴

Group III – In the third group are included work areas with unusual installations consisting of a row of plastered or stone shallow vats that are related to outlet systems, but otherwise bear no trace of dye-stuffs or other substances. Lacking other contextual data, the ultimate function of these installations is far from certain, but they have probably had an industrial occupation. It can be suggested that such shallow vats were meant to hold jars or amphorae containing liquids, such as wine or oil, or even dye-baths or detergent solutions.³⁵

Group IV – A large number of sites and contexts fall into the fourth group. These have some particular installations (slab with drain) and/or large- and

³³ In the first group are included: Rooms 72-4 and 81 at Myrtos Phournou Koryphi (EMII), Building 4 at Archanes Phourni (LMIA), the Artisans’ Quarter at Mochlos (LMIB) and the Unexplored Mansion at Knossos (LMII).

³⁴ In group II are included: Rooms 8-10 and 16-17, with probable *creta fullonica*, and Rooms 58-60, with traces of animal fat in a basin, at Myrtos Phournou Koryphi (EMII), and the House of the Snake Tube at Kommos (with two phases, LMII and LMIII, with phosphates near a slab and drain device).

³⁵ In group III are included: Rooms XVII-XX of the West Wing of the Kato Zakro Palace (LMI), House I/J of the Hogarth’s excavations at Kato Zakro (MMIII-LMI), the Vat Room of the Knossos Palace (LMI) and perhaps Room XXVIII.1 of the Malia Palace (MMIII?). The structures are discussed in Platon 1971, p. 103 and in Platon 1993, p. 117. «Whilst thus unconvinced, the author cannot offer any alternative explanation – unless the unit is some sort of a public toilet and washing facility?» (EVELY 1993-2000; 496). On the Knossos Vat Room, see *KN CPS*, 230-1, n. 211 and 213.

medium-scale equipment for liquid processing (especially vat-and-jar system), and many textile tools (loomweights for two looms). Generally, at least three basins, vats or γούρνες are attested in each context. There are not traces of dye-stuffs or other substances. The structures are mainly large urban houses or important «villas», with a surface between 200 and 400-m², and must have been intended as large multi-purpose productive units dedicated, among other activities, to the processing of textile fibres and textile making.³⁶ In the Vathypetro and Epano Zakros «villas» (both dated to LMI), the vat-and-jar system has been improved and connected to outlet facilities.³⁷ At Kommos, the Oblique House (LMIB – LMIIIA2) and House X (LMII-III A1) both have a similar liquid-processing device consisting of a stone slab connected to an outlet drain. Petras House II (LMIB) contains a very large number of basins and gournes, but data are provisional.

Group V – In the fifth group have been included those sites with less specialized and less numerous equipment for processing liquids and textile fibres. Neither dye-stuffs, detergent, nor «serial» or particular installations are attested; basins or γούρνες are few, generally less than three, and the number of loomweights would not serve more than one loom. Dimensions range from 100 to 200-m². In general, the sites of this group are typical domestic contexts, representing the basic production unit (οἶκος; *household*). Textile activities, among many others, were probably carried out on a medium- or small-scale. Many medium- and small-sized urban houses at Malia, Haghia Triada, Palaikastro and Kato Zakros belong to this group, along with some farmsteads and isolated groups of building, but the list can be enlarged.³⁸

Group VI – Most strictly domestic contexts have been included in the sixth group. These completely lack liquid-processing equipment but they have textile tools and indicators of some other productive activities on a small-scale. They are quite common in the archaeological record.

4) b – *Specialization, scale and work organization.*

As far as textile activities are concerned, the more interesting groups are Ist, IInd, IVth and Vth. In these contexts, fibre-processing and textile-making

were carried out on a large- or medium-scale amidst other domestic or food-production activities. Groups I and II differ from the others in the presence of indicators of probable dyeing and mordanting processes, while groups IV and V represent multi-functional contexts with textile activities. Group IV, in particular, includes large productive units, with a scale of production exceeding that of the household level and involving many people at work. In some cases, such as Vathypetro (LMIB) or Epano Zakros (LMI), multiple and improved installations point to a transformation of the work organization towards some sort of team work, probably under administrative control.

As far as weaving evidence is concerned, none of the work areas identified in Neopalatial times seem to involve the presence of more than one or two looms: the production therefore would not have been concentrated but rather dispersed in the territory (BURKE 1997). A different situation seem to be documented at Knossos in the Proto- and Post-palatial periods by the large number of loomweights concentrated in the Loomweights Basement of the Palace (MMII) and in the Unexplored Mansion (LMII).

This is not a definitive picture - many others sites still need to be examined and more work has to be done on typology and analysis. Nonetheless, this paper outlines the many levels of interpretation that the Minoan textile evidence can offer.

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³⁶ Most of them belong to type 1 and especially type 2 in the classification proposed in MC ENROE 1982. In group IV are included: the Vathypetro «villa» (LMIB), the LMIB House at Chalara-Phaestos, the Oblique House (LMIB-III A2) and the House X (LMII-III A1) at Kommos, many houses of Kato Zakros (MMIII-LMI), the Epano Zakros «villa» (LMIA-B), the House II at Petras (LMIB) and the Tourtoulis-Phroditis Ilias «villa» (LMIA).

³⁷ See ALBERTI 2007 a and 2007 b. For a discussion on the typology and function of Minoan «villas», see *Minoan Villa*.

³⁸ E.g. the Chalinomouri farmhouse at Mochlos (LMIB) or the Building 6 at Palaikastro (MMIII-LMIA).

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