Textile Tools and Production at a Mycenaean Secondary Centre

By Max K. MacDonald
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Supervisor:
Dr. Brendan Burke, (Department of Greek and Roman Studies)

Departmental Member:
Dr. Alejandro Sinner, (Department of Greek and Roman Studies)

Abstract:

This thesis is a study of textile production in the Late Bronze Age, using new evidence uncovered by excavations at Ancient Eleon in Boeotia, Greece. Textile production is a nearly forgotten art. To the Mycenaeans of the Greek Late Bronze Age (ca. 1700-1100 BCE) textiles were nearly a form of currency, and a symbol of power. This thesis begins by examining the Mycenaean administration of textile production, which was systematically controlled by the palatial centres of Greece and Crete. Linear B documents record resources and workers under palatial control, and the amounts of cloth that they were expected to produce. The Mycenaean palace at Thebes was the administrative centre that controlled the region of eastern Boeotia, including sites such as Eleon. No document directly links textile production at Eleon to Thebes, but other Theban tablets and the two sites' close proximity suggest a similar relationship to other Mycenaean centres and their dependents.

Usually, ancient textiles from Greece do not survive in the archaeological record. The only evidence that remains is the Linear B archives and the tools of production. Linear B tablets have not been found at Eleon, but many spindle whorls for yarn production, loom weights for weaving, and other tools indicating the production of textiles have been recovered from the site. This thesis discusses the significance of these objects and attempts to place Eleon in the greater context of the Mycenaean textile industry.

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For My Mother.

Penelope and the Suitors by John William Waterhouse, 1912

No time hath she to sport and play:
A charmed web she weaves alway.
A curse is on her, if she stay
Her weaving, either night or day

- *Alfred Lord Tennyson*
(The Lady of Shalott, Part II, 1832)

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I

Introduction

Textile production is nearly forgotten as an art form, and yet it was one of the important pillars of any ancient civilization. The utilization of fibres for cloth production is one of the most ancient technologies, predating nearly all other known crafts.[1] Often regarded as work done by women, in reality textile production was a communal undertaking: fibres needed to be harvested from sheep that needed shepherding or from plants that had to be cultivated; then the fibres needed to be spun into yarn, treated with oils and dyes, and woven on a loom. Marie-Louise Nosch has written that "nearly all men, women and children would directly or indirectly participate actively in Mycenaean textile production, either in home production or the palace-organized production."[2]

By the Mycenaean period, textile production was already thousands of years old, but with urbanization and the consolidation of the power of the elites, it became a palatial industry. The Mycenaean palaces mobilized a vast workforce to produce cloth for both for domestic consumption and for foreign trade; in pre-monetary societies, such as Mycenaean Greece, crafts like textiles could sometimes function as currency. The importance of the textile economy to the Mycenaeans can be seen in the Linear B documents, which record textile production more than almost any other craft.

The palaces may have administered the textile industry, but the work was done in the country and at smaller sites. On Crete, the palace of Knossos was the centre of Minoan power. Textile work groups were situated in minor centres; textile production was carried out in the smaller towns, villages, and rural communities that were

[1] Burke 2016, 635; Kvavadze 2010.
[2] Nosch 2012, 50.

functioning under the Minoan palatial system. This system was then adopted by the Mycenaeans in the Late Bronze Age. In Messenia, the Palace of Nestor contained archives of Linear B concerned with textile production, but that production actually occurred at other sites within the Pylian kingdom, at Leuktron, Iklaina and Nichoria, and other small villages spread throughout Messenia.[3]

In central Greece, in the area of Boeotia, the palace of Thebes has not produced as many Linear B tablets as Pylos or Knossos; it currently boasts a collection of over 400, and these show that it functioned in a similar way. Similar to the organization of Knossos, Thebes seems to have had its textile production dispersed throughout its territory, unlike Pylos where much of the work was concentrated in larger centres. One tablet, Ft 140 (fig. 1), mentions the eastern Boeotian site of Eleon (*e-re-o-ni)* in relation to the economic capacity of its agricultural land.[4] The palace would have coordinated some of the economic activities at Eleon, and presumably it would have been obligated to provide Thebes with a portion of its production.

Excavations have been carried out at Eleon since 2011[5] following an intensive surface survey from 2007-2010.[6] This thesis seeks to synthesize the archaeological evidence of textile production at Eleon with what is known about the Mycenaean textile industry, and to place Eleon in context with the rest of the Mycenaean world. First, there is a short introduction to the craft of textile production, then the general organization of the Mycenaean textile industry is described in detail, in order to frame the discussion. Following this, Chapter III looks at one particular palatial centre,

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[3] Hope Simpson 2014; Carington Smith 1992.
[4] Killen 2006, 79.
[5] Burke *et al.* 2011, 2012, 2013, 2014, 2015.
[6] Aravantinos *et al.* 2016.

Thebes, which was the dominant political entity in eastern Boeotia. This chapter investigates the textile production occurring at the palace, as well as the nature of the Theban state, and its relationship with Eleon. Chapter IV begins the discussion of archaeological remains of the tools used for textile production, beginning with the most numerous finds, spindle whorls. Chapter V discusses weaving and looms, and the only archaeological remains they leave behind, loomweights. Chapter VI investigates some of the other tools associated with textile production that have been found at Eleon, including bone tools for weaving and large ceramic cylinders that could have functioned as spindle whorls. Finally, a catalogue of all the textile tools from Eleon has also been provided at the end of this work. The catalogue is based off of Jill Carington Smith's 1992 catalogue of textile equipment from Nichoria. It also follows new guidelines set out by the Centre for Textile Research in Andersson Strand and Nosch 2015, *Tools, Textiles and Contexts: Investigating Textile Production in the Aegean and Eastern Mediterranean Bronze Age*. The Eleon tools were categorized by shape based on the typologies provided in that volume (fig. 17).

II

The Organization of the Textile Industry and its Role in the Mycenaean Economy

Textile production was a crucial aspect of the Mycenaean economy, closely controlled and meticulously recorded by the palatial centres throughout Late Bronze Age Greece. Manufacturing cloth was extremely labour intensive, not only because it was time consuming, but because each phase of production required a certain degree of specialization. Shepherds, farmers, spinners, weavers, fullers, finishers, dyers, and others all participated in the production of Mycenaean cloth and were overseen by the palace or regional centre in the area.[7] Wool was the main source of cloth in the Aegean, though plant fibres such as flax also had their place in the Mycenaean economy. The Linear B tablets record the processes in which these raw materials became objects fit for distribution among the population, as well as prestigious goods for elite consumption and trade. Although each palace organized its textile industry differently, examination of the information gathered from the larger archives of Pylos and Knossos can shed light on the organization at other centres, such as at Thebes, where a smaller number of Linear B tablets have been discovered. It is important to discuss the process in which raw materials are collected and worked into cloth and clothing, and then explore how aspects of the industry were regulated by the palaces and other regional centres, emphasizing the importance of the hinterland of a palatial centre using evidence from the Linear B tablets.

[7] Burke 2010b. 430-431.

Fibres to Fabric:

Plant Fibres

There were many different plant fibres that were used for cloth production in the ancient world, though not all were widely utilized in the Bronze Age Aegean. For example, cotton was cultivated in India, but doesn't seem to have reached the Mediterranean until the first millennium BCE.[8] Fibers from esparto grass (both *Stipa tenacissima* and *Lygeum spartum*) were used mainly in Spain and North Africa.[9] Hemp (*Cannabis sativa*), used for rope and baskets as well as clothing, was mostly harvested in Central Europe; Herodotus recounts that the Thracians wore hempen clothing which closely resembled linen:

> "Now there is a plant called cannabis, which grows in their land which mostly resembles flax, except that cannabis is far superior in its thickness and size. It grows both wild and cultivated, and from it the Thracians make clothing very much like garments of linen. Unless someone had real expertise, he would think they were made of linen and not cannabis; and if he had never seen cannabis at all, he would certainly think the cloth was linen."[10]

Elizabeth Barber suggests that hemp was still unknown in Greece by the fifth century BCE, since Herodotus' description seems to imply that his audience would have little knowledge of the plant. Hemp had been a source of textile fibres for many cultures across the northern regions of Eurasia, from Germany in the west to China in the east. Since the Neolithic period, nomads of the central Asian steppe likely transferred it east to west. Archaeological evidence for hemp use can sometimes go undetected because of

[8] Barber 1991, 32-33.
[9] Barber 1991, 33-34.
[10] Herodotus 4.74.

its similarities to flax fibres, even at the microscopic level.[11] Nosch, on the other hand, has argued that hemp was indeed used by the Mycenaeans, stating that "it is hard to imagine that the Mycenaeans, who mastered the mechanical and chemical treatments of plant fibres, who had boats and naval initiatives, who organized extensive cultivation of various crops, and who were engaged in international networks, would not have known or used hemp."[12]

A rare fragment of Aegean cloth was discovered at the Cretan site of Khania, interwoven with goat hair and wild nettles.[13] Although linen and wool were the main sources of cloth in Bronze Age Greece, this is evidence for the utilization other fibres that were not necessarily documented by the palatial administration of the textile industry.

Silk

Silk is often overlooked as a textile material in the Aegean Bronze Age, but there is some evidence to suggest that it could have been cultivated on a small scale. The insect that spawned the great Silk Road trade network in the medieval period is a domesticated silk moth, the *Bombyx mori*. Native to Chinese river valleys, the *Bombyx mori* most likely did not appear in Greece until at least Alexander's conquest of the east, but even then there is no direct evidence for that particular moth.[14] Aristotle talks in vague terms about the presence of a local silk industry in Greece:

[11] Barber 1991, 15-19.
[12] Nosch 2015, 176.
[13] Nosch 2012, 51-52; Barber 1991, 19-20.
[14] Van Damme 2012, 165.

> "Some of the women actually unwind the cocoons from these [moths,] by reeling the thread off, and then weave a fabric from it; the first to do this weaving is said to have been a woman from Cos named Pamphile."[15]

Silk is harvested not only from Chinese moths. Two species were native to the Mediterranean, *Saturnia pyri* and *Pachypasa otus,* and it is more likely that any silk produced in the Classical world comes from one of these two moths. The means of production is the same for all silk moths: the cocoons are dipped in boiling water and then the silk can be unwound and turned into thread, which can be spun and woven just like wool or flax.[16] There is some evidence that silk was known in the Bronze Age Aegean and produced as a luxury good; artistic representations found on the frescoes from Thera, usually interpreted as butterflies, could in fact represent silk moths.[17] Additionally Brendan Burke has suggested that silk might also have been harvested in the Bronze Age from the fibres found on the *Pinna nobilis*, a large mollusk found at the bottom of the Aegean. Some *Pinna* shells have been discovered in LBA III contexts on Crete at Knossos and Khania, as well as on Euboea at Lefkandi, suggesting the possibility that the Mycenaeans were harvesting the rock-grabbing fibres from the mussel for the production of textiles.[18]

Flax/Linen

Unlike hemp and silk, domestic flax (*Linum usitatissimum*) was most certainly one of the main fibres used in the production of ancient cloth. The domestication of flax

[15] Aristotle *Historia Animalium,* 5.19.6
[16] Van Damme 2012, 163-164.
[17] Panagiotakopulu 1992, 585-592; Van Damme 2012, 167-168 also discusses the possibility of silk appearing in Linear B, KN Lc(1) 531 and TH Of 34 specifically, *a-ra-ka-te-ja* could be translated as "shiny cloth workers."
[18] Burke 2012, 171-178.

probably occurred at some point in the Pre-Pottery Neolithic B period (7600-6000 BCE), somewhere in the Fertile Crescent.[19] It then spread west to the Near East, to sites like Jericho in Israel (evidence for domesticated flax seeds occurs very early here, between 7900-7550 BCE).[20] The spread of domesticated flax then spread to Egypt and Europe in the Neolithic period (between 5000 and 3000 BCE). Wild flax may have been used for textile production at a much earlier date, as twisted and dyed flax fibres have been found in Upper Paleolithic contexts in Georgia.[21] The flax plant not only contains fibres for textile production, but its seeds can also be harvested for the production of linseed oil, which is still used today for paints, stains, varnishes, glues, cosmetics, and soaps. The flax seeds themselves have some nutritional value as well, so it is possible that the presence of flax does not necessarily indicate a textile function, though the best time to harvest the plant for its fibres occurs earlier in the year, before it begins producing its seeds. Pliny the Elder, writing in the first century CE, mentions that "linseed makes a potent medicine; and it is also popular in rustic porridge [in Italy, north of the Po River]."[22] In modern times, two different varieties of domestic flax plants have been developed, fibre flax and oilseed flax. While the fibre flax produces a better-quality textile, the oilseed flax has been developed to produce more flowers, and thus more seeds.[23]

Pliny speaks at length about the importance of flax in the Mediterranean, asking "what is more marvelous than the fact that there is a plant which brings Egypt so close

[19] Zohary *et al.* 2012, 101-106.
[20] Zohary *et al.* 2012, 103.
[21] Zohary *et al.* 2012, 103; Kvavadze *et al.* 2010
[22] Pliny the Elder *Natural History,* 19.3.16.
[23] Heinrich 1992, 3-4.

to Italy..."[24] Here, Pliny is talking about the use of linen for ship sails and ropes, but of course, linen was also used for clothing, and he later discusses the mode of preparing flax for weaving into linen.[25] Many of the procedures mentioned by Pliny are still used today or have, at least, been used up until recently, so it is not entirely unlikely that similar processes would have been employed during the Bronze Age as well. The first stage of flax harvesting requires the entire stalk to be uprooted; stalks are then tied together and left out in the fields to dry in the sun. Any seeds, leaves, or other imperfections are then combed out and the process of retting begins. *Retting* is a form of fermentation; the flax stalks are laid out over a dewy field or rooftop[26] and begin to rot (figs. 2-3). As this process occurs the useful fibres can be separated from the rest of the stalk (fig. 4). A more effective method, which also produces better quality strands, was to submerge the flax stalks in fresh water which, if done properly would produce "supple and golden blond" threads.[27] After the *retted* material has dried the fibre is separated from the woody and unusable core of the stalk by the process of *breaking* or *braking*. In ancient times this would have been done by striking the dried flax with a wooden mallet or "brake." *Scutching* further removes unwanted matter from the flax before the process of *hackling* begins. *Hackling* is the last phase of preparation before spinning; using a hackling board, "a mean-looking bed of pins or nails," the long *line* fibres are separated from the shorter, coarser, *tow* fibres, though both can be used for textile production.[28] However, harvesting flax is extremely labour intensive, requiring a large amount of well-watered, arable land, and the output is minimal as only 100 kg of

[24] Pliny the Elder Natural History, 19.1.3.
[25] Pliny the Elder *Natural History,* 19.3.16; for more on flax harvesting see Jerde 1992 121-124.
[26] An example of this appears in the Bible, Joshua 2:6; Heinrich 1992, 22.
[27] Barber 1991, 13-14.
[28] Heinrich 1992, 19-32. These processes would have been nearly the same for the harvesting and preparation of hemp. Barber, 1991, 15.

usable fibre is produced from every 1000 kg of raw flax.[29]

The palatial organization of the flax and linen industries are highlighted in the Linear B tablets; Pylos in particular had a thriving linen economy. The tablets recovered from the Palace of Nestor show an intensive palace-controlled linen industry. Indeed, Messenia produced over half of Greece's linen up until the 1960's, and both classical and medieval records show flax to have been a continuously cultivated crop in the area.[30] There are several signs on the tablets that refer to flax or linen: SA, the ideogram **146,* and *ri-no*. The commodity denoted as SA in the tablets is most often associated with flax or linen, though a specific translation is unclear. Françoise Rougemont argues that SA represents a large unit of flax at a certain point in its cultivation (whether just uprooted or after it has been retted or spun into linen) similar to (GRA) for grain and (OLE) for olive oil, or it could function more like the symbol for the raw material wool (LANA).[31] According to tablet PY Ng 319, about fifty thousand kilograms of SA were produced by the Hither province in one year.[32] *Ri-no* in Mycenaean Greek becomes *λίνον* in Classical Greece, which can refer to flax, linen thread, cloth or clothing, and nets for hunting and fishing. It is possible that *ri-no* had a similar catchall meaning in Mycenaean Greek as well.[33] **146* is the name given to an ideogram that can be transliterated as *wehanos* cloth; this seems to be a linen garment produced at the local level and collected as a tax by the palace, as recorded in the Pylos Ma series of tablets.[34]

The Pylos tablets record that several groups of workers were employed by the

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[29] Burke 2010a, 7-10.
[30] Chadwick 1976, 153-156. references Thucydides 4.26.8 linseeds are part of the rations smuggled to the Spartans on the island of Sphakteria, indicating the presence of flax cultivation in Messenia.
[31] Rougemont 2007, 46-47; Robkin 1979, 473 also identifies SA as referring to some type of flax product.
[32] Burke 2010b, 437.
[33] Robkin 1979, 469.
[34] Rougemont 2007, 46-49.

palace but were dispersed around the Hither and Further provinces. Many workgroups of linen workers, *ri-ne-ja,* existed across several locations. Leuktron, capital of the Further province, Pylos Lauranthias, *e-pi-jo-ta-na* in the Hither province, and other Further province locations attest to linen production on a statewide scale.[35] Female labourers are recorded as receiving rations, but their exact social status is unclear. The women in these work groups, though not all, are sometimes identified by an ethnic toponym suggesting they were foreigners, or children of foreigners, from western Ionia. It is possible that these designations describe the specialized work that a group performed, which then became associated with that group's homeland –Milesian spinners, for example.[36] They may also indicate that these women were refugees, fleeing the Mycenaean settlements on the Anatolian coast as the turmoil at the end of the Bronze Age caused them to be displaced. In return for being taken in by the Pylians, these refugees were expected to work; this is a deal similar to one described by Xenophon in Athens during the Peloponnesian War when female refugees were put to work making clothing and baking bread.[37] In any case, it is clear that the linen industry at Pylos involved a large number of workers at a variety of sites throughout both provinces. The Hither province seems to have produced more flax than the Further province, but the Further province's capital of Leuktron and several other sites seem to have had a larger number of flax/linen-workers; however, this discrepancy is probably due to the fragmentary information provided by the tablets.[38]

The precise nature of the linen industry in Messenia is, in many ways, unknown.

[35] Olsen 2014, 79-82.
[36] Burke 2010a, 99-100.
[37] Xenophon *Memorabilia* 117.2-8; Billigmeier and Turner 1981, 6-7; Burke 2010a, 100.
[38] Chadwick 1976. 153-156; Olsen 2014, 80 prefers linen-workers as opposed to flax-workers.

The Linear B provides a glimpse into its organization, but anything more is speculative. There are two categories of textile production: fine cloth produced in palace-controlled workshops by specialists, and domestically produced cloth collected by the state through taxation.[39] The palace administered the industry across secondary centres throughout the Pylian kingdom at sites such as Nichoria.[40] Flax cultivation must have occurred outside of the immediate vicinity of palace in the Pylian hinterland and coastline, but "under the authority of the palace a certain amount of land, primarily in the Hither province, was devoted to the cultivation of flax."[41] The palace granted permission for use of its land in return for a payment of a certain amount of flax; tablet Na 396 records officials (*ko-ro-ku-ra-i-jo*) who administered land controlled by the palace, whose job it was to collect a certain amount of flax on behalf of the palace.[42] The Ma tablets from Pylos imposed a tax on the commodity **146,* a simple linen garment, at the time of its destruction; the palace was expecting five-hundred and twenty units to be collected.[43] This shows that the palace assessed linen and flax material by requiring land to be set aside for the growing and harvest of flax, and by taxing domestic or local textile production operations.

Wool

Wool was the most prominent textile material in Mycenaean Greece, but the use of wool fibres for cloth production likely developed in the east before the beginning of

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[39] Killen 2007, 50.
[40] Carington Smith 1992; Shelmerdine 1998. 139-144.
[41] Robkin 1979, 473.
[42] Burke 2010a, 98-99; Halstead 2001, 44-47 suggests that land mentioned in the Na tablets was less for collecting raw materials for normal textile production, but was instead a means of mobiliz ing labour for military purposes, as heavy linen may have been used as light armour, see Chadwick 1976, 160.
[43] Nosch 2012, 45-46.

the Bronze Age. The domestication of sheep occurred as early as 9000 BCE most likely in northern Iraq;[44] the mouflon (*Ovis orientalis orientalis*) subspecies of sheep, found in northern-western Iran, was likely the main genetic contributor to the modern domestic sheep (fig. 5).[45] Initially, sheep resembled their wild counterparts and were hairier rather than woolly. The three fibres found on all sheep have varying degrees of thickness (fig. 6). Kemp is the thickest fibre and most coarse, and it is from this fibre that the mouflon's coat is mostly made. Hair is also present on many ovid coats; it is thinner and smoother than kemp, but wool is thinner and smoother still.[46] Over the next several thousand years after initial domestication, sheep began to become woollier and less kempy. It is difficult to state with any certainty when sheep began to be reared for their wool. A clay figurine from Tepe Sarab, in Iran, depicts a sheep with wooly tufts (fig. 7), showing that by at least 5000 BCE some domesticated sheep had begun developing more woolly coats.[47] Domesticated sheep had made their way to Crete and mainland Greece as early as 6000 BCE, and both sheep and goat make up a significant portion of the faunal remains from Neolithic sites across Greece.[48] Since their faunal remains are remarkably similar to those of sheep it is important to note that goats are also a source of wool, but archaeologically it is very difficult to distinguish between the two species; today, goat's wool is most commonly associated with cashmere, but coarser goat hair is still used for tents in Bedouin society.[49]

Sheep domestication is considered to be part of the Secondary Products

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[44] Ryder 1983, 51, using faunal evidence from the site of Zawi Chemi Shanidar, near the meeting point of Iraq, Iran, and Turkey; Burke 2016, 636-637.
[45] Barber 1991, 22; Ryder 1983, 20-21, 51-54.
[46] Barber 1991, 20-21.
[47] Burke 2010a, 10-11, figure 9; Barber 1991, 24; Greenfield 2010. 35-37.
[48] Ryder 1983, 57-64.
[49] Andersson Strand 2014, 43-44.

Revolution model; sheep were initially domesticated for their primary, one-harvest-only products such as meat, hide, and bones, but over time they began to be used for their secondary products such as milk and wool, which could be harvested over almost the entire lifespan of the animal.[50] The development of woolly sheep also led to a slow increase in pastoralism, which spread throughout the Old World over the course of the Bronze Age.[51] Zooarchaeological data from what was once northern Mesopotamia has shown that the 3rd millennium BCE heralded the next step in the exploitation of woollier sheep. With an increasing urban population, the demand for wool increased, and woollier sheep were selected to meet that demand, eventually leading to the development of wool-based economies throughout the eastern Mediterranean.[52]

The process of wool harvesting begins with the removal of the wool from the animal, usually by shearing, combing, or plucking. While shearing is the most common method today, it was not until later in the classical world that it became the norm. Writing in the first century CE, Pliny states that, "sheep are not shorn everywhere, in some places the practice survives of plucking off the wool."[53] Although shearing had become the standard procedure for shepherds in the Roman world in Pliny's day, he implies that plucking wool is the older method of wool collection.[54] Sheep can only be plucked once a year, but they can be shorn twice a year. However, plucking has the benefit of removing only the old growth from the previous year while allowing the newer

[50] Sherratt 1983; Greenfield 2010.
[51] Schumacher *et al.* 2016.
[52] Vila and Helmer 2014; Burke 2016,637.
[53] Pliny the Elder *Natural History,* 8.73.191.
[54] Barber 1991, 260-261, argues that the Greek verb *πέκω* which usually means "to comb, card; shear" originally referred to wool plucking, that "to shear" was a later meaning. Plucking must have been the method employed during the Bronze Age, since shears are not attested until the Iron Age.

growth to remain.[55] When the wool fibres are removed from the animal, they need to be washed and combed. Once the fibres have been sorted –by colour, length or some other characteristic– and washed, a special comb is used to remove dirt and knots and to straighten out the fibres in preparation for spinning.[56] Linear B tablets from the palaces mention the occupation *pe-ki-ti-ra₂* which has been interpreted as "female combers;" presumably, these women would receive the raw wool and would produce combed wool, to be handed off to other palace textile workers.[57]

Wool can come in several natural colours and shades, even from the same sheep; these can be sorted and separated to produce different colours of thread, but dyes can also be applied at several stages of textile production, to fibres, yarn, or cloth. Dye can be made from plants such as woad (*Isatis tinctoria* L.) or saffron (*Crocus sativus* L.); these plants and others are soaked or boiled in water, then the fibres are added to the bath along with metals and salt to produce more vibrant colours.[58] Molluscs were also used in the Bronze Age to create a purple textile dye. These sea-snails, known as murex snails (*Murex brandaris*, *Murex trunculus*, and *Purpura haemastoma*), have been found on Crete in contexts dating back to the early 2nd millennium BCE and slightly later in the rest of Greece and at Troy.[59] The snails were caught and kept in large numbers; they were then crushed and stewed in a vat. When textile material was added, it would steep and produce a purple-coloured cloth.[60] Because this process is both time consuming and labour intensive, purple was a luxury colour and associated with royalty in antiquity. In the Linear B tablet Kn X976 textiles are denoted as *wa-na-ka-te-ro po-*

[55] Andersson Strand 2014, 44-45.
[56] Andersson Stand 2014, 45-47.
[57] Nosch 2012, 48.
[58] Andersson Strand 2014, 48.
[59] Burke 1999, 75-82.
[60] Pliny the Elder *Natural History,* 9.60-65.

pu-re, "purple befitting the *wanax* or 'royal purple;'"though this may not refer specifically to murex purple it still highlights the importance of textiles and dyes in the Bronze Age.[61]

The Textile Industry of the Mycenaean Palaces

The cultivation of flax and wool both fall under the umbrella of the Mycenaean textile industry, which was administered by the palatial or regional centres. The most extensive records concerning the wool economy come from Knossos, where the tablets record over 100,000 thousand sheep controlled by the palace; these flocks are spread throughout the central and western part of the island, and consist mainly of castrated male sheep, also known as wethers.[62] Castrated males produce the best quality wool of any type of sheep; ewes, female sheep, produce the second-best fleece, while fully grown rams grow the poorest quality. It stands to reason that flocks of sheep kept for harvesting wool would be made up of mostly the best wool-producing sheep. Of course, some ewes and rams must be kept for breeding purposes; ewes could also be used for their milk as well as their wool.[63] The tablets found at Knossos show that the Mycenaeans employed highly sophisticated herd management strategies, which ensured high economic return and a minimal expenditure of labour.[64] Nosch lists six key features of Mycenaean herd management that can be verified in the Linear B records:

[61] Burke 1999, 78, note 16; Nosch 2015, 182.
[62] Killen 1984, 49. Burke 2010a, 70-71 the distinction between ewes, wethers, and rams is present in the Linear B tablets for both sheep and goats.
[63] Barber 1991, 26-27.
[64] Cherry 1988, 6.

1. Monitoring reproduction schemes by castration (KN Da-Dg and Dn series).
2. Creating and monitoring reproductive flocks (KN Dk-Dl series).
3. Manipulating the sex balance in sheep flocks by isolating one sex, such as the ewes (KN Dk and Dl series).
4. Manipulating the age balance in the sheep flocks by isolating some lambs, yearlings (*WE*) and adult animals (*OVIS*).
5. Specific combinations or specialisations of animal species, such as the widespread monoculture of sheep, cows or horses.
6. Decreasing the number of animals or kinds of animals by specific slaughter patterns.[65]

The Mycenaean administration of the wool industry at Knossos is different from the mainland palatial organization, since the Minoans already had a thriving textile industry prior to the Mycenaean takeover in the 15th century BCE.[66] Nevertheless, Knossos has produced over eight hundred administrative tablets concerning at least 80,000-100,000 sheep and seven hundred shepherds, providing a somewhat clear picture of the organization of the wool economy. The Minoan influence on the Mycenaean administration at Knossos is evidenced by the decentralized nature of the wool and textile industries. Many of the jobs performed at the palace proper on the mainland were, on Crete, spread throughout the outlying settlements of the central and western parts of the island. Certain flocks are associated with toponyms which could refer to their grazing locations or the regional administrative centre responsible for them; it is much more likely that the latter is correct, as these toponyms can sometimes be

[65] Nosch 2015, 169-170
[66] Burke 1997; Killen 1984.

identified as settlements, as in the case of Phaistos (*pa-i-to*).[67] There is a somewhat complicated relationship between centre and periphery on Late Bronze Age Crete. The Linear B tablets present an incomplete picture of the administration of the island's regions, favoring the central region of the island over the west and especially the east. Jan Driessen has argued that early on in the Mycenaean administration Knossos does not seem to have had control over all of Crete. Using the place-names found in the tablets, Knossos seems to have had a stronger economic hold over central and northwestern Crete, and these regions are the areas in which there was a strong wool and textile production sector by LMIII.[68] Driessen summarizes that "[after the Mycenaeans appear on Crete] the subsistence economy remained in the hands of local producers, but the Knossian elite directed a massive shift to sheep herding after the LMIB destructions because it was easier to control. Sheep herding and textile productions were the main issues and the goals of economic exploitation..."[69] Textile work groups were situated in minor centres or villages, which in turn existed in a settlement hierarchy with Knossos at the top. The Mycenaean elites at Knossos coordinated and exploited the old Neopalatial Minoan system of decentralized production, while superimposing a version of their own centralized system at Knossos in order to oversee the industries of the island, especially textile production and shepherding.[70] Through the growth of a centralized textile industry, the Mycenaeans were able to extend their influence over smaller localized communities. The textile industry "could have been the 'long arm' of Knossos, at least in central Crete, and a

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[67] Rougemont 2004, 25.
[68] Driessen 2001; Alberti 2007, 247
[69] Driessen 2001, 111-112.
[70] Alberti 2007, 244-251; 259-260; Petrakis 2012.

means for active involvement and, hence, control over a hinterland that would have been otherwise out of palatial reach."[71]

Ta-ra-si-ja

Textiles were a major focus of the Mycenaean palatial administrations which set production targets for the textile industries, distributing the raw material to workers with the expectation that the finished product would be handed over to the palace. This system, called *ta-ra-si-ja* in the tablets, regulated "the distribution and requisition of raw materials to dependent workers."[72] *Ta-ra-si-ja* records allotments of raw materials or unfinished goods that were doled out to workshops or workgroups that were expected to produce an exact quantity of the finished product.[73] The *ta-ra-si-ja* system does not include food production or other products necessary for subsistence; instead, it is reserved for craft production, mainly bronze working and textiles.[74] To meet the targets of the *ta-ra-si-ja* system, the Mycenaean palaces employed a large workforce of low-status workers, mostly women and children who are recorded as having been given

[71] Petrakis 2012, 84: "I would like to… propose that the political motivation behind such emphasis on textile production on a massive scale at 'Mycenaean' Knossos was its use as a medium for access to local economies and gaining control over a bewildering spectrum of activities. Through this massive enterprise, the 'palace' was able to mobilise and engage a remarkable amount of personnel, 'shepherds,' the so called 'collectors'... and specialised wool and textile makers from a great number of sites; to this we must add a network of officials of varying degrees of affiliation to the centre, which must have been certainly active, although they remain textually invisible so far; and they, in turn, became attached to and, consequently, depended on the palace for their subsistence and economic/political status; the dense concentration of most Knossian geographic references on the sheep records underscores the key-role of this management for central control."

[72] Burke 2010, 72-74. *ta-ra-si-ja* occurs later in 1st millennium BCE Greek as ταλασία when it has a much narrower meaning, referring to wool working alone, while in Mycenaean Greek it refers more broadly to craft production such as textiles, metallurgy, and even the manufacture of chariot wheels. See also: Barber 1991, 265; Killen 2001; Nosch 1997-2000, 2011; Montecchi 2012.

[73] Alberti 2007, 245-246; note 8.

[74] Nosch 2006, 162.

rations by the palace.[75] These workgroups were spread throughout the palace's hinterlands; textile workers are more numerous than smiths under *ta-ra-si-ja*. Because they were working with materials of less value, they came from a lower stratum of society (and therefore could be more easily mobilised for work) and worked from their home villages, creating a large and decentralized workforce dependent on the palace.[76]

Sometimes the obligation of *ta-ra-si-ja* was administered and overseen by supervisors, known to modern scholars as "collectors." Collectors oversaw about thirty percent of textile production under the *ta-ra-si-ja* system, but their exact function is unclear.[77] Collectors have been termed as such because of the Mycenaean word *a-ko-ra*, similar to the 1st millennium BCE Greek word *ἀγορά* "collection," and *a-ke-ra*, *ἀγείρει*, meaning, "he collects."[78] Killen has interpreted collectors to be members of the ruling class, perhaps even members of the royal family "who have been assigned part of the productive capacity of the kingdoms for their own benefit that share, however, still being managed on their behalf by the central authorities."[79] Collectors appear at all levels of the production of textiles, including sheep breeding, wool collection, and cloth manufacturing, yet their activities are still recorded meticulously by the palace in the exact same way as all other 'non-collector' flocks or workgroups are. Both collector and non-collector groups are given the same rations and assigned the same production targets, the only major difference being that "separate totals are kept for 'collector' and 'non collector' activity."[80] In fact, at Knossos the collectors' production targets and

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[75] Olsen 2014, 186-187.
[76] Montecchi 2012, 191-192; Killen 2001, 175, "*ta-ra-si-ja* was one method of organizing production over which the palace would not otherwise have had full control."
[77] Nosch 2006, 169.
[78] Burke 2010a, 72-73, gives PY Cc 660 as an example of a 'collector' from Pylos.
[79] Killen 1995, 213.
[80] Killen 1995, 213.

workers, under *ta-ra-si-ja,* are recorded separately and by a different scribe (scribe 108), and these records were even stored in a different room of the palace, suggesting that collectors were well integrated or even "deeply embedded" in the *ta-ra-si-ja* textile production, despite the fact that their purpose is still elusive.[81] It has been argued that collectors should not be thought of as a "distinct set of administrators," but rather as members of a larger group of named individuals from the tablets "located along a continuum of importance: at the top are the 'collectors,' who are typically involved in a large number of significant activities, while further down are multitasking individuals whose responsibilities are more mundane, and less wide-ranging."[82] Whether or not collectors should be categorized as elites is debatable, although they are clearly of higher status than other workers. Often collectors have common names across polities, which suggests that they were named from a limited aristocratic pool of names.[83] Comparatively, the Ur III tablets mention owners of flocks and wool stocks who are of high status, such as the king, queen, and other state officials like the *ensi*, and even the temple of Nanna.[84] Whatever the collectors' exact functions were, they appear to be linked with the *ta-ra-si-ja* obligation, specifically with the textile industry.

Conclusions

"Nearly all men, women and children would directly or indirectly participate actively in the Mycenaean textile production, either in home production, or in the palace organized production. Textile researchers have measured how time-consuming textile

[81] Nosch 2006, 168-169.
[82] Nakassis 2013. 168-169.
[83] Nakassis 2013, 9; Burke 2010a, 73, compares collectors' names to those used by the British royal family, such as William, Edward, and Elizabeth.
[84] Killen 1995, 214.

production is, and it can be concluded that this activity must have formed a constant occupation for the majority of any population in prehistory."[85] In this quote, Marie-Louise Nosch sums up the importance of the textile manufacturing in the Aegean Bronze Age: it was an industry that required mobilization and organization of the population on a massive scale. Employing the same methods for harvesting plant and animal fibres that had existed for thousands of years, the Mycenaeans built a textile industry that managed workers across their kingdoms. The relationship between centre and periphery is vitally important for most aspects of the Mycenaean economy, but especially for textile production. The Linear B tablets at both Pylos and Knossos describe many aspects of the Mycenaean textile industry, and while Pylos had a more centralized system than Knossos, both centres could not have functioned without control of their hinterlands. Both palaces required work to be done in the towns and villages, in the secondary centres. Knossos posed a different set of challenges for the Mycenaeans since they were inheriting an old Minoan system, and while they imposed control over Crete, they utilized the decentralized system already in place and drastically increased sheep-rearing in the central plains to further expand their economic control. Control of the rural landscape outside the palace was crucial. Since textile production is such a massive undertaking, in order for the industry to function it needs land to grow flax or to herd sheep and goats, workers to pluck the wool or beat the flax, groups to spin the fibres and to weave the threads, scribes to record the input/output, and elites to oversee and collect.

[85] Nosch 2012, 50.

III

Textiles and Production at Boeotian Thebes

Thebes and Eleon

The Mycenaean palace at Thebes (fig. 8), the Kadmeion, is of particular importance to this study as it is the palatial centre which is most likely associated with the second-tier site of Eleon, *e-re-o-ni,* recorded in two Linear B tablets from Thebes. Although no tablets have been discovered to date that directly show a connection between Eleon and Thebes' textile industries, there is evidence that Thebes exercised control over Eleon and its agricultural production. TH Ft 140, found in the so-called Arsenal at Thebes, records the "taxable productive capacity of the land" controlled by the various sites listed on the tablet.[86] Initially it was supposed that this tablet recorded a tax by the palace onto outlying centres under its domain, but a more likely interpretation is that Ft 140 was an evaluation of the amount of land for grain or olives controlled by places like Eleon to be used in the future for tax levies. The tablet suggests that Eleon's relationship to Thebes may be similar to that of Nichoria or Iklaina to Pylos, "second-order sites, or district capitals, incorporated within the regional hierarchy overseen by the *wanax* [and the palatial administration];" as a "community obliged to provide Thebes with taxable goods, Eleon would therefore have commanded the collection of goods from its surrounding communities."[87] Since there is evidence for textile production at Thebes, as well as Eleon, it may be helpful to outline what is known about the textile industry at Thebes. Linear B tablets provide insights into the palatial administration of the industry, while archaeological excavations have uncovered tools

[86] Killen 2006, 79-81.
[87] Aravantinos, Burke, Burns, et al. 2016, 307-309.

related to textile production (some of which bear similarities to those found during the recent excavations at Eleon). The Of series from Thebes also mention textile workshops, some operating within the religious sphere, which offer a look at another aspect of Mycenaean textile production.

Thebes in the Late Bronze Age

Thebes, for much of ancient history, held a preeminent position in the Boeotian political landscape. In the Bronze Age, it is thought to have shared its first-order status with its traditional rival Orchomenos, jockeying for control of land and resources, especially in and around the Lake Kopaïs and its drainage basin. Its importance as a Bronze Age centre is reflected in the legends and traditions from later periods that recall the Theban royal family, the House of Kadmos, which included members such as Oedipus and Antigone, and the city's epic struggles with the Seven Against Thebes.[88] Settlement on the Kadmeia, the Theban acropolis, began in the Early Helladic period, though earlier settlement occurred in the plains nearby.[89] By EH II the system of hills that make up the historical upper town were densely populated, and even in this early period Thebes could be described as a "vital and crowded city."[90] By the Late Bronze Age there was extensive settlement on the Kadmeia and the surrounding areas. Linear B documents from the palace suggest that the extent of palatial involvement was far reaching, from the Corinthian Gulf to the Euboean coast, and perhaps even to Euboean

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[88] See Buck 1979, 45-68. Differing ancient sources offer alternative explanations for the mythical founding of the city; examples include Homer, *Odyssey* 11.260-65, Strabo 9.2.28. The *Catalogue of Ships* mentions "the men who held the rough-hewn gate of Lower Thebes" (Homer, *Iliad* 2.494-2.510), but there is a tradition that the king of Thebes did not participate in the Trojan War, possibly because the palace had already been destroyed when the war took place.

[89] Dakouri-Hild 2010b, 691; Henceforth Kadmeia will refer the the hill on which the modern city of Thebes and the Kadmeion, the ancient palace, sits.

[90] Aravantinos 1995, 614.

sites such as Amarynthos, Chalkis, and Karystos.[91]

It is also possible that the Thebans had some involvement in, and benefitted from, the complex drainage programme of the Kopaïs, the massive shallow lake to the north west of Thebes. By LH IIIA2 the Mycenaeans had constructed an elaborate system of canals and dams that redirected rivers and streams that flowed into the Kopaïs into natural sinkholes (*katavothrai*) thus draining the lake; at the same time, the fortified hilltop site of Gla (Glas) was constructed, ostensibly to guard the reclaimed land and to act as a storehouse for the agricultural surplus the drainage created. The most recent excavations of the citadel took place at the end of the twentieth century, and the findings of the excavator, Spyros Iakovidis, are largely considered definitive.[92] Iakovidis argued that Gla "obviously belonged" to the palace at Orchomenos; this is corroborated by Strabo, who writes: "They say that the place now occupied by Lake Kopaïs was formerly dry ground, and that it was tilled in many ways when it was subject to the Orchomenians, who lived near it. And this fact, accordingly, is adduced as an evidence of their wealth."[93] Strabo also adds that Orchomenos had imposed a tribute on Thebes, and Diodorus goes so far as to assert that the Orchomenians "had enslaved the Thebans."[94] Both Strabo and Diodorus claim that the Thebans revolted against Orchomenos, and Herakles, who fought for the Thebans, destroyed the drainage works, flooding the lake. This ancient tradition associated the power of Orchomenos with the draining of the Kopaïs, and the Thebans with its destruction.[95] Using the archaeological evidence from the excavations at Gla and Orchomenos, Iakovidis found that the late

[91] Dakouri-Hild 2005, 208. "It seems that these sites were affiliated somehow with Thebes, as 'islands of influence' in otherwise non-Theban territory (Sherratt 2001, 231)."
[92] *e.g.* Hope Simpson and Hagel 2006, 204-209.
[93] Strabo 9.2.40; Iakovidis 2001, 151-152.
[94] Diodorus Siculus 4.18.7.
[95] Iakovidis 2001, 152.

IIIB2 destruction date for Gla matched floor deposits from Orchomenos and concluded that the two were destroyed by the same force (perhaps the Thebans). While Gla ceased to be occupied after this event, Thebes continued to be inhabited, even after the destruction of the Kadmeion.[96] The presence of the *melathron*, a "megaron-like" building which is split into two equal halves, suggests two administrators of equal rank were in charge of the fortification. If Orchomenos did construct the fortress, then these administrators managed the defences and the storehouses respectively.

A challenge to Iakovidis' interpretation has been argued by Christofilis Maggidis, a former student of Iakovidis, who undertook a geophysical survey of the citadel in 2011. the study found significant structures outside of the central enclosure, which until now were thought to have been empty. Maggidis now believes that there is a "whole city within the walls, whose identification raises interesting questions about Mycenaean political geography."[97] Gla could be associated with one of the cities mentioned in the *Catalogue of Ships,* perhaps Arne or Hyle, but Maggidis has also proposed an interesting theory that the palatial authorities of Orchomenos moved their administration and population to Gla after its construction for a more strategic, well-fortified location.[98] Another interpretation is that Orchomenos and Thebes worked together to construct the drainage system and Gla itself, and both palaces had one representative in the *melathron*.[99] In any case, the relationship between Orchomenos, Gla, and Thebes in many ways defines the political geography of Boeotia. If Thebes had

[96] Iakovidis 2001, 156-157. Alternatively, an invasion from the Argolid ie.the Seven Against Thebes
[97] Maggidis 2014.
[98] Maggidis 2014. Unfortunately, the 5-year survey was suspended by the Athens Archaeological Society in 2012 after two years of research "on grounds of complete lack of interest in further exploring the site." Maggidis, at the 2016 AIA conference in San Francisco, claimed that the suspension was perhaps political in nature.
[99] Kramer-Hajos 2016, 118; Maggidis 2014; Hope Simpson and Hagel 2006, 209.

a hand in the drainage of the Kopaïs, then it would have benefitted economically from it, and if Orchomenos held the basin with a tight grasp, then Thebes would have been affected by its rival's economic boom.

If Thebes and Orchomenos did in fact work together on the Kopaïs drainage project, it would not have been an unprecedented act of friendship. On a smaller scale, but pertinent to the study of Mycenaean textiles as well as Thebes in the greater Mycenaean world, a Linear B tablet from Mycenae records a possible gift exchange between Mycenae and Thebes: Tablet MY X 508 from the House of the Shields, at Mycenae, records a shipment of *pu-ka-ta-ri-ja,* a type of woollen textile, to be given to Thebes.[100] It is entirely possible that this is not Boeotian Thebes, as place names are duplicated throughout Greece; there is the well-known Messenian Pylos, as well as an Elian Pylos for example. While there are other known sites with the name Thebes, in Thessaly and in Egypt for example, it seems most likely that an "extra-regional" exchange of cloth exported from Mycenae would be sent to Boeotian Thebes, a palatial centre of relatively equal size and status to Mycenae itself. Palaima is skeptical of the identification of this Thebes as Boeotian Thebes, but offers explanations as to why the palace at Mycenae might be sending a relatively common type of cloth to another Mycenaean centre. The quality of Argolid wool or the skill of the wool workers may have produced a high-quality garment for elite gift exchange, or possibly a dedication to a divinity, the latter being preferred by Palaima.[101]

[100] Burke 2010a, 102.

[101] Palaima 1991, 276-277, *ma-ri-ne* is perhaps the name of a deity mentioned on tablets from other sites, "On Knossos tablets Ga 674, Gg 713 and As 1519 **ma-ri-ne-u* is the name of a divinity connected with spices, honey and male personnel; while on two Thebes tablets Of 25 and Of 35 women designated **ma-ri-ne-we-ja* or 'servants of **ma-ri-ne-u'* are explicitly connected with wool (LANA and *ku* LANA)

Archaeology of Thebes

Archaeological excavation of the Kadmeia is complicated by the fact that the modern city of Thebes sits directly on top of both the Bronze Age palatial centre and the classical city. There are later Byzantine and Ottoman phases of the settlement as well. Rescue excavations have been conducted at several points during the twentieth and twenty-first centuries; these have discovered remains from the Mycenaean palace complex, as well as smaller deposits from all periods of the city's habitation. Fortunately, these excavations have produced a sizeable collection of Linear B inscriptions, many of which discuss the manufacture and administration of Theban textiles.

The first archaeological investigation of the Kadmeia took place at the beginning of the twentieth century under the Greek excavator A. Keramopoullos from 1906 to 1929. The main goal of these early excavations was to investigate the fortifications of the city, testing the veracity of the Theban mythical cycle, in which the walls of Thebes play an important role.[102] Following the work of Keramopoullos, excavations at Thebes came to a halt during World War II and the Greek Civil War, and it wasn't until 1960, when the modern town began to rapidly expand, that rescue excavations were undertaken.[103] These excavations continue today. Because of their piecemeal nature, the rescue operations have revealed that the palatial complex, including workshops, shrines, magazines, living quarters, and other ancillary and annex buildings, were quite extensive and covered most of the Kadmeia. Significant finds, such as elite objects and

[102] Demakopoulou and Konsola 1981, 20-22; Keramopoullos believed that he had found evidence for a fortification wall encircling the Kadmeia following the natural ridge of the hill. It was thought for a time, during the second half of the twentieth century that Thebes was not encircled by walls, similar to Pylos or the Cretan palaces, but it is now accepted that there were LH III fortifications surrounding the city. Symeonoglou 1985, 26-38; Aravantinos 2015, 24-26.
[103] Demakopoulou and Konsola 1981, 23-24; Aravantinos 2015.

Linear B documents, are not concentrated in one area of the city; they have actually been found all over in many of the excavated plots.[104]

Thus far, 352 Linear B tablets have been found in at least six different spots across the Theban acropolis.[105] The first set of Linear B tablets from Thebes was discovered during excavations in 1963-4 under Pelopidou St. in what is commonly referred to as the "Arsenal" because of the abundant military and cavalry equipment stored there. These 24 palm-leaf type tablets are still not fully understood.[106] Thirty years later, between 1993 and 1996, a further 238 Linear B documents were uncovered in the next plot over from the original find spot, in what is considered to be a continuation of the same building complex.[107] These documents have been interpreted as allocations of food, livestock, and wool as well as food and leather acquisitions for some sort of festive banqueting or similar religious activities.[108] These new tablets also discuss female working collectives with names derived from the names of Cretan collectors, and of the thirty or so personal names from the new tablets, a large percentage match only with names known from Knossos.[109] This, coupled with the abundant number of inscribed stirrup jars, seems to strengthen the argument that Thebes was in close contact with Crete.[110] Tablet Ft 140, the one referencing Eleon, was

[104] Aravantinos 2015, 32-37.
[105] Dakouri-Hild 2010, 700-701.
[106] Aravantinos 1995, 619-620.
[107] Aravantinos 1995. 621; Aravantinos, Godart, Sacconi 2001,14-16, 19-20. It is probable that the number of tablets may not be entirely accurate as there could be several fragments from a single tablet.
[108] Dakouri-Hild 2010b, 701; Hiller 2006, 71-75.
[109] Hiller 2006, 74-75. While this onomastic connection is notable, it doesn't necessarily imply more than a cultural connection between two relatively similar entities. Almost half of the names from the new tablets are mentioned in documents from Pylos or Mycenae. It may still hint at a close relationship between Thebes and Crete.
[110] Kramer-Hajos 2016, 112. 43 Cretan inscribed stirrup jars have been discovered in Boeotia; of these, 41 come from Thebes. Karmer-Hajos suggests that Thebes' near monopoly on Cretan inscribed stirrup jars comes from its close maritime control of the Euboean Gulf; its access came through the Tanagran Plain, and most likely through the territory of Eleon, Aravantinos 2015, 37.

also among the new tablets.

The Theban Textile Administration

A group of documents concerning the Theban textile industry come from a smaller cache of documents discovered in the early 1970s by Th. Spyropoulos at the corner of Epaminondas and Metaxas Streets, although it is usually referred to as the Soteriou-Dougekou plot or "Archive." Sixteen tablets were located in Room 1 of a three-roomed building and are classified in the Of series. This building was originally identified by the excavator as an archive room and a workshop where wool was processed; the presence of tablets relating to wool and a row of five shallow depressions coated with waterproof lime for wool washing all led to this conclusion.

Cynthia Shelmerdine has argued that the room was neither an archive room nor a wool processing facility. She argues that the cache does not meet the accepted definition of an official palace archive room, since among other reasons, it was found in a self-contained building outside the main palace complex.[111] Instead she posits that this building was used as a clearinghouse for wool to be collected before being sent out to workers, perhaps to places outside of Thebes, as tablet Of 25 mentions wool being sent to Amarynthos, possibly the site located on Euboea (fig. 9). A clearinghouse seemed more plausible than a textile workshop for the definition of this building for another reason as well – that no spinning or weaving equipment was discovered in the building other than one small whorl.[112] However, a later reexamination of the excavations

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[111] Shelmerdine 1997, 388, outlines the requirements for a cache of Linear B documents to be considered a true "archive room."

[112] Shlemerdine 1997, 388-389, n. 16. Shelmerdine states in a footnote that the whorl should be considered a button rather than a true spindle whorl because it is too small and light to properly spin thread, but the CTR in Denmark has shown that whorls even as small as four grams can produce quality

revealed that many steatite spindle whorls had been recovered from the building. They all weigh less than 13 grams and could suggest that there was focused production of a particular thread type; the presence of *in situ* stirrup jars could also point the treatment of yarn with (perfumed?) oil.[113] Alternatively, these spindle whorls could have been included in the shipments of wool.[114]

Brendan Burke has suggested that the two postholes discovered in the building, which Shelmerdine and Spyropoulos agreed were the remains of a shelving unit for the storage of the tablets and possibly wool, could be the insets for the beams of a vertical loom. A raised platform close to the postholes could have been a bench for the weavers, and the clay *larnax* discovered in the same room could have held spun fibres ready for weaving.[115] It is also possible that the tablets fell from a second storey, since the tablets were found about 15-30 cm above the surface layer and joins were found over 2m apart. The building was destroyed by fire towards the end of LH IIIB2, and the tablets were found in a layer of burnt material. Despite this, Spyropoulos claimed there was no evidence for a second storey.[116] It seems possible that this particular building could have functioned as a clearinghouse, but it should not be ruled out that textile production took place here as well.

The sixteen Of tablets, along with several new tablets from the Pelopidou plot, can illuminate many elements of the administration of Theban textile production by comparisons with the more copious records from Pylos and Knossos as well as Mycenae. The Of tablets record disbursements for small quantities of wool, although not a

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thread, Nosch 2008, 201.

[113] Shelmerdine 1995.

[114] Fappas 2012, 95, in Alberti *et al.* 2012; Alberti et al. 2015, 285-286.

[115] Burke 2010a, 101.

[116] Del Freo and Rougemont 2012, 100, n. 56, in Alberti *et al.* 2012.

substantial amount when compared with the records from other palatial centres.[117] It is possible this could be because the Soteriou-Dougekou building was for specialized production or finishing/decorating of finer material.[118] Similarities between the Theban textile tablets and documents from the other palaces suggest that all the palaces organized and administered their textile industries in much the same way. Women are recorded with occupational titles such as spinners and *te-pa* makers and many others with well-known parallels from Knossos and Pylos. Appearing on Of 36 is the occupational title *no-ri-wo-ki-de*, which, despite its unknown meaning, also occurs at Pylos on a personnel list, which suggests that the term is a "common Mycenaean term for specialized women-workers in the textile industry."[119] Often groups of women textile workers are connected to a "collector" and evidence for this office exists at Thebes as well; for example, a female work group is designated as *a-ka-i-je-ja* deriving from a male name, *a-ka-i-jo*. Similarly, at Knossos and Pylos many workgroups are associated with the abbreviation *DA*, which is thought to refer to a male occupational title, probably a supervisor. At Thebes, the *DA* was a man named *ko-tu-ro*$_2$ and is recorded along with a group of female textile workers.[120]

The Theban textile tablets share many features with both Knossos and Pylos' records. Because of the small number of tablets from Thebes, however, it is difficult to say with certainty whether it is more comparable to Pylos and the other mainland sites, or if it shares the administrative, decentralized style of Knossos.[121] Based on available evidence, it seems perhaps that a decentralized model for Thebes is more likely. The Of

[117] Burke 2010a, 101.
[118] Del Freo and Rougemont 2012, 100-102 in Alberti *et al.* 2012.
[119] Nosch 2001,183.
[120] Nosch 2008, 194. TH Of 34.
[121] Nosch 2001, 189.

tablets record small quantities of wool being sent to various places for a number of reasons, such as finishing or decorating, and these individuals are connected in some instances to the religious sector, and some with "collectors;" others are dependent on the *wanax,* suggesting that production was "partly decentralized and controlled by separate authorities closely linked to the palace."[122] Decentralization on a statewide level could have been the model for Thebes. The tablets record that wool was sent to Amarynthos on Euboea as well as to *a-ki-a₂-ei-ja-de,* somewhere on the coast, and Del Freo and Rougemont note that "it is not excluded that sending these quantities was part of a productive circuit linked to the *ta-ra-si-ja*, which is well attested for the textile industry at Knossos. This, however, cannot be proven at the moment, since the word *ta-ra-si-ja* itself never occurs in the Thebes texts."[123] Allocations were also sent to regional locations such as *ra-mo*, Of 38; *a₃-ki-a₂-ri-ja*, Of 25, 35; *no]-u-ja*, Of 43, thought to be sites in eastern Boeotia, further suggest a large decentralized industry spread throughout Theban-controlled eastern Boeotia.[124] The distribution of textile tools across the Kadmeia suggests that textile production was "a diffuse craft in late Mycenaean Thebes." Spindle whorls and loomweights as well as other archaeological textile tools have been found in every excavated plot so far, yet nowhere is there a high concentration of these tools that would suggest "central textile workshops, which would have enrolled groups of dependent workers, such as those which have been hypothesized for Pylos."[125]

[122] Del Freo and Rougemont 2012, 102, in Alberti *et al.* 2012.
[123] Del Freo and Rougemont 2012, 102, in Alberti *et al.* 2012.
[124] Dakouri-Hild 2005, 214-215.
[125] Alberti 2012, 99, in Alberti *et al.* 2012.

Religious Textile Workshops at Thebes

The Theban Of series, all of which contain the wool ideogram LANA, refer to the allocation of wool by the palace to workshops mentioned throughout the series. Susan Lupack, in her 2008 publication concerning the religious sector's role in Mycenaean society, put forth a number of ideas relating to the nature of the religious textile workshops at Thebes, based on the tablets from the Of series. Divine figures sometimes appear as holders of textile workshops at Thebes, suggesting that religious collectors held an "economic position that was parallel to that held by collectors."[126] Since workers in these instances are associated with a divinity, rather than a personal name, it is likely that a religious group in the service of that particular deity controlled these workgroups. These divinities include Hera (*e-ra*, Of 28.2); Hermes (*e-ma-a$_2$*, Of 31.1); and Potnia (*po-ti-no-ja*, Of 36.2), among others.[127] Each of these divinities can be associated with a workshop. Lupack identified another possible religious workshop at Thebes, one associated with a deity **ma-ri-ne-u;* another workshop might be associated with the *ko-ma-we-te-ja* women from Of 35, but it is more dubious than the others.[128] It is possible that wool allocations were given to religious workshops, but the textiles produced may not have been necessarily for religious purposes. Using Of 36 as an example, Lupack argues that religious workers would have produced textiles just like their secular counterparts. The palace does not seem to have differentiated between the religious and secular workshops, it utilized all workshops to ensure that its quotas were met. Lupack also suggests that religious workshops, which were often connected to religious sanctuaries, made their income by producing textiles for trade, therefore producing

[126] Lupack 2008, 105.
[127] Spyropoulos and Chadwick 1975, 91; Lupack 2008, 105.
[128] Lupack 2008, 106-114.

enough textiles each year for the *ta-ra-si-ja* or similar palatial tax, trade, and for religious purposes.[129] One of the new tablets from the Pelopidou excavations, Av 106, relates a cultic connection to the Theban textile industry; it records individuals and groups, including specialized fullers known as *ka-na-pa-we*, participating in a religious feast in a professional capacity. Other textile workers are present on tablets from the Fq series as recipients of feasting allocations.[130] Other than the possible workshop from the Soteriou-Dougekou building complex, no known textile workshops have been excavated at Thebes. While the religious textile production at Thebes need not be interpreted as solely for the purpose of ritual, the use of cloth in Mycenaean cult practices is well attested from Linear B documents from other sites. At both Knossos and Pylos ideograms *146 and *166, *wehanos,* have a connection to religious activity, as offerings treated with scented oils, or dressings for cult statues.[131]

Thebes in LH IIIC

After the collapse of the palace at Thebes at the end of the LH IIIB period, it is no longer possible to rely on Linear B documents for evidence of the textile industry. Certain specialized industries, sponsored by the palace, probably ceased to exist, and long distance trade goods became unavailable; while Thebes began to decline, other centres, such as Lefkandi on Euboea, began to rise in prominence. There is evidence that production of certain goods continued on the Kadmeia. Clay recipes for the production of ceramic dining vessels are unchanged during the entire LH III period,[132] suggesting

[129] Lupack 2008, 105-106.
[130] Dakouri-Hild 2005, 215.
[131] Nosch and Perna 2001, 471-477, discuss reasons why *146 should not be associated with linen cloth only and have shown that wool *wehanos* did also exist.
[132] Tomlinson 2000.

uninterrupted production. Bronze working, as well, seems to have continued to take place after the collapse of the palace.[133] Archaeological evidence from the Pelopidou plot also suggests that textile production continued into the post-palatial period at Thebes as well; the LH IIIC Early and Middle layers produced a large quantity of textile equipment, including many spindle whorls, which "have a more domestic character."[134] In addition, unbaked clay loomweights, often referred to as reels or spools, appear in LH IIIC, but are unknown in the palatial period.[135] These objects have been found at numerous sites including Lefkandi[136] as well as Eleon, suggesting that although the palace at Thebes was no longer operational, the inhabitants who remained on the Kadmeia were not excluded from participating in the changes that occurred in the final phases of the Bronze Age.

Conclusions

Thebes played a vital role in the Late Bronze Age; it was a dominant power in central Greece, whose power extended over eastern Boeotia, and possibly parts of Euboea. It may have also interacted diplomatically with other Mycenaean palaces such as Orchomenos and Mycenae. Like the other palaces, it kept records of its textile industry; although only a small number of tablets have been found that discuss textile production, the Of series provides clear parallels to the administrations of Knossos and Pylos, whose records are much more plentiful. The small amounts of fabric allocated to workers and workshops in the Of series, and the allocations doled out to places outside of Thebes, leaves the possibility open that secondary sites such as Eleon could have been

[133] Dakouri-Hild 2005, 217.
[134] Alberti *et al*. 2015, 285.
[135] For Thebes examples see Alberti *et al.* 2015, 283.
[136] Evely 2006, 296-300. These loomweights will be discussed further below.

called upon to produce textiles for the palace. Ft 140 shows that the Kadmeion had assessed Eleon's agricultural capacity for tax purposes, and it is possible the same was true for its textile industry.

IV

Spinning and Spindle Whorls

"The comparative material for the terracotta whorls is the largest assortment of useless possible parallels collected in the course of this study. It is certainly the most frustrating to deal with." - Elizabeth Banks 1967, 545. On the whorls from Lerna.

Spindle whorls are extremely common finds on the Greek mainland. The spindle whorl serves a simple yet important function, to act as a flywheel to stabilize and increase the spin time of the spindle. Their use in a textile context is for the production of yarn, although because of their simple design they must have been, in some cases, multi-purpose. For over a century a debate has raged over identifications of whorls; many have doubted certain whorls' textile functions, instead believing them to be buttons or dress weights or something entirely different.[137] Schliemann was very interested in whorls and dedicated space in many of his works to them, often providing detailed accounts and illustrations of the more intricately decorated examples (fig. 13).[138] Unfortunately, spindle whorls were not as interesting to archaeologists of the twentieth century, and they were often left out of site publications. Slowly, this is changing, but it still persists that whorls are either not included in final publications, or important information, such as weight, is left out.[139] Spindle whorls are also notoriously difficult to classify because of the wide range of shapes in which they occur; even within a specific region and site there can be much variation. The Centre for Textile Research conducted a series of experimental archaeological tests that can help shed light on the

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[137] Schliemann 1884, 39, notes that 4000 terracotta spindle whorls were uncovered during his excavations at Troy and the surrounding region, he suggests that many of them may have had a secondary function as votive offerings.
[138] *e.g.* Schliemann 1880a, 76-78, plates no. 1801-2000; Schliemann 1880b, 416-420; Schliemann 1884, 39-40; Schliemann 1886, 175-176.
[139] Rahmstorf 2015, 3, 14.

functionality of different whorl shapes and sizes. At Eleon over eighty spindle whorls, not counting pierced discs, have been recovered and recorded.

Use and Function of Spindle Whorls

Spindle whorls are not the only tool used to spin raw fibres into yarn; however, in Greece they are usually the only aspect of the process that survives in the archaeological record. Spinning requires two rods: the distaff, which holds the roving or raw fibres ready to be spun, and the spindle, to which the whorl is attached to add weight to the spin (figs. 8-9). As the spinning pulls the unspun fibres from the distaff onto the spindle, the individual fibres are tightly twisted together creating yarn. Spindle whorls have a relatively simple purpose: to add weight to the spindle for an easier spin. Both the diameter and weight of the whorl have an effect on its functionality; if the whorl has a large diameter, it will spin more slowly and produce a looser thread with fewer twists than a whorl with a small diameter, which would produce a tighter, more twisted thread. With regards to weight, it is usually the case that a lighter whorl is used to produce finer thread. Likewise a heavier whorl leads to a coarser, thicker thread.[140] The perforation of spindle whorls must be located in the centre, otherwise the spin is uneven and doesn't last; one suggestion for whorls with off-centre holes is that they could be jar stoppers for alcohol fermentation much like the small torus loomweights.[141]

Spindles

It is usually the case that while spindle whorls often survive in the ground, the

[140] Barber 1991, 51-54.

[141] Rahmstorf 2015, 5. The CTR spinners noted that it was possible to spin with an off-centre hole, but it was not preferable. Olofsson et al. 2015.

spindles on which they were attached do not. Spindles, except in some rare instances, are simple wooden rods; any additional features are most likely the result of cultural idiosyncrasies rather than increased functionality. For example, the placement of the whorl at either the top or the bottom of the spindle has little to no effect on the spun thread. In most societies in Europe and the Near East whorls were placed at the bottom of the spindle, yet there is clear evidence that Egyptian spinners were spinning with a whorl on top; the Egyptian hieroglyphic for depicting the word "spin" is a representation of a "high whorl" spindle.[142] That the ancient Greeks used "low whorl" spindles is suggested from Attic vase paintings from the Archaic and Classical periods. In the Bronze Age, a low whorl was also likely used, as evidenced by the ornate ivory spindles and whorls found in tombs at Perati in Attica (fig. 12).[143] Spindles, although usually wooden, also could be made from bone or even metal, but unless they were found connected to a whorl, it is very difficult to infer an object's use as a spindle.

Conuli - Beads, Buttons, Weights or Whorls?

Dispute over the functionality of small whorls under ten grams has been ongoing, with some arguing that these artifacts should be considered buttons or beads rather than textile production tools. It was for a long time believed that the small stone *conuli* found at Mycenaean sites in LH III contexts (as well as on Crete as early as the Neolithic period[144]) were too small to have been used as spindle whorls; the fact that they were rebranded as *conuli* makes this explicit. Though there is really no consensus, *conuli* are typically defined by three characteristics: light weight (less than 10 g), conical shape,

[142] Barber 1991, 53.
[143] Iakovidis 1980, 95-96.
[144] Carington Smith 1992, 685.

and made of stone, usually steatite, a very soft stone that can be easily worked.[145] They are found in both settlement and burial contexts, as well as in palaces and citadels. It seems that whorls are not confined to one type of context. This led Iakovidis to state that *conuli* "belonged to everyday life as well as items of grave furniture. It is therefore safe to assume that they must have been part of what people wore or carried with them."[146] More often than not, *conuli* are referred to as buttons; Tsountas, after discovering a large hoard of 160 *conuli* in a single tomb at Mycenae, argued that there were simply too many to be considered spindle whorls, and they were instead buttons.[147] However, there are other types of buttons known from the Mycenaean period, lighter and with at least two holes, a functional advantage over the singularly pierced *conuli.*[148] Necklace beads are another suggestion, but this presents a number of difficulties as well; museums will often present small steatite *conuli* strung together in a reconstruction of a necklace, but there have been no reported burials where the objects have been found *in situ* around the neck or chest.[149] A necklace from burials at Mavro Spelio near Knossos, for example, was reconstructed with *conuli* from nine different tombs.[150] Carington Smith, deducing the size and weight of necklace beads from the "Frauenfries" relief from Thebes, estimates that a necklace of *conuli* would weigh almost 400 grams, a hefty piece of jewelry to wear around the neck, but not out of the realm of possibility.[151]

Iakovidis claimed that *conuli* were attached to the tassels of women's dresses and acted as dress weights, and depictions of women on frescoes as well as the finds from his

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[145] Andersson Strand and Nosch 2015, 353.
[146] Iakovidis 1977, 116.
[147] Carington Smith 1992, 686; Tsountas 1897, 174.
[148] Konstantinidi-Syvridi 2014, 147-149
[149] Carington Smith 1992, 686.
[150] Hallager 2012, 357.
[151] Carington Smith 1992, 686.

excavations at Perati (Tomb 16) make a strong case for his argument, although the location of the steatite whorls below the knees of the skeleton is rather atypical in Mycenaean burials.[152] Carington Smith reports that some examples from Nichoria showed signs that the *conuli* were threaded in some way, leading her to support Iakovidis' suggestion that they were dress weights sewn onto the hem of a skirt or kilt (fig. 23).[153] That *conuli* could be spindle whorls was for a long time thought to be unlikely; light whorls were usable, but too difficult to work with because the weight of the whorl was not sufficient to keep the spindle spinning. Carington Smith draws the line between spindle whorls and *conuli* at 10-12 grams, but the experimental archaeology carried out by the Centre for Textile Research clearly shows that it is entirely possible to spin high quality yarn with small whorls weighing only 4 grams.[154] In early Islamic times in the Middle East, whorls weighing less than one gram were used to spin cotton and silk, so it is unwise to rule out the possibility that any of these whorls could have been used for spinning yarn.[155] That being said, it should also not be ruled out that these objects served multiple purposes, first as a spindle whorl, and then as a dress weight or some other form of ornamentation. One type of whorl, which Furumark and Iakovidis classify as "shanked," might be exclusively a dress weight.[156] There are only two shanked whorls from Eleon, one of green steatite (**165**) and the other possibly of white stone or bone (**166**); both have extremely small perforations of only 2-3 mm in diameter. Robert Liu, in his world-wide investigation of spindle whorls, claims that the

[152] Konstantinidi-Syvridi 2014, 146.
[153] Carington Smith 1992, 685-686.
[154] Andersson and Nosch 2003, 202-203.
[155] Liu 1978, 90-91.
[156] Furumark 1941, 89; Iakovidis 1977, 114.

smallest whorl perforations anywhere are between 3-4 mm in diameter,[157] and Barber argues that "one would need excellent reason to assign an object to the category of whorl if its hole fell outside the range of 3-10mm in diameter."[158] It seems acceptable therefore, to assign these two objects the designation of dress weight rather than whorl.[159]

Linear B evidence from Knossos shows that 100,000 sheep were under the control of the palace, all of which would produce about 37,500 kg of cleaned wool every year. Andersson and Nosch estimate that about 20 metres of thread could be spun in one hour, and thus that the wool from the Cretan sheep could produce between 146,250 km and 525,000 km of yarn annually, depending on the thickness of the thread produced.[160] With that much yarn to be spun, it becomes more plausible that "thousands of spindle whorls must have been in daily use including whorls of different weights and sizes for the different types of thread needed."[161] Only in rare instances is it possible to firmly rule out a *conuli* as a spindle whorl, so with this evidence in mind, *conuli* have not been placed in a separate category from the other, heavier whorls, and will be regarded as textile production tools in this analysis of the material from Eleon.

Something else?

Whorls act as flywheels, allowing the spindle to spin with less effort from the human operator.[162] Was this principle applied for purposes other than just the spinning

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157 Liu 1978, 97.
158 Barber 1991, 52.
159 Rahmstorf 2008, 297. "Conuli with concave or flat-concave profile and stem-shaped perforation channel are most often of light weight and were possibly used only as beads."
160 Andersson and Nosch 2003, 200-201.
161 Hallager 2012, 357-358. Not to mention any wool obtained from sheep not controlled by the palace.
162 Firth 2015, 154-158. The spin of a whorl can be explained mathematically by calculating moments of

of yarn? It is possible that the Mycenaeans employed spindle and whorl for use as a cord or pump drill. Drills are used to bore holes into wood, stone, or some other material using pressure caused by the rotation channeled down the spindle. The rotation is either produced manually by turning the drill or aided mechanically in some way. For a cord drill (figs. 24-25), a drill bit is attached to the bottom of the spindle, and at the top a string is attached, and then twisted around the spindle in such a way so that when the ends of the string are pulled the drill begins to spin. A pump drill (fig. 26) is set up in a similar way, but with a horizontal crossbar attached to either end of the string, for an even easier spin. Evely claims that the pump drill is a post-Bronze Age invention, though the design is so simple it seems strange to assume that people in the Bronze Age could not have developed this technology.[163]

It seems entirely possible that the same technology could be used for fire-starting. Without a stone drill bit, a cord or pump drill creates friction between the end of the wooden spindle and another piece of dry wood. The process is essentially a mechanized version of rubbing two sticks together. The drills make fire starting quick and effective. A hobbyist from Australia recorded himself creating both a cord and pump drill from sticks and clay, and then using both to start a fire. In his blog, the hobbyist, only referred to as "Primitive Technology," stated that the cord drill was more effective than the pump drill, and was "a good method of making fire without getting blisters."[164] The use of whorls as fire-starters in the Mycenaean period is speculative, but it seems entirely plausible. In domestic contexts, spinning thread and starting fires could be

inertia (a property of matter).

[163] Evely 1993, 77-85.

[164] Primitive Technology. "Cord Drill and Pump Drill." *Primitive Technology* (blog). January 22nd, 2016. https://primitivetechnology.wordpress.com/2016/01/22/cord-drill-and-pump-drill/ These methods were also used by First Nations peoples such as the Inuit and Iroquois, see Hough 1890.

accomplished with a single familiar tool.

Decorated Spindle Whorls

A spindle whorl can be decorated on its top, bottom, or sides. Rarely with paint, whorls are usually decorated with incised lines and geometric shapes, such as chevrons or concentric circles. Decorated whorls are more common at Anatolian sites like Troy than on the Greek mainland.[165] It is sometimes the case that script characters are inscribed on whorls; one example of such an inscription is from the tenth century BCE at Çatal Hüyük (fig. 14). Written in the Phoenician alphabet, it states, "This produces spun yarn."[166] Similarly, there are examples of inscribed whorls from Spain in the later half of the first millennium; unlike the Phoenician example, these bear no repeating characters and were perhaps used for practice by students learning the Iberian alphabets.[167] Inscribed whorls from the Bronze Age are not as well documented as in later periods. Some Trojan whorls have been thought to bear Linear A ideograms, but these date to the EBA levels at Troy, making them either the earliest examples of the Minoan script or, more likely, their inscriptions bear only a "superficial visual resemblance" to Linear A.[168]

Only a small sample of Eleon's spindle whorls are decorated; six whorls, all ceramic, are incised with simple lines or patterns. Three of these have parallels from Thebes' Kofini plot, which dates to a very advanced phase of LH IIIB2.[169] Both **065** and **070** have nearly identical patterns: concentric circles running around the central

[165] Guzowska *et al.* 2015
[166] Gervirtz 1967. This inscription should also put to rest any doubts that stone whorls were primarily for textile production.
[167] Ferrer i Jané *et al.* 2011.
[168] Rahmstorf 2015, 4-5.
[169] Alberti *et al.* 2012, 89.

perforation, with triangles or chevrons opening out from the centre. Both of these objects have been catalogued as biconical whorls, but in some typologies they might be considered conical whorls with rounded tops. A similarly patterned whorl fragment was recovered during the Eleon survey; labeled **G168.NT.2 2009,** it appears to be a more squat, biconical, whorl than the examples from the excavation, but was found in an area with a high concentration of Mycenaean sherds just off of the acropolis, on the exterior side of the polygonal wall.[170] A biconical Theban whorl, **38-2** (fig. 18), from the Kofini plot bears a similar pattern, but unlike the Eleon examples (fig. 19), the pattern does not extend past the waist of the whorl.[171] The other incised whorl from Eleon that has a connection with Thebes is **077** (fig. 21), with one incised concentric circle around the piercing and incised lines stemming out from the circle to the edge of the whorl, which is delineated by another incised circle. The shape might be called biconical with a rounded bottom, or spherical. The Theban whorl, **40-2** (fig. 20), also from the Kofini plot, has nearly the same shape and pattern.[172]

Only three other whorls have any sort of decoration on them. **066** is a ceramic biconical whorl; the bottom has two concentric circles around the central hole, and concentric semi-circles drop down from the waist. **113** is a reworked Grey Minyan base, pierced through the centre, with an incised spiral beginning at the centre and moving outwards to the edge. Reworked sherds and pierced discs and their connection to textile production will be discussed in more detail below. **068** is interesting; deep incisions spiral down longitudinally from the piercing on one end of the bicone to the other.

Why would such a utilitarian tool like a spindle whorl be decorated or incised? A

[170] Aravantinos, Burke, Burns, *et al.* 2016, plate 9.
[171] Alberti *et al.* 2015, 280-282, Fig. 6.10.4.
[172] Alberti *et al.* 2015, 280-282, Fig. 6.10.4.

simple, yet thoughtful answer is offered by Elster *et al.* in their discussion of incised spindle whorls from Chalcolithic Sitagroi: "An incised whorl reflects the investment of extra thought, effort and time, but is no more effective as a tool than an unadorned example... The incisions perhaps may convey a self-conscious and symbolic message of pride; pride in the tool which a skillful spinner employs to practise his/her craft."[173] It is not difficult to imagine that a well-made whorl of polished green or purple steatite, of which Eleon has many more examples, would have conjured similar feelings in the mind of its user just as any new, good quality tool or toy would.

Typology and Chronology of Spindle Whorls

Typologies of Bronze Age spindle whorls are woefully wanting. Furumark in 1941 published a simple typology (fig. 15), dividing clay and steatite "buttons" into only three categories: conical, concave, and shanked.[174] Clearly, this does not cover the many variations of shapes that whorls can take. In 1977 Iakovidis' new typology (fig. 16) added only two more categories, notably splitting conical and biconical whorls into two separate shapes.[175] Jill Carington Smith in 1992 created a typology of whorls and *conuli* from Nichoria, relying heavily on Trojan examples as well. Her typology is broken up into twenty-five categories, exemplifying the staggering variation in the shape of Late Bronze Age spindle whorls.[176] Andersson Strand and Nosch in 2015,[177] using Carington Smith's and other typologies, placed spindle whorls into eight broader categories with variations (fig. 17), and these are the categories in which the Eleon tools have been

[173] Elster *et al.* 2015, 302.
[174] Furumark 1941, 89-91.
[175] Iakovidis 1977, 114.
[176] Carington Smith 1992, 676-680.
[177] Andersson Strand and Nosch 2015, 148.

catalogued. There are problems with this typology as well. The somewhat rudimentary illustrations of whorls in both Andersson Strand and Nosch's and Carington Smith's works make it sometimes difficult to properly categorize whorls, and oftentimes a whorl could be placed into more than one category.

Shape, however, is not the most important factor for the actual production of yarn; experimental spinning tests performed by the CTR (fig. 22) found that weight, as well as fibre quality, were the main factors that affected the final product, while the height was only of "minor importance."[178] In general, lighter whorls were shown to produce lighter thread types, and heavier whorls spun heavier, thicker yarn. The diameter of a whorl is also important, as it affects the spin and moment of inertia; a large diameter was also found to be preferable when spinning flax, as it prevented linen threads from slipping off the spindle.[179]

Spindle whorl shapes are not easily differentiated by time, since many different whorl types were in continuous use since the Neolithic period. No new whorl type appears in Greece to mark the beginning of the Mycenaean period; instead, shapes from the Middle Helladic period continued in use.[180] Stone whorls, usually made of steatite, are common at most Mycenaean sites during the palatial period, although they originated on Crete much earlier.[181] Crete has at least six deposits of steatite, which were being fully utilized by EM II and throughout the Minoan period. Although steatite whorls are not exclusive to LH III, the Mycenaean presence on Crete starting at the beginning of this period may have played a role in their popularity on the mainland. The

[178] Olofsson *et al.* 2015, 77-87.
[179] Olofsson *et al.* 2015, 80-81, 87.
[180] Carington Smith 1975, 419-420.
[181] Rahmstorf 2008, 297.

steatite whorls from Eleon seem to fall into a LH III date range; although many are from mixed contexts, some stone whorls came from secure LH IIIC Early destruction levels, suggesting their use in the palatial and post-palatial period. Others have been found in mixed deposits with other material dating to LH III. Terracotta whorls never died out, however; at Thebes, for example, they outnumber stone whorls in LH IIIB2 Late contexts, and continue to appear in IIIC Early and Middle contexts as well.[182]

Spindle Whorls from Eleon

There are 53 complete, or nearly complete, spindle whorls that have been found during the excavations at Eleon, out of 83 total stone and clay whorls. Of the 53, the most frequent shape is conical (46%), then biconical (31%), convex (similar to conical but with a rounded bottom, 9%), and cylindrical (6%).[183] These figures create an interesting contrast with the percentages of whorls from the CTR database, which found that the most common shape across sites in the eastern Mediterranean (excluding the massive hoards found by Schliemann at Troy) was biconical (27%), then cylindrical (25%), and conical (17%).[184] At Thebes, at least in the palatial phase, conical whorls also seem to be the dominant shape for both stone and clay whorls.[185] Whorl shape does not play a role in the quality of the thread produced, but the shapes at Eleon are common across the eastern Mediterranean. The shape of a whorl may not be as informative as the weight and diameter, but whorls are almost always categorized by shape. Early scholarship treated whorls like pottery, organizing them by shape, and this tradition

[182] Aravantinos *et al.* 2015, 281, Fig. 6.10.2.
[183] These numbers exclude pierced discs.
[184] Firth 2015, 157. If Troy is included in the percentages: biconical (39%), cylindrical (16%), conical (13%)
[185] Aravantinos *et al.* 2015, 288.

carries on into the present day. The data does not reveal the reason behind the use of different shapes, it can only indicate the frequency in which the shapes appear in the archaeological record. It is still useful, however, to organize textile tools by shape so that the scholarship is consistent, as long as weight and dimensions are reported as well.

Since the weight of a spindle whorl is the most important factor for determining the size of thread they produce, it appears that much of the Eleon material was focused on producing thin, fine thread. All of the stone whorls, and a majority of the clay ones are less than 40 grams in weight. Spinning experiments at the CTR had two spinners use three different whorl weights – 4 g, 8 g, and 18 g – to spin wool and flax samples into yarn (fig. 22). The experiments found that the weight of the whorls and the quality of the fibres had more impact on the outcome of the yarn than the spinner herself, since two spinners produced roughly the same amount of thread when using the same fibres and whorls of equal weight.[186] It was also found in the experiments that a spindle whorl as light as 8 grams was suitable for spinning flax fibres into linen threads, but that the wider diameter (24mm in the tests) was preferable as the flax fibres tended to slip when smaller whorls were used.[187] This indicates that many of the Eleon whorls could have been used for linen production in addition to wool, as only five whorls have a diameter of less than 21 mm (fig. 47). Although today the area around Eleon is quite dry, Strabo reports that in antiquity marshes were situated close to Eleon, which derived its name from the Greek word for marshes, *hele*.[188] Since flax grows well in heavily watered areas, and the spindle whorls from the site are appropriate for flax spinning, it should not be

[186] Olofsson *et al.* 2015, 77-87.
[187] Olofsson *et al.* 2015, 77-79, the experimental whorls were reconstructed from three examples from Carington Smith 1992, nos. 2605, 2656, 2647.
[188] Strabo 9.2.12; 9.2.17; Aravantinos, Burke, Burns *et al.* 2016, 306.

ruled out that linen was being produced at Eleon, although there is no direct evidence.

Textile Production in the Northwest Quadrant at Eleon

Roughly half of all of the Eleon whorls were found in the northwest trenches (0.14 per m^2), and there is an abundance of evidence to suggest that the textile production was occurring here, especially in Rooms 3 and 4. Six ceramic spools were found together in Room 4, and nearby to the west a nearly intact stirrup jar, spindle whorls, and the so-called "spindle stands" were all found.[189] These items could have served a function for the production of textiles. The presence of a stirrup jar could indicate treatment of yarn with olive oil, a practice known from both the Linear B records and later literary tradition.[190] The spindle stands will be discussed in more detail, but could have been utilized for textile production as well.

In many ways Eleon's northwest complex shares similarities with the possible textile workshop or wool clearing house from the Soteriou-Dougekou plot at Thebes. In an adjacent room, Room 1 (NWB2d, NWB1b), a clay *larnax* or "bathtub" was found in situ, with similar dimensions to the bathtub found by Spyropoulos at Thebes, theorized to have been used for wool washing.[191] The pottery assemblage from the Thebes "bathroom" also has similarities to the finds around the Eleon bathtub; at Thebes, the remains of "plain drinking ware and many storage vases" were recovered,[192] and at Eleon, kylikes and deep bowls along with a jug were found.[193] The Eleon pottery is well decorated however, since the northwest complex is of a more domestic nature than the

[189] Burke *et al.* 2012, 3.
[190] Shelmerdine 1995, 99-107; Alberti *et al.* 2012, 95-96.
[191] Thebes bathtub: 1.18 x 0.575 m at rim, Eleon bathtub: 1.0 x 0.5 m. Shelmerdine 1997, 388, n. 8; Burke *et al.* 2013a, 14; Spyropoulos and Chadwick 1975, 13-14.
[192] Alberti *et al.* 2012, 95-96.
[193] Burke *et al.* 2013a, 14.

workshop at Thebes, and the presence of cooking pots and storage vessels suggests food processing and storage there. It is hardly inconceivable that a large household basin could have had multiple functions.[194] The pottery indicates that this area dates to the destruction at the end of LH IIIC Early, built upon an earlier LH IIIB2 layer, while the Thebes bathroom dates to LH IIIB2 exclusively. This is not an argument that the building(s) in the northwest at Eleon is a textile workshop; it is an elite domestic space, but it shares characteristics with a building from Thebes that was involved in the textile industry. Rooms 3 and 4 in NWB2c, especially, have direct evidence for textile production.

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[194] Burke *et al. 2013b, 2.*

V

Looms and Loomweights

Loomweights are among the most common archaeological evidence for weaving in the Bronze Age since they are usually the only piece of the loom that was made from non-perishable materials. Made from clay or sometimes stone, loomweights were designed to keep the vertical warp threads of a loom taut (fig. 28), while the weaver passed the horizontal weft threads through them. Loomweights were used with one specific form of loom, the warp-weighted loom (fig. 27). The warp-weighted loom seems to have been the preferred loom type in Europe and Anatolia since its conception, while other types of looms, such as the horizontal, are more prevalent in Egypt and the Near East. The Minoans also used warp-weighted looms, which, like so much of Minoan culture, could have influenced the wider Aegean world, including the Mycenaeans. After much experimental archaeology and analysis of loomweights from the eastern Mediterranean, researchers can estimate the different types and sizes of thread that various loomweights would have supported. Loomweights are not numerous at Eleon, but several different types are represented. Using the parameters set by the Centre for Textile Research, the Eleon weights have been categorized by type, and the thickness and weight have been recorded along with the other dimensions. In some rare cases loomweights were stamped with symbols, which are not fully understood, and Eleon's weights seem to have parallels to other Mycenaean sites.

Looms and Weaving in the Bronze Age

While the tradition of the warp-weighted loom was dominant in Europe during the Bronze Age, Egypt and the Near East were using another type of loom, known to us as the horizontal loom. The horizontal loom is first depicted during the fourth millennium BCE in Neolithic Egypt, although it is more probable that the technology spread from the Fertile Crescent down into Africa and India.[195] Horizontal looms were placed low to the ground and required at least two individuals to operate; in this regard, the warp-weighted loom is advantageous because it requires only one weaver. It probably developed in central Europe early in the Neolithic period, and its popularity spread throughout the rest of the continent. In fact, its use continues today in some parts of Scandinavia, an unbroken tradition since the Bronze Age.[196] The earliest evidence for the warp-weighted loom comes from Early Neolithic sites in Hungary; sites belonging to the Körös culture have produced examples of postholes with heaps of clay loomweights situated nearby.[197] Çatal Hüyük in Anatolia has also produced early loomweights from the beginning of the sixth millennium, but despite the close dating of the loomweights from Anatolia and Central Europe, Elizabeth Barber prefers a Hungarian origin for the warp-weighted loom. She argues that the Danube was a centre for the progress of fibre arts and that Europeans knew practices such as the use of sheds and heddles long before they appeared in the east.[198]

Despite its simplistic aesthetic, the warp-weighted loom is a complex piece of machinery that was nevertheless accessible to a large swath of the population. The main pieces required in constructing a loom were two large posts that could be leaned against a wall, and a crossbar that connected them at the top. The thread would be wrapped

[195] Barber 1991, 83-91; Hoffman 1964, 333-336.
[196] Hoffman 1964; Andersson Strand 2015, 52.
[197] Barber 1991, 93.
[198] Barber 1991, 112-113.

around the crossbeam, and the warp thread would hang down close to the ground. Loomweights were attached to the warp thread, and sometimes one weight could hold multiple strings. The weft thread would be held by the weaver and fed in between the warp threads. The weft would then be "beaten" into place with a "beater," a small tool made of bone or wood, which pushes the weft securely into place. Adding smaller rods, known as shed bars, creates different sheds or heddles, which allow the weft to pass through warp more easily. Usually two or more rows of loomweights exist, on either side of the heddle bar. Once the weft has passed through the warp threads, the heddle bar is pulled backwards and the warp threads in the back row are brought to the front, and *vice versa*. Elaborations and variations exist on a warp-weighted loom. It is most preferable to use four rows of loomweights in order to weave a common 2/2 twill weave (the weave used in most experimental archaeology for the study of ancient textiles).[199] The warp-weighted loom offers many advantages, including the separation of warp into more than one shed, allowing for the production of denser textiles as well as different pattern variations. Warp threads can also be made longer, as excess thread can be bunched up with the loomweights.[200]

Loomweights and Ethnicity

Because of the conservative nature of textile production, changes in type or style of loomweights can sometimes be interpreted as cultural identifiers, though this cannot always be the case. Barber gives an example for the spread of a distinct Anatolian loomweight that was in use in the Early and Middle Bronze Ages in southeastern

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[199] Andersson Strand 2015, 52-54. Carington Smith 1992, 675.
[200] Andersson Strand 2015, 54-55.

Turkey, which, in MBA II, began to appear at sites in the southern Levant. Since the type had been unique to Anatolia and the warp-weighted loom was not in use anywhere in the Near East, Barber concludes that the presence of these loomweights in Israel point to a migration of weavers from somewhere in Asia Minor, who brought with them the weaving traditions of their homeland. Interestingly, no loomweights of this type have been recorded in the area between Israel and eastern Turkey, which leads Barber to assert that the migration in MBA II occurred by boat.[201]

Ethnic associations with loomweights can also be drawn between a number of different types of loomweights and the island of Crete and the Minoan civilization. Spherical weights are only found on Crete, primarily during the Neopalatial period, between the later Middle Minoan period and Late Minoan II. About the size and shape of an orange, Minoan spherical loomweights are balls of clay, perforated through the centre, and often quartered by impression marks left by the yarn tied around the weight. While appearing frequently on Crete, spherical loomweights do not occur at any other settlement within the Minoan sphere of influence such as Thera, Kea, Kythera, or Rhodes. Because of their exclusivity to Cretan sites and their association with palatial workshops, it was suggested by Burke that these weights were specifically for textiles for the ruling Minoan elites at Knossos, and thus there was no need for their export off of Crete.[202]

Another type of Minoan loomweight that *does* occur frequently off of Crete is the Minoan discoid weight, dating from EM II until LM III. In her 1975 dissertation, Jill Carington Smith argued that Minoan discoid weights were as culturally Minoan "as

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[201] Barber 1991, 299-303.
[202] Burke 2010a, 51-55; Burke 2003, 195-197.

double axes or horns of consecration, and when found beyond Crete may be considered as an indication of Minoan presence."[203] These weights are recognizable by their oval or pear shape, with the piercing located near the top. A large deposit of discoid weights was discovered by Sir Arthur Evans at Knossos during his excavations of the Old Palace at the turn of the twentieth century in a room that has been dubbed the Loom Weight Basement. What is interesting about this deposit is the uniformity; most examples were close in weight (127 grams to 205 grams) and dimensions (9 or 10 cm in height by 7.5 to 8.5 cm in width), suggesting an "attempt at regularized textile tools."[204] Unlike the spherical loomweights, which were limited to Crete, Minoan discoid weights dominate minoanized areas off of Crete, such as Keos, where Minoan weaving technology was prevalent by LC I.[205] Minoan discoid weights appear in Mycenaean contexts outside of Crete at a slightly later date, between MM IIIB and LM IA. At Nichoria in Messenia, twelve loom weights had been recovered by 1992; two were proper Minoan discoid weights dating to LH II or possibly LH IIIA1; the other ten were of a similar type, but originated from the Greek mainland.[206] The presence of Minoan weights at sites across the southern Aegean is an indication of the spread of Minoan technology; Carington Smith suggests that the people of mainland Greece did not use a warp-weighted loom as their primary weaving technology, perhaps using instead a horizontal two beam loom, which would not leave any archaeological traces.[207] Thus the presence of Cretan-style loomweights at sites all across the southern Aegean may indicate the introduction or reintroduction of the warp-weighted loom, which would slowly make its way to the

[203] Carington Smith 1975, 276.
[204] Burke 2010a, 56-57.
[205] Burke 2010a, 58.
[206] Carington Smith 1992, 687-688.
[207] Carington Smith 1992, 689-690.

Greek mainland by the Late Helladic period.[208]

Mycenaean loomweights have been found in Philistine contexts in Israel, supporting the idea of a Mycenaean migration to the southern Levant at the end of the Bronze Age. The clay spools that appear at Eleon and sites across Greece in LH IIIC have parallels from the Philistine sites of Ashdod, Ekron, and Ashkelon, sometimes in large numbers. At Ashkelon, several groups of spools were found. The first had 71 examples, the second had 52, and the third yielded over 150 examples. In some of these instances the spools were found *in situ* in a row along a wall with linen fibres, further supporting the evidence that these objects should be identified as loomweights. The appearance of loomweights does seem indicative of some sort of cultural shift, since prior to this period loomweights are unknown in Israel. This is probably due to the fact that this area was using a type of loom that did not require the use of weights, probably an Egyptian style horizontal loom.[209]

Lorenz Rahmstorf is more skeptical of these changes in weaving technology as representing an ethnic migration out of the Aegean, especially since spools also appear at similar times in Anatolia and Crete as well as Cyprus and Central and Eastern Europe: "the emerging picture does not easily support a diffusion of this class of objects from the west (Aegean) to the east (Cyprus, Levant)."[210] A more likely explanation for the spread of these artefacts (which will be discussed in greater detail below) is that they were a new, "superior" form of weight, as has been shown through experimental archaeology, and cheap to produce, especially since most spools were made of unbaked clay.[211]

[208] Cutler 2012.
[209] Yasur-Landau 2010, 267-270; Georgiadis 2003, 10-11.
[210] Rahmstorf 2005, 159; Rahmstorf 2003.
[211] Olofsson *et al.* 2015, 92-95.

Loomweights from Eleon: Spools

There are two distinct groups of spool-shaped loomweights from Eleon, the earlier, perforated type, and the imperforated, LH IIIC type. The latter group is by far the more commonly occurring, outnumbering perforated spools 7:1. There are two perforated spools from Eleon, both of which are badly damaged and incomplete, and it would therefore be difficult to draw many conclusions from them. Both are ceramic, lightweight, and have a black exterior; they are perforated lengthwise, and flare outwards on both ends, resembling a modern bobbin or spool. Carington Smith suggests that these spools or "reels" were used on a spool rack or warping-frames similar to ones used in Egypt on the horizontal ground loom. Up until the mid-twentieth century in modern Greece similar objects called *διάστρες* were used to prepare the warps on a horizontal pedal loom.[212]

The second type, the imperforated, unbaked spools of the LH IIIC period, have already been discussed in terms of their connection with wider Late Bronze Age migrations, but more can be said specifically about the fourteen Eleon spools. It has for some time been a subject of dispute as to the exact function of these so-called spools. Heinrich Schliemann recorded finding spools at Tiryns during his excavations. Although he does not provide the weights of these objects, he asserted that they were loomweights.[213] One of these weights was drawn and recorded with two linear impressions on one end of the spool;[214] a similar feature occurs on **005** at Eleon. These markings might be an impression left from yarn once wrapped around the spool.

Evely, in discussing the clay spools from Lefkandi, mentions that they were for a

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212 Carington Smith 1975, 404-410.
213 Schliemann 1886, 146-147.
214 Schliemann 1886, woodcut No. 71.

time thought to be just an effective way of storing clay in usable amounts. The Lefkandi spools are similar in many ways to Eleon's. They can be grouped by shape as "cylindrical" and "waisted," although it is unclear if these distinctions have any bearing on the weaves produced. However, not all weights and sizes are given. Evely notes that the average spool was between 3-3.5 cm thick and weighed around 150 grams, but he notes that others were closer to between 30-40 grams, and some as much as 350 grams. While not exact, all of the Eleon spools lie within the Lefkandi examples' range.[215] Lefkandi is not far from Eleon, only a short distance to the coast and across the water, and it has been found that the two sites have many similarities during LH IIIC, so it therefore unsurprising that spools occur at both sites at the same time (LH IIIC Early, Phase 1b at Lefkandi).

At Thebes, another important site in relation to Eleon, 11 spools have been reported in secure contexts (figs. 34, 35). The earliest appears in LH IIIA2, but the majority of them occur in IIIB Late, while Eleon's spools are from the burnt destruction at the end of LH IIIC Early. However, the Thebes examples are very similar in weight and thickness to the Eleon spools. Neither group includes spools thicker than 50 mm, and they are mostly between 30-150 grams. These lighter weights would be best suited for extremely fine thread, so it is debatable whether or not the spools under 50 grams could have functioned as loomweights. If they did, they would have required very fine thread, but this is consistent with the number of lightweight spindle whorls at Thebes, which produce finer threads.[216]

One explanation for the lighter spools could be their use in "tablet weaving" to

[215] Evely 2006, 296-298.
[216] Alberti *et al.* 2015, 288-291.

create cloth bands and belts (fig. 32). Barber has proposed that the clay spools of the Aegean could have been used to weigh down thread in a similar way to a traditional Japanese style of braiding known as *kumihimo*.[217] *Kumihimo* uses several threads of the same size each tied to a spool on one end, and the other end of all the threads is tied to a single counterweight. The table used for this style of braiding is called a *marudai*, a small round table with a hole in the centre in which the braid is created. While the strings are hung over the sides of the table and are weighted down by the spools, the threads are passed over each other to create the pattern (fig. 33). Even modern versions of *kumihimo* bobbins look remarkably similar to the Aegean spools, despite being made of wood rather than clay. It may not be that this was the exact use of the lightweight clay spools, but it does suggest that the shape was useful in other ways besides on the warp-weighted loom. Other types of tablet weaving have also been suggested for the use of spools, which make use of banding/plaiting. Another method involves several thin tablets or 'cards' of bone, leather, or wood that have four holes to thread the warp through, and the small spools are tied at the end to keep the warp taught.[218]

Linda Olofsson, working with spools from Khania on Crete, tested the functionality of spools as loomweights. Two sets of spools were reconstructed based on examples from Khania. The first was a set of "large spools," with a thickness of 5.5 cm and a weight of 280 g, the second was a set of "small spools" about 4 cm thick and 105 g. No large spools have yet come to light at Eleon. The heaviest complete spool is only 111 grams, and most of the other examples are significantly lighter than Khania's "small spools." However, the experiment found that when using a set of 16 large spools –two

[217] Barber 1997, 515-516.
[218] Andersson Strand 2015, 57; Barber 1991, 118-122.

rows of eight, with the width of the rows being 46 cm each– that the textile produced was perfectly suitable and created "an open and rather balanced fabric, giving a transparent impression" (fig. 29).[219] It should be noted that although the people performing the experiment are all textile experts, the Mycenaeans weaving in this fashion would have spent their entire lives honing their skills, so the quality of their work may have been higher than can be produced by anyone living today. The "small spool" experiment has more relevance to the Eleon spools, which all fall within or below the reconstructed spools' dimensions. Twenty-four small spools were reconstructed, in two rows of twelve spanning 48 cm (fig. 30). The experiment used very thin yarn that required only 10 grams of tension to be suitable for weaving. A similar thread could have been produced on a 4 gram spindle whorl. A second sample was woven with slightly thicker thread from an 8 gram whorl and was used for the weft. It produced a weft-faced fabric, rather than the open fabric from the first sample. Both of the "small spool" samples produced good quality "densely woven and yet thin fabric."[220] This experiment proves that the unbaked clay spools, so common across the eastern Mediterranean in the closing decades of the Late Bronze Age, could have been used effectively as loomweights for the production of fine textiles (fig. 31). The weavers noted that the spool shape was useful for the storing of extra warp, and made the setup of the loom easier than if other weight types had been used. In fact, they state that for thin thread "we actually found the spools to be superior to other shapes... the spool shape was especially efficient when warping and when regulating the length of the warp on the loom." They also noted that the spools functioned well as bobbins (or actual spools)

[219] Oofsson *et al.* 2015, 93.
[220] Olofsson *et al.* 2015, 93-94.

while they rested on the ground during the warping of the loom.[221]

Eleven of the fourteen spools from Eleon come from the Northwest building complex, all from Trench NW B2c, and all are connected to the LH IIIC Early burnt destruction there. Spools **006-010** were all found very close together. Although some are better preserved than others, they all share similar length and thickness. Their weights are slightly varied, but whether reflected their manufacture or their subsequent deterioration over time is unclear. The only two imperforated spools found elsewhere are in the Southwest, one in a probable IIIC Early context and the other in a IIIC Middle trash deposit. It is safe then to say that spools of this type appeared at Eleon in LH IIIC Early, a slightly later date to the spools found at Thebes in LH IIIB2 Late.[222] Both sites are in contradiction to Rahmstorf's assertions that spools only appear in the Aegean in LH IIIC Middle.[223]

Pyramidal Loomweights

Only one pyramidal loomweight has been recovered from Eleon (**025**); arguably, it is also one of the most well-made loomweights from the site. Standing at 7.2 cm tall, and 2.8 cm thick at its base, it has a bright orange fabric with small black inclusions, and most significantly has on its base an impressed X with four dots, one within each space created by the cross. The base does not appear to be stamped, but rather incised or impressed, perhaps like a potter's mark. While Pyramidal types of loomweights have been discovered in contexts as far back as the Neolithic, the Eleon example was found with potsherds from LH IIIB and IIIC. It is also plausible that this weight was mould-

[221] Olofsson *et al.* 2015, 94-95.
[222] Alberti *et al.* 2015, 290.
[223] Rahmstorf 2003,400-402; Rahmstorf 2005, 147.

made based on its shape and similarity to mould-made weights of later periods, such as the Hellenistic.[224]

The EBAP Intensive Surface Survey recovered two loomweights in 2007 atop the Eleon akropolis,[225] so their dates can only be assumed. The first is a truncated pyramidal weight (**B47.3.1**) quite a bit shorter than the example found during the excavation, but with the exact same width at its base. It is dated "classical (?)", but this shape is common in earlier periods as well.[226] The second loomweight (**A48.NT.3**) is referred to as a conical weight, rather than pyramidal, but it is included here because it seems that the only difference between the two types is their horizontal cross-section, which has been found to have no effect on the actual weaving.[227] Despite their difference in appearance, they function the same way in practice. This second example has a preserved height of 6.6 cm and a preserved width of 5.1 cm.

Torus/Doughnut Weights

Torus, sometimes referred to as doughnut or donut weights, are fired clay rings. Although similar to discoid weights, these weights are defined by their more rounded edges and large central piercing. Parallel weights have been found in Viking contexts as well as Iron Age Levantine contexts, but in the case of the Aegean Bronze Age and the eastern Mediterranean, their use as loomweights has been questioned. Doughnut shaped loomweights from the Levant have been suggested to be jar stoppers for alcohol

[224] *e.g.* Sofianou 2011. Though similar to Hellenistic examples, since the Eleon weight was found in the northwest (NWB1b) in a Bronze Age context.
[225] Aravantinos, Burke, Burns *et al.* 2016, 338, Plate 9, 257.
[226] Carington Smith 1975, 225, 447.
[227] Firth 2015, 175.

fermentation.[228] However, in Scandinavia, torus loomweights are very common, so it should not be ruled out that this was the case in the Mediterranean as well.[229] Four torus examples have been found at Eleon, one complete, the remainder all over fifty percent preserved. All of these weights are small and light compared to the 280 g torus loomweight used in Linda Olofsson and M.-L. Nosch's weaving experiments.[230] Could this indicate other uses for this shape? The large perforation might have been for a spindle, since the diameter of the perforation is wider (mean=1.5 mm) than the other loomweights (discoids, for example, mean=1.2 mm).[231] The most interesting torus weight is **020,** because of a rosette stamp on its side. Unlike the pyramidal impressed base, this is a small stamp, impressed into the clay before firing. Stamped loomweights are known from Minoan Crete and have been suggested as a means of organization; whether the images implied ownership, product type, weight, or something entirely different is unknown.[232] Much like the markings on the pyramidal weight, it is still not clear what its purpose might be. The date ranges on all the examples from Eleon, based on the pottery chronology, suggest that they were in use as early as LH IIIA, though all were found in mixed contexts.

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[228] Gal 1989; Rahmstorf 2015, 8.
[229] Andersson 1999; Andersson Strand 2007.
[230] Olofsson and Nosch 2015, 120.
[231] See Barber 1991, Ch. 2; example of wide spindle from Perati, Iakovidis 1980, 95-95.
[232] Burke 1997, 418.

VI

Other Textile Tools

Apart from spindle whorls and loomweights, a number of other types of artifacts have been recovered from Eleon that, either directly or indirectly, may have been utilized for textile production. The most numerous of these are the so-called pierced discs, reworked potsherds that potentially could have been used as spindle whorls. Spinning may also have been the function of three large clay cylinders found in the northwest sector of the site. These very heavy objects have been tentatively labelled as spindle stands due to their weight (the heaviest and most complete example being 1.87 kg) and central piercing, but other functions seem more likely. Finally, a number of bone objects are associated with textile production, mostly possible weaving tools as well as a number of needles. These are also only tentatively considered textile tools, since many are fragmentary or too simple in design to be specifically for a single craft. Metal objects have not been included in this list or in the catalogue, but these could have been used in textile production as well. For example, metal objects could have been used as pins or in linen production during hackling, scutching, or braking.

Pierced Discs

Pierced discs are quite common at Eleon; thirty-three examples and thirteen more that were semi-pierced were recovered during excavation. Most of these objects are rounded, although some were irregularly shaped, with at least one perforation in the centre of the sherd. Of the thirty-three examples of pierced discs from Eleon only ten are complete. Their weight ranges between 16 g to 46 g (mean=29.1 g). While weight can only be estimated for the incomplete examples, thickness and diameter can both be measured for all pierced discs over 50% complete, of which there are 19 examples. In this category, the thickness ranges from 5mm to 29 mm (mean=11.2 mm), and the maximum diameter ranges between 35mm and 83mm (mean=54.5 mm).

The purpose of pierced discs is not entirely clear, but there have been suggestions that they were makeshift spindle whorls.[233] Some have argued that many pierced sherds are not round enough or have piercings too irregularly shaped to be useful as whorls,[234] but examples from Late Neolithic Tabaqat al-Bûma in the Near East seem to indicate otherwise. Using replicas of the pierced discs, it was found that they functioned perfectly well as spindle whorls: "after a very short time even a novice spinner was able to produce lengths of yarn of each kind of fibre. Even the most asymmetrical «whorls» could be used. The low mass of the whorls was not a critical impediment even when spinning flax. Likewise, the hourglass-shaped holes did not create a critical problem [either]."[235] These experiments also found that producing a pierced sherd was not a difficult task. From a potsherd using an unhafted flint tool as a hand-drill, it took less than two minutes to create a usable example.[236] Additionally, two of Eleon's pierced discs and one semi-pierced disc have two perforations. The double piercings suggest that these discs were not spindle whorls, but something different; perhaps they were used as buttons for fastening sacks, baskets or bags.[237]

Pierced discs seem to be prevalent throughout all periods of the Bronze Age, and

[233] Rahmstorf 2008, 296.
[234] *e.g.* Andersson Strand and Nosch 2015b, 356-358.
[235] Gibbs 2008, 91.
[236] Gibbs 2008, 90. The experiments used flint tools, but a similarly shaped bone tool could just as easily have been used.
[237] Evely 2006, 300.

continued to be used into the historical period.[238] Many of the Eleon examples come from mixed contexts or levels that have not yet been securely dated, but there is a potential trend among the ones that have associated dates. Many were found in Middle Helladic or early Mycenaean contexts, or at least in levels where LH I is the latest possible date. Others have been found in contexts with a *terminus post quem* of LH IIIC, which could suggest that these stopgap spindle whorls, if that is what they were, may have been more necessary during times of economic downturn, such as the relatively poor Middle Helladic period, or during the collapse of the palace system.[239] Other sites have reported increases in the number of reworked sherd discs including Tiryns, especially in the Developed-Late phase of LH IIIC.[240] Lefkandi, another site of particular relevance to Eleon, has produced at least sixteen pierced or semi-pierced discs from LH IIIC, and Evely notes that other sites such as Konstanas and Teichos Dymaion also have possible IIIC pierced discs as well.[241] At Nichoria, however, pierced sherds occur with similar frequency throughout the entire Late Helladic period.[242]

Finally, the thirteen semi-pierced sherds from Eleon have a weight range between 9 g and 53 g (mean= 23.15 g); this includes both complete and incomplete examples. If the weights are estimated for incomplete sherds, the range is between 10 g and 106 g (mean=40.92 g). Their thickness ranges from 4mm to 18mm (mean=10.92mm) and their diameter ranges from 37mm to 65mm (mean=52.0mm). It is likely that most of these objects are simply incomplete pierced discs that either broke during production or

[238] Carington Smith 1975, 435; Andersson Strand and Nosch 2015, 356-358.
[239] Dickinson 1977.
[240] Rahmstorf 2008, 296. Plates 7-21; 89, 7-9; 90, 1-3.
[241] Evely 2006, 300, note 92. A good example of the parallels between Eleon and Lefkandi is the use of decorated pottery, Eleon's **115** and Lefkandi's **#10** in Plate 101 are both recycled Mycenaean decorated pottery sherds with central perforations.
[242] Carington Smith 1992, 680, "Type 15" *Sherd Whorls.*

were abandoned before completion. Since they are slightly thinner than the average pierced disc, it could be that thinner discs were more likely to snap while the hole was being bored. In all three examples where the disc was not snapped in half, the piercing was very small and shallow, and slightly off-centre, which would have made them ineffective spindle whorls.

"Spindle Stands"

Three cylindrical objects of unbaked clay with a central hole were recovered from the LH IIIC burnt destruction layer in NWB2c. One is fully complete, the second is mostly preserved but broken in five pieces, and the third is quite fragmentary. The complete example weighs over 1.8 kg, and it is likely that the other two would have had a similar weight if intact, since all three are very close in thickness (6.4cm to 6.7cm), diameter (17cm), and perforation diameter (2.2cm). All three were found in NWB2c, which has produced many different textile tools, and can be securely dated to the end of LH IIIC Early.[243] Similar objects have been found at Lefkandi, although they are slightly smaller and lighter (13-14cm in diameter, 1-1.25kg).[244] Evely considers these to be possible loomweights, but acknowledges that they may be too heavy for such a purpose.[245] He also comments that, "their existence does, however, show that objects of apparent practicality were made from unbaked clay."

Although they have been labeled as spindle stands, their exact function is subject to speculation. Spindle stands are not well known in Greece, and ones that resemble the

[243] Burke *et al.* 2012, 2-3. A copper alloy pin was also found in the same sondage as some of the stands, further suggesting a textile function of the area of NWB2c.
[244] Evely 2006, 297, Plate 99.1-4. All of the Lefkandi "ring weights" were found in Phase 1b (LH IIIC Early) or later contexts.
[245] Carington Smith 1975, 455, also suggests that they could be loomweights, but admits that she did not examine the finds from Lefkandi first hand.

Eleon examples are even more rare; one spindle stand comes from EM Myrtos. Unlike the ring-shaped Eleon stands, it is oblong and not fully perforated; there is instead a deep depression on one side where the end of a spindle would have rested.[246] It therefore seems unlikely that the Eleon objects are spindle stands,[247] but they still could have performed a textile production function. That they might be loomweights is interesting, but it is difficult to imagine that a loomweight weighing nearly two kilograms had many uses. Since heavier loomweights are used with thicker and heavier thread, it is possible that these extremely heavy weights could have been used for tents, sails, rugs, or different textiles other than clothing.[248]

An even more intriguing possibility is their use as thigh-supported spindle whorls, as they bear many similarities to so-called donut stones from the Late Preclassic and Classic periods (250 BCE to 850 CE) of the Mayan civilization in Mesoamerica. Found in mostly household or domestic contexts, these perforated cylindrical stones were initially considered to be weights for spears or farming tools (fig. 36), but more recently it has been suggested that they were actually for spinning yarn and cordage. Using ethnographic data from the Navajo of the American southwest, J.J. Tomasic has interpreted these objects as large spindle whorls for a "supported spinning" technique (fig. 37). This style of spinning is different than the drop spindle method. It requires a much larger spindle and whorl; the spindle is rolled between the thigh and the palm of the spinner, and the heavier weight of the whorl allows for increased momentum. This in turn increases the twist of the fibres, but since the spindle is supported the fibre is

[246] Burke 2010a, 27; Militello 2014, 266.
[247] Unless they supported the distaff and roving, freeing one hand of the spinner for some other purpose, but the cylindrical design of these objects doesn't seem to agree with their interpretation as stands of any kind.
[248] Firth 2015, 166. Only seven loomweights in the CTR database are over 1200 g.

less in danger of breaking.[249] Reproductions of the Mayan donut stones were created for thigh-spinning experiments; it was found that they were effective for spinning long coarse fibres into yarn, but they were equally able to spin that yarn into "two-ply" cordage more than one centimeter in thickness.[250] The dimensions of the Mayan donut stones can vary, but most range between 10-20cm in diameter and 5-10cm in height, fitting the dimensions from the three Eleon cylinders. Given the abundance of textile production tools in NWB2c and the surrounding area, thigh-supported spinning tools would not be out of place.

Bone Tools

Bone tools are not an uncommon item at Eleon, but only a few can be associated with textile production with any degree of certainty. There are really only two categories of bone tools for textile production at Eleon: points and needles. Bone tools, by their nature, are not suited for heavy duty crafts such as metal or wood working, but would serve for work with soft stones or textile production. Needles are most easily connected to the realm of textile manufacturing, since they have retained the same design down into the modern age. Needles are simple, yet nicely polished, bone shafts that on one end come to a fine point, and on the other, have a central eye for yarn to be threaded through. The only needles included in the Eleon catalogue are ones where an eye is present, since otherwise they cannot be differentiated from bone pins. Bone pins are the same basic shape as needles, but are not included in the catalogue since they likely did not play a role in textile production or repair. They are more likely to have been used for

[249] Tomasic 2012, 218.
[250] Tomasic 2012, 224.

holding up and adorning hair.[251]

Eleon has only two securely identifiable needles with eyes, **163** and **164**. **163** has been mended from three fragments, but preserves almost its entire length from point to eye. The needle is broken at the eye with nothing preserved beyond it, so the total length is unknown, but it has a preserved length of 11.1cm. **164** is only partially preserved, but the end with the eye is wholly intact; the eye has a diameter of less than 2mm.

Awls, punches, and points do not necessarily belong exclusively to textile production; they were versatile tools for a variety of crafts, but bone incarnations are more likely to be associated with textiles and other soft materials. Punches are blunted objects that are intended to puncture holes in material - for example, through a sheet of metal to produce a rivet-hole. Awls are pointed but serve a similar function, often for poking holes into harder material such as leather. It is difficult to identify these differences in the archaeological record since, as Evely asks, "is a tool with a slender, rounded tip a punch for delicate tasks or an awl in need of resharpening?"[252] Since these distinctions are not always clear, and since the characteristics of bone limit the number of functions a tool can perform, all of the bone tools in the Eleon catalogue have been labelled as "points." The most likely role that a bone point plays in textile production is as a pin beater. A pin beater is a multi-purpose tool used by weavers to adjust and position thread on the loom, and to pick out misplaced threads. They are called beaters because they are used to beat the weft up to create a tight weave (fig. 37).[253] Five bone points have been catalogued from Eleon, with preserved lengths ranging from 32mm to

[251] Evely 2006, 293-294.
[252] Evely 1993, 86-96.
[253] Rahmstorf 2015, 11-12.

115mm (mean=63.8mm) and thicknesses from 5mm to 12mm (mean=9.4mm). It is also a possibility that some of these examples, specifically **158** and **162**, are not actually bone, but are instead antler, most likely red deer.[254] There is evidence for the use of antler for similar tools at Lefkandi.[255]

[254] Dr. Yin Lam, who has been studying the faunal remains at Eleon, examined both artifacts and he felt that there was a possibility that the tools could have been antler, but he couldn't say for sure.
[255] Evely 2006, 293-294, Plate 93.

VII

Conclusions: Tying it all Together

Where does Eleon fit into Mycenaean textile production? Nearly all preindustrial societies spent a considerable amount of time and effort to produce textiles, and in the Late Bronze Age the Mycenaeans had mobilized a massive textile industry. At the state level, the palaces kept meticulous records of considerable resources and workers under their control, where they were, and what they owed to the palace. The palaces may have administered the industry, but the work was done in the hinterlands. Land was needed to herd sheep and goats, to grow and process flax and other bast fibres, and workers were needed to turn the fibres into a finished product. This is why control of the rural areas and smaller settlements was crucial for the palatial textile industry to function.

While most of the information about textile production comes from the Linear B documents from Pylos and Knossos, it was the palace at Thebes that controlled the land around Eleon. Thanks to tablet TH Ft140, it is undeniable that Eleon was under the Kadmeion's sphere of influence. Some documents about the Theban textile industry have been found, although it is clear that they are not a complete account. They provide enough information to show that Thebes' industry shared similarities with the more well-known systems of Knossos and Pylos. Thebes was a powerful citadel that controlled an area that extended from the Corinthian Gulf to parts of Euboea; it played a leading role in the Mycenaean world and would have required a large textile industry, functioning both in the city itself and throughout its hinterlands, especially eastern Boeotia. The site of Eleon sits atop a hill in the middle of a natural corridor that leads from the shores of the Euboean Gulf to the gates of Thebes; it is in an advantageous spot from which to manage and monitor the flow of trade, providing its inhabitants with some degree of wealth. Eleon is only mentioned on the Thebes tablets in relation to its agricultural capacity, but there is no reason to rule out that it played a part in the Theban state's textile production. Even today, shepherds cross the site with their flocks, and in antiquity the marshes around the acropolis may have provided well-watered soil for growing flax for linen. After the calamity at the end of LH IIIB2, Eleon was able to outlive Thebes and forge new connections across the Euboean Gulf with settlements like Lefkandi; the two sites have many similarities, including their textile tools.

Over one hundred and fifty objects recovered from Eleon between 2011-2016 show that textile production was occurring at the site. While the domestic architecture dates mainly to LH IIIB/C, textile tools have been found from throughout the Late Bronze Age. Spindle whorls are by far the most numerous artifacts with a textile function; the objects, both of clay and stone, indicate that spinning thread was a regular activity being carried out at the site. They came in many shapes and sizes, and some may have served other functions, but there is no reason to doubt that many, if not most, were for spinning yarns of different types and sizes.

Was Eleon a major textile producer for Thebes? Probably not, but there is plenty of evidence to suggest production on a smaller scale. Trench NWB2c and the area surrounding it have produced strong evidence for textile production there in LH IIIB2/C Early. In addition to multiple spindle whorls, several clay spools were found in the area, as well as the large clay cylinders, which may have been used for thigh-spinning.

One of the greatest challenges archaeologically with Bronze Age textile production is the lack of consistency in the scholarship. Schliemann was fascinated with the spindle whorls from Troy, but later scholars often failed to even mention them in their reports. This is slowly changing, and the Centre for Textile Research in Denmark has begun to create a coherent system for recording and publishing archaeological remains of textile tools. A greater degree of clarity, and a shift of focus away from typology will surely benefit the study of these artifacts. Eleon's textile tools are in no way atypical; they represent a fairly average assemblage from a Mycenaean secondary centre. It is reasonable to conclude that Eleon played a productive role in the Theban state and its textile industry, which it continued to do even after Thebes itself ceased to be the dominant power it once was.

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Figures

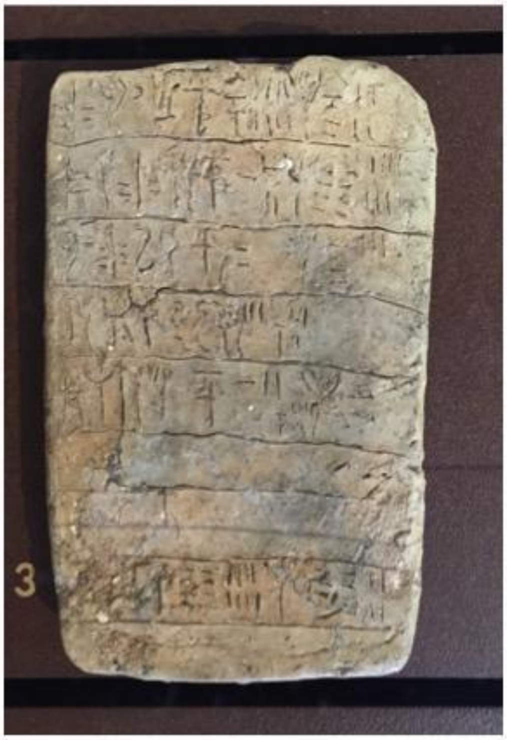


Fig. 1 TH Ft 140 (Photo by: Max MacDonald)

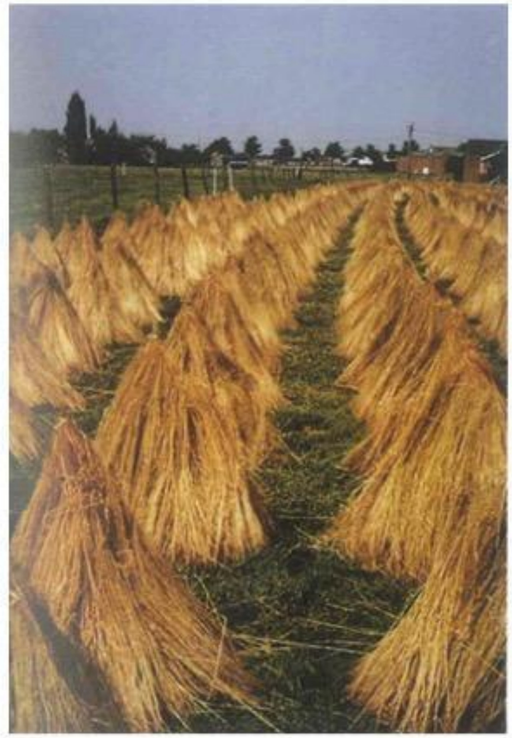


Fig. 2 Flax Dew Retting

Fig 3. Flax Dew Retting

Fig. 4 Retted Flax

Fig. 5 Mouflon, a likely ancestor of the modern sheep.

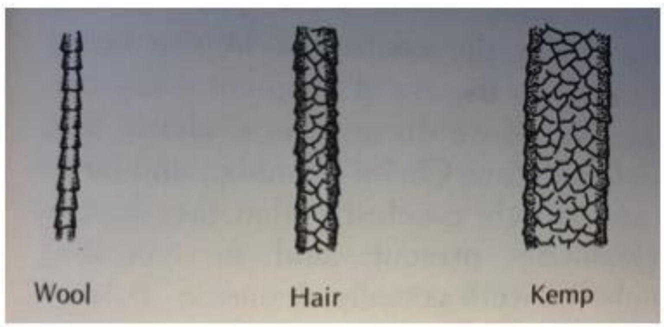


Fig. 6 Microscopic view of different sheep fibres

Fig. 7 Sheep figurine from Tepe-Sarab, Iran, c. 5000 BCE.

Fig. 8
Map of Thebes excavation plots.
1. "House of Kadmos"
2. "Treasury and "Room of Pithoi"
3. "Wool Workshop" (Soteriou-Dougekou plot)
4. "Armoury"
5. Pelopidou Street
6. "Ivory Workshop"
7. Christodoulou, Stamati and Liaga Plots
8. Kofini Plot.

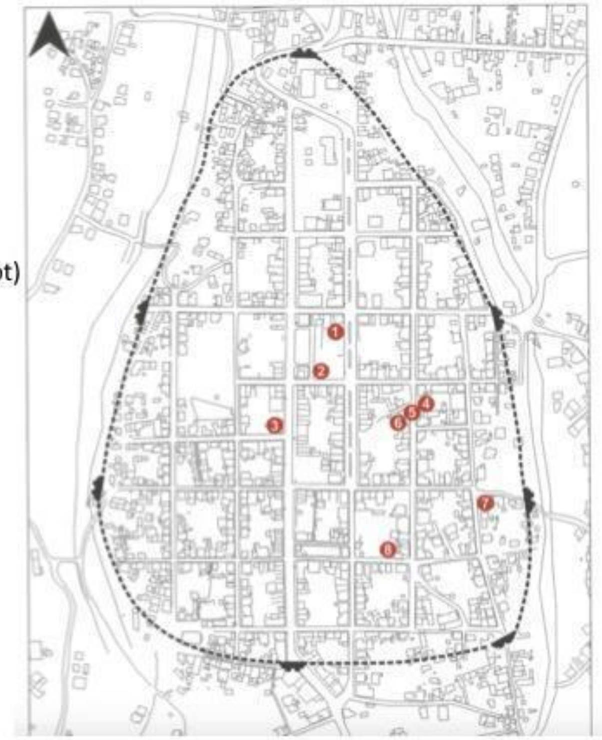


Fig. 9 Map of Boeotia with possible Linear B site names.

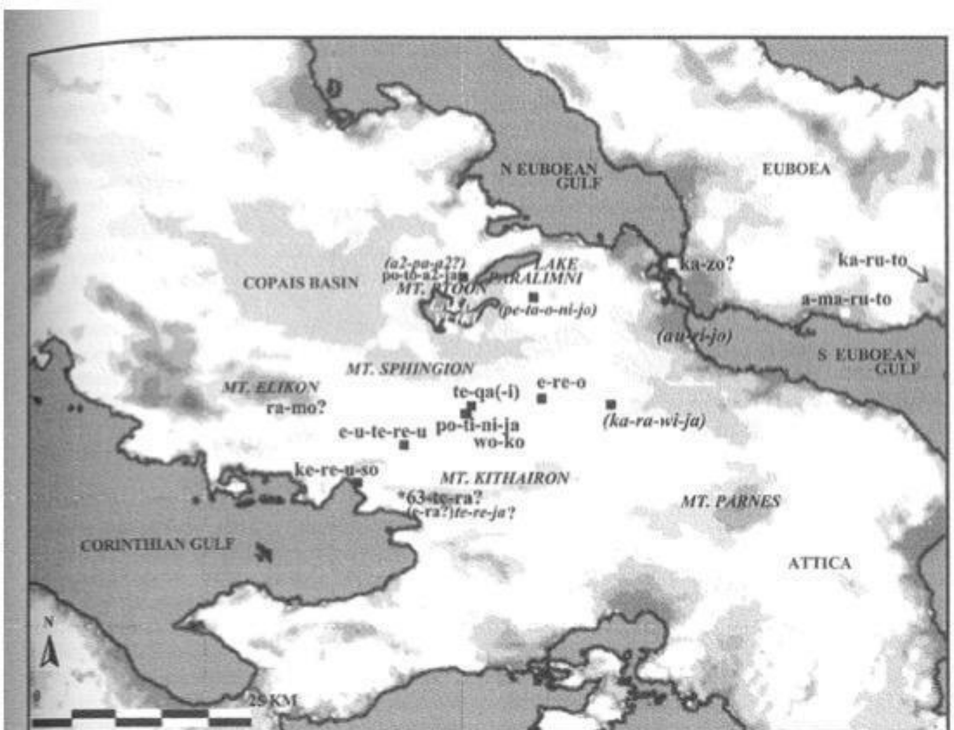


Fig. 1. The Theban state (dubious identifications of Linear B place-names are accompanied by question marks; the parentheses indicate deity/personal names or ethnics deriving from possible place-names).

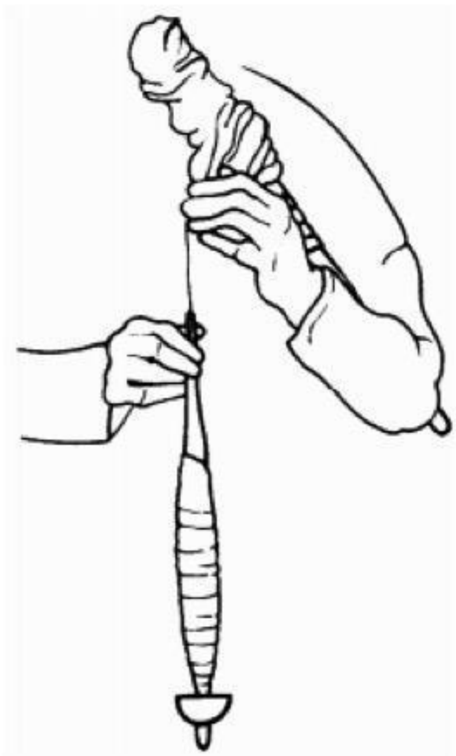


Fig. 10 Example of a drop spindle.

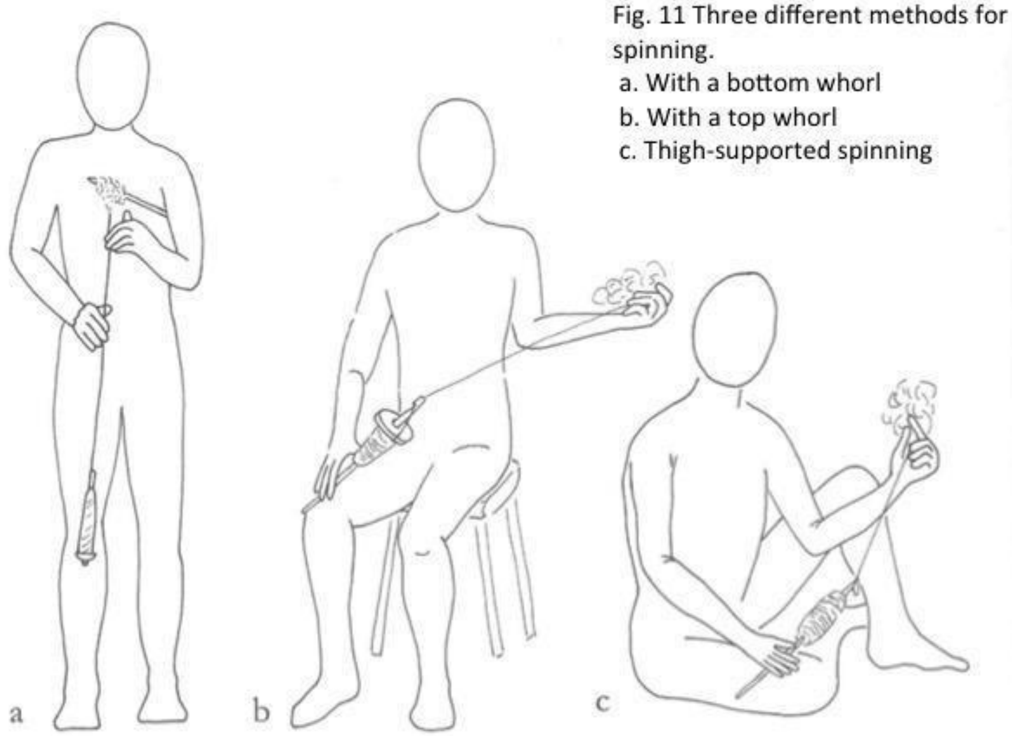


Fig. 11 Three different methods for spinning.
a. With a bottom whorl
b. With a top whorl
c. Thigh-supported spinning

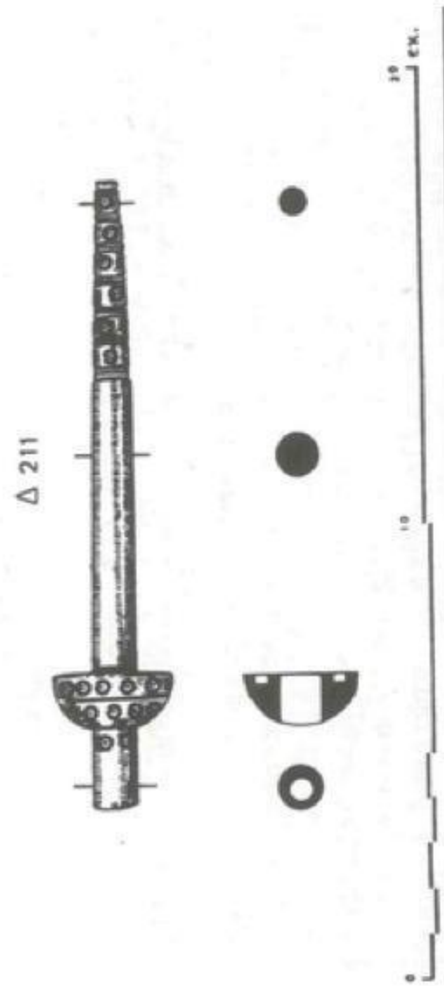


Fig. 12 Decorated Ivory Spindle from Perati, Attica.

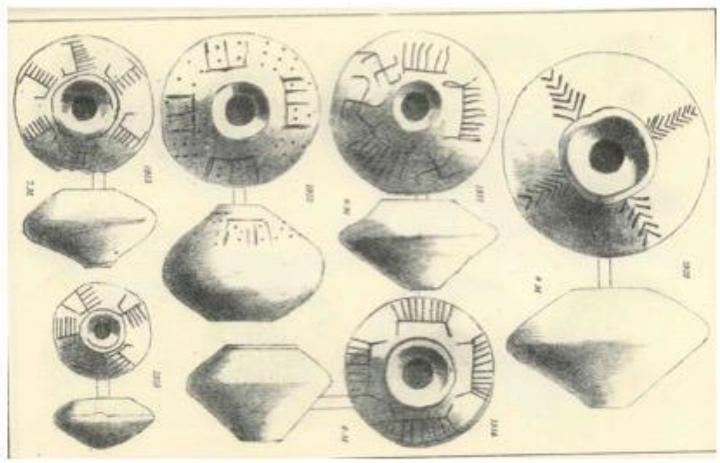


Fig. 13 Examples of Schliemann's whorls from Troy.

Fig. 14, 10th century inscribed stone spindle whorl.

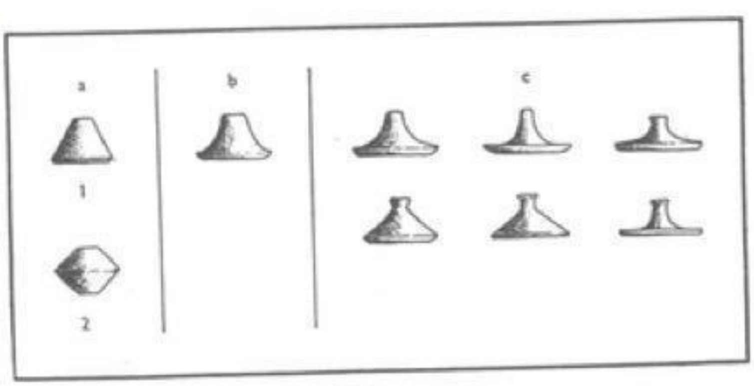


FIG. 2.

Fig. 15 Furumark's typography of stone spindle whorls.

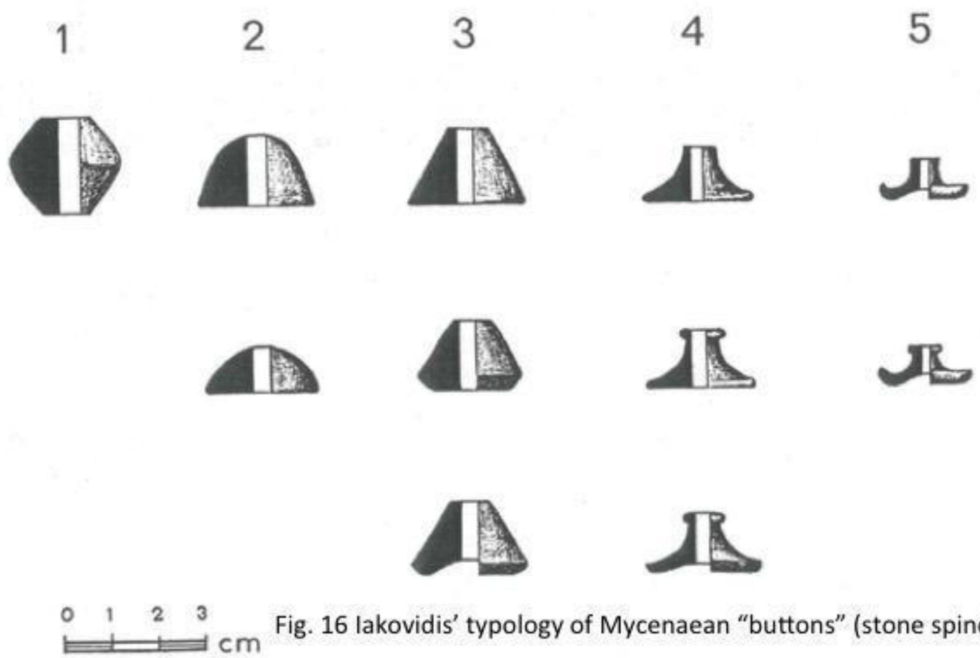


Fig. 16 Iakovidis' typology of Mycenaean "buttons" (stone spindle whorls.)

Fig. 17 Andersson Strand and Nosch, Typology of spindle whorls. This was the basis for the catalogue of Eleon's spindle whorls.

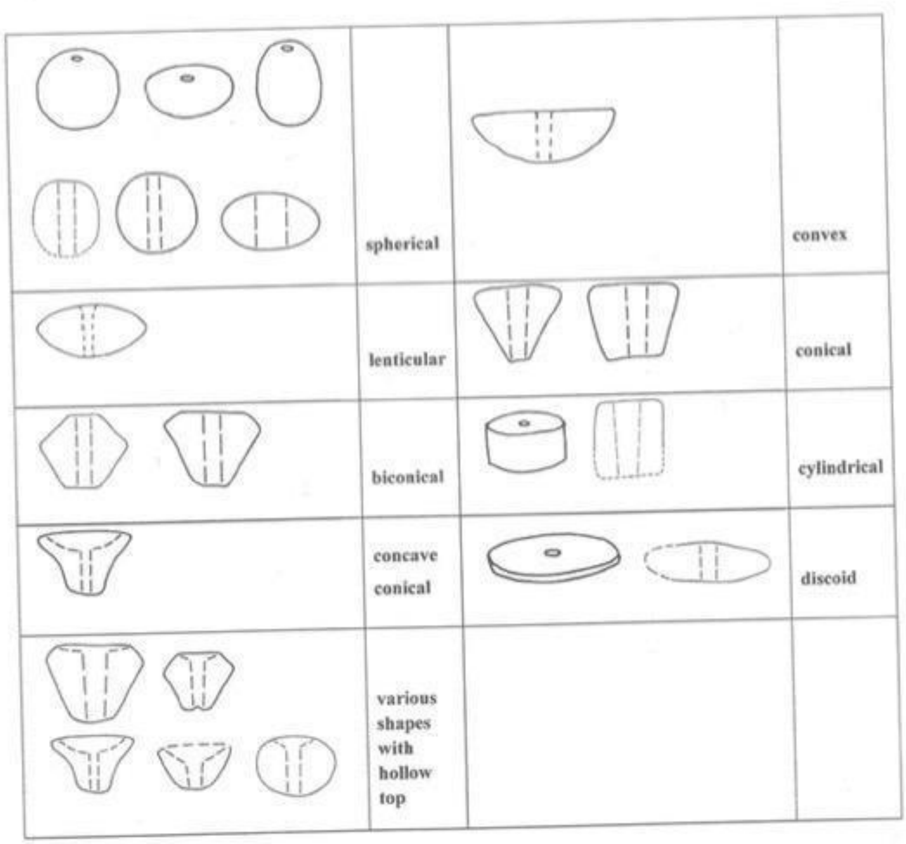


Fig. 5.1.5. Spindle whorl types (drawings after Beck 1928; Carington Smith 1992 and Gleba 2008).

Fig. 18 Decorated whorl from Thebes.

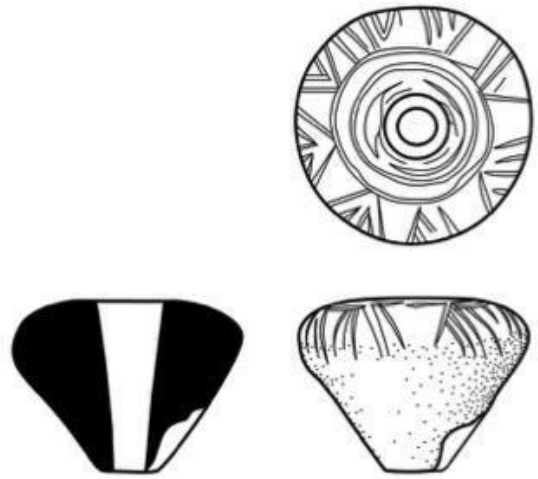


Fig. 19 Decorated whorl from Eleon.

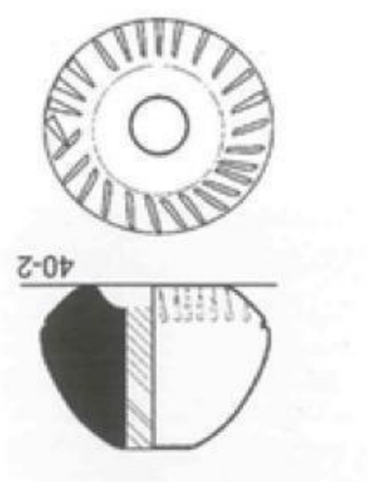


Fig. 20 Decorated whorl from Thebes.

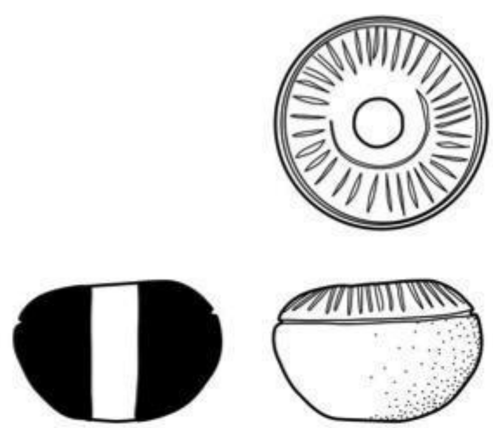
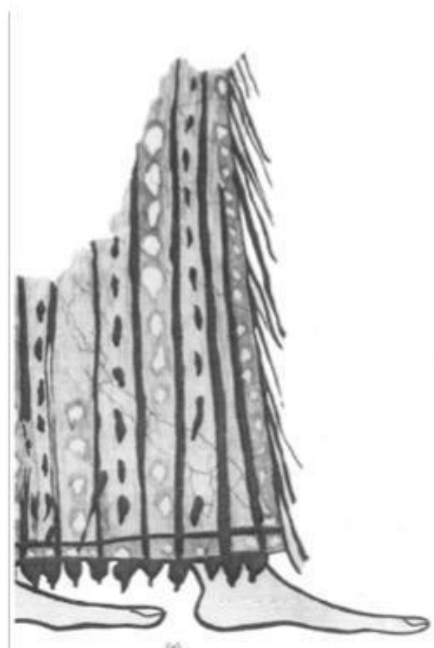


Fig. 21 Decorated whorl from Eleon.

Fig. 22 CTR Reconstructed spindle whorls.

Fig. 23 Female figure from the Room of the Fresco in the Cult Centre at Mycenae. Note the shapes on the dress hem.



Figs. 24, 25 Examples of a cord drill fire starter.

Fig. 26 Example of a pump drill fire starter.

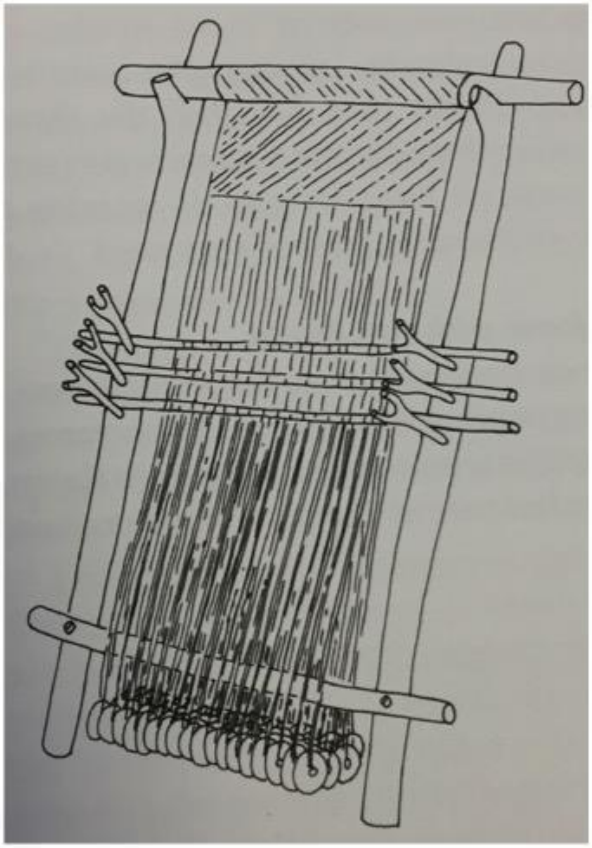


Fig. 27 A Warp-Weighted Loom

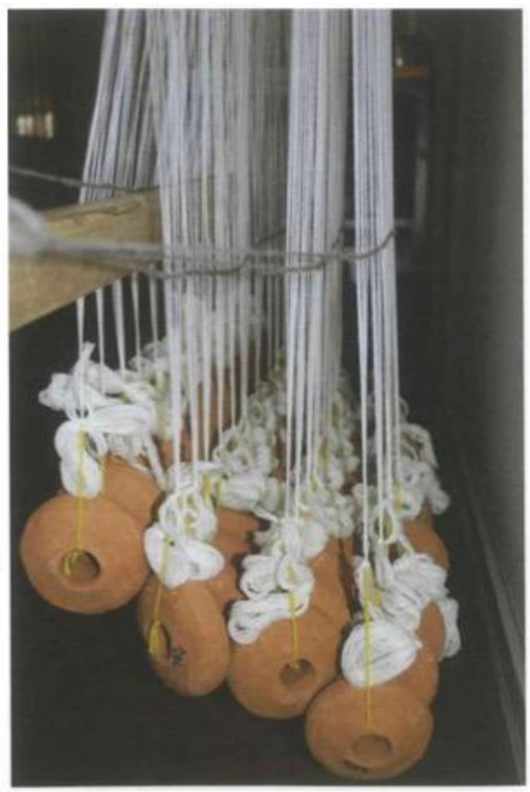
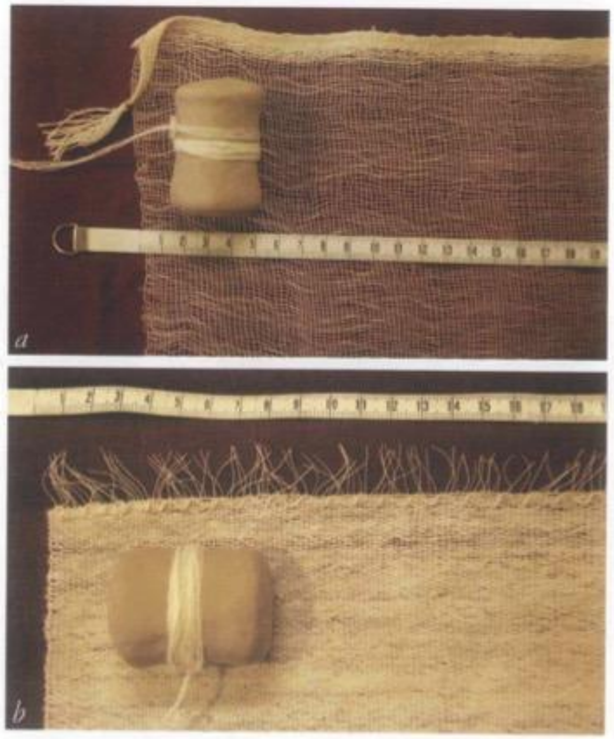


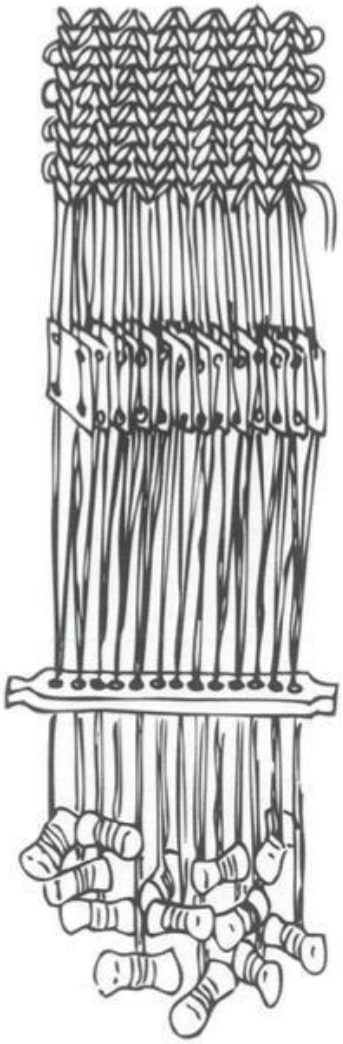
Fig. 28 Reconstructed Torus Loomweights



Top Left: Fig. 29 Examples of cloth woven with spool shaped loomweights

Top Right: Fig. 30 Spool loomweights while setting up the loom

Bottom: Fig. 31 Spools as loomweights.



Top left: Fig. 32 reconstruction of tablet weaving with clay spools.

Top right: Fig. 33 Modern *Kumihimo*.

Bottom: Fig. 34, 35 Clay spools from Thebes.

Figure 1. Donut stones from Kaminaljuyú (Kidder et al. 1946: Figure 159). Scale bar added and artifacts rearranged for clarity (courtesy of the Carnegie Institution for Science).

Top: Fig. 36 Ancient "donut stones"
Bottom: Fig. 37 Reconstructed thigh-spinning technique.

Figure 5. Replicative demonstration by Tricia Waggoner using donut stone Replica 2 as a thigh-supported spindle whorl.

Fig. 37 Using a bone point to beat the weft.

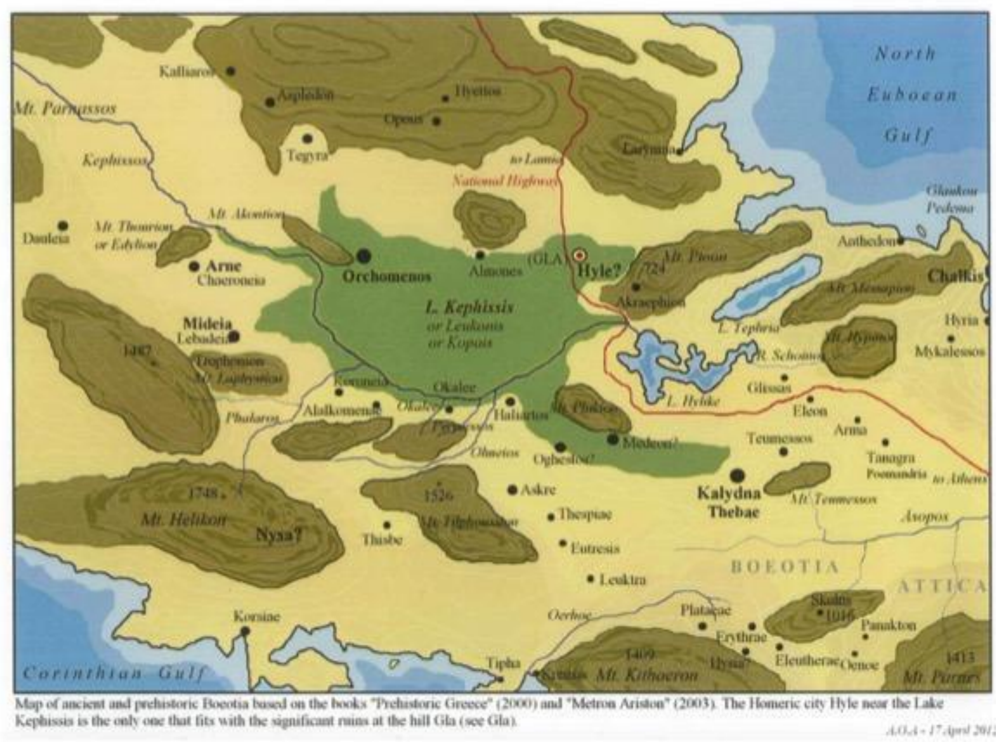


Fig. 38 Map of Boeotia. Note that the site of Ancient Eleon is located near the modern village of Arma.

Figure 39

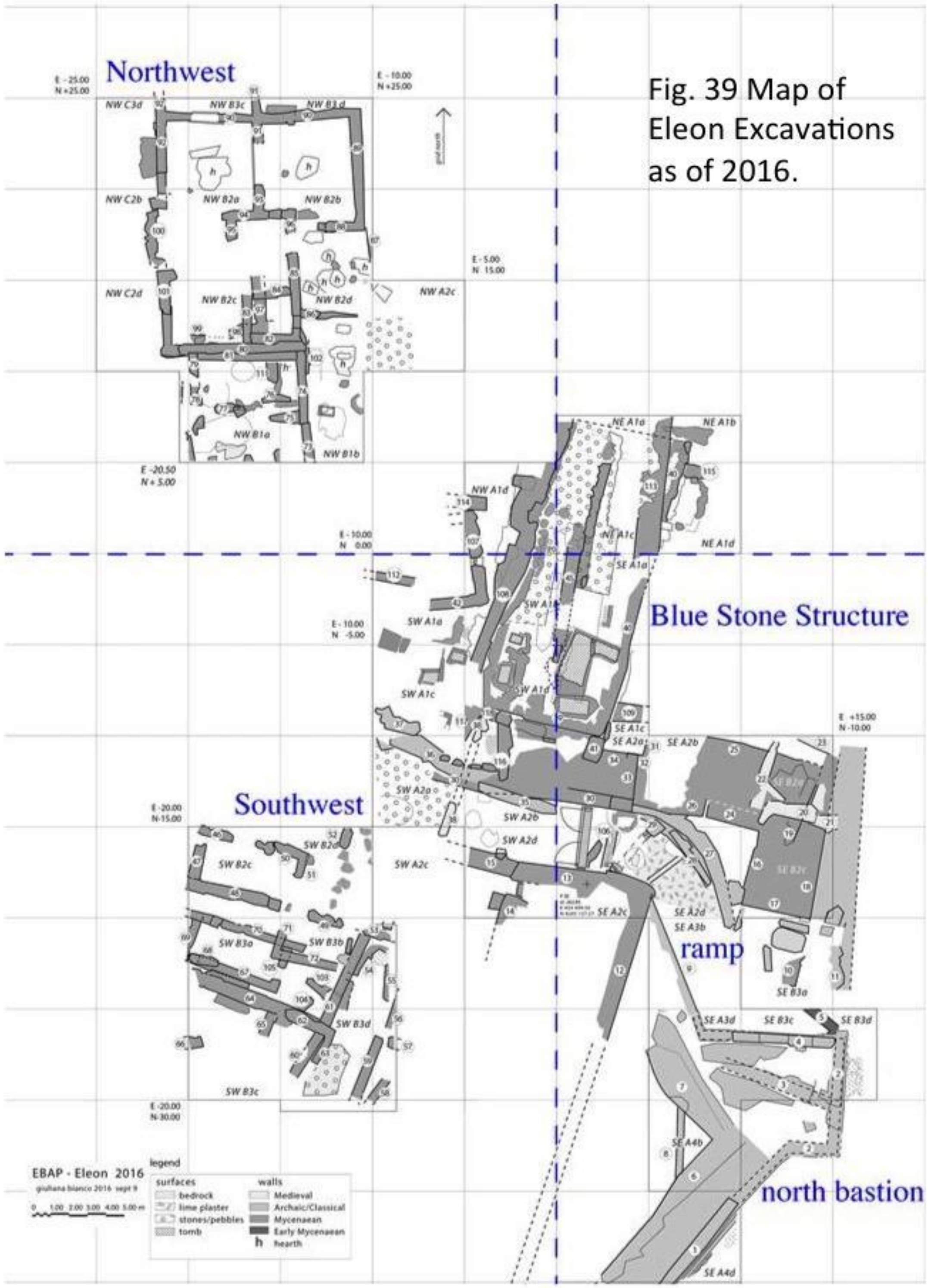


Fig. 39 Map of
Eleon Excavations
as of 2016.
Northwest
Blue Stone Structure
Southwest
ramp
north bastion
EBAP - Eleon 2016
legend
surfaces
bedrock
lime plaster
stones/pebbles
tomb
walls
Medieval
Archaic/Classical
Mycenaean
Early Mycenaean
h hearth

Figure 40

Eleon Complete Spindle Whorls

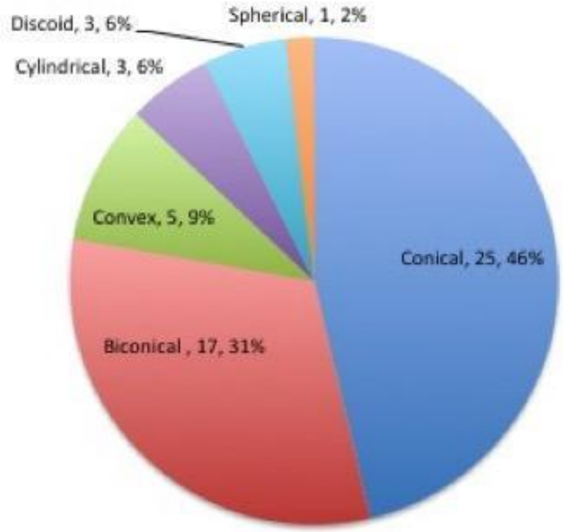


Figure 41

Complete Clay Spindle Whorls

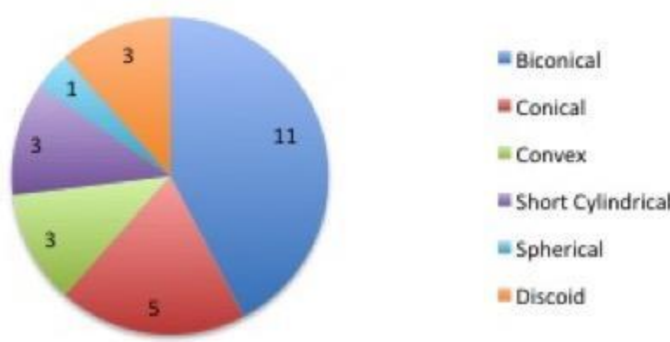


Figure 42

Stone Spindle Whorls

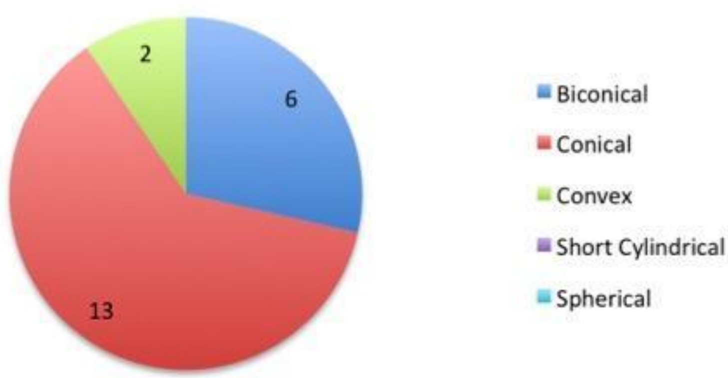


Figure 43

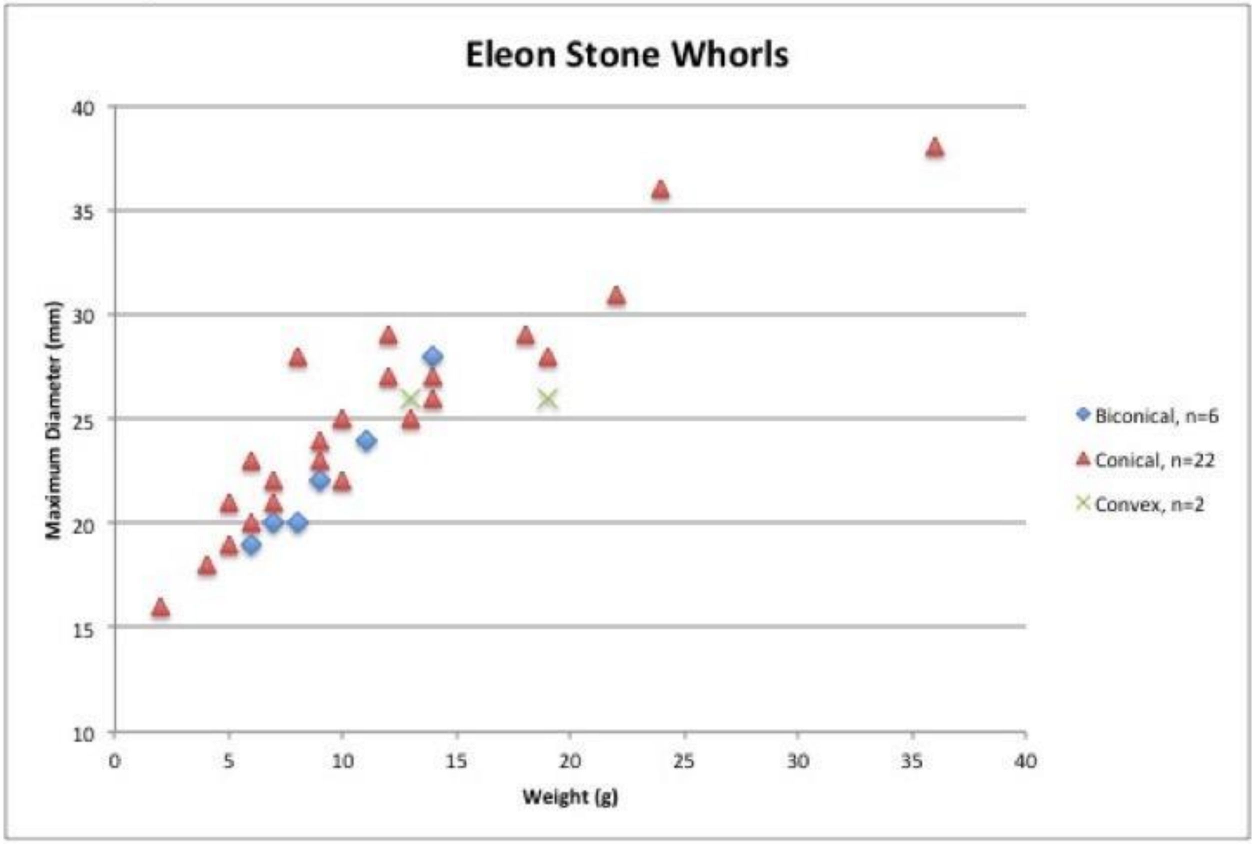


Figure 44

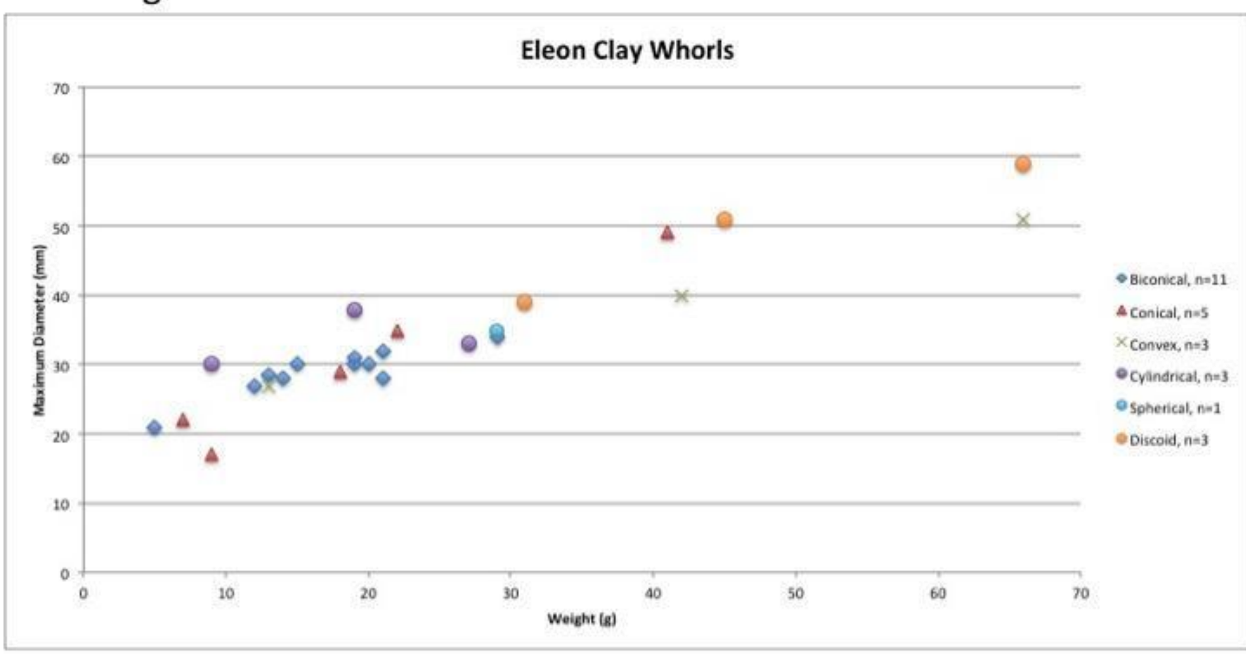


Figure 45

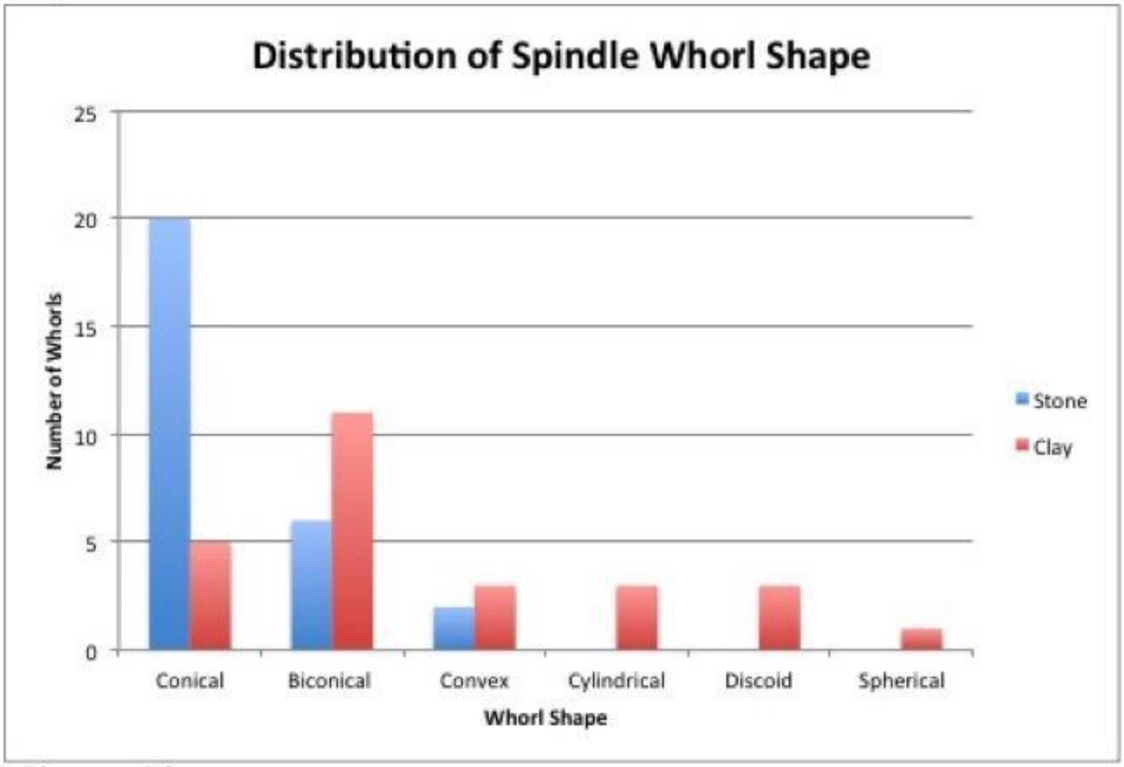


Figure 46

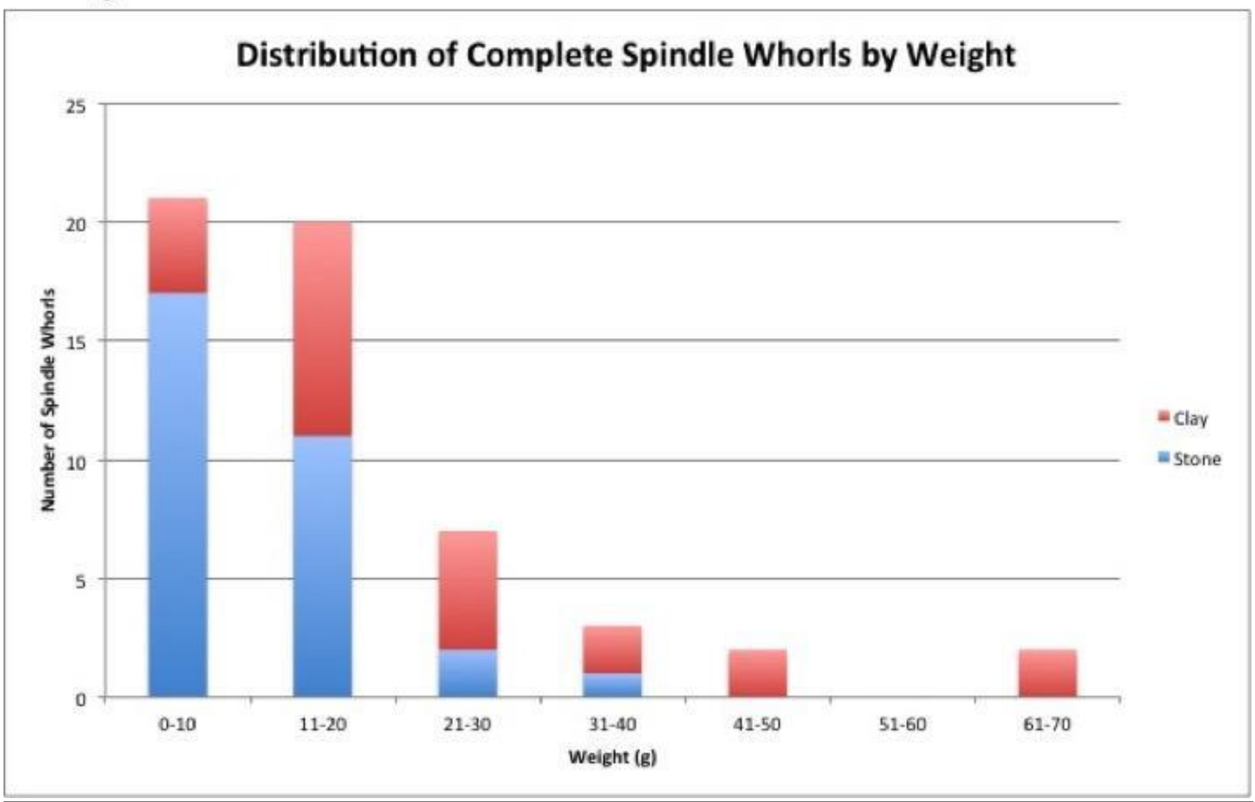


Figure 47

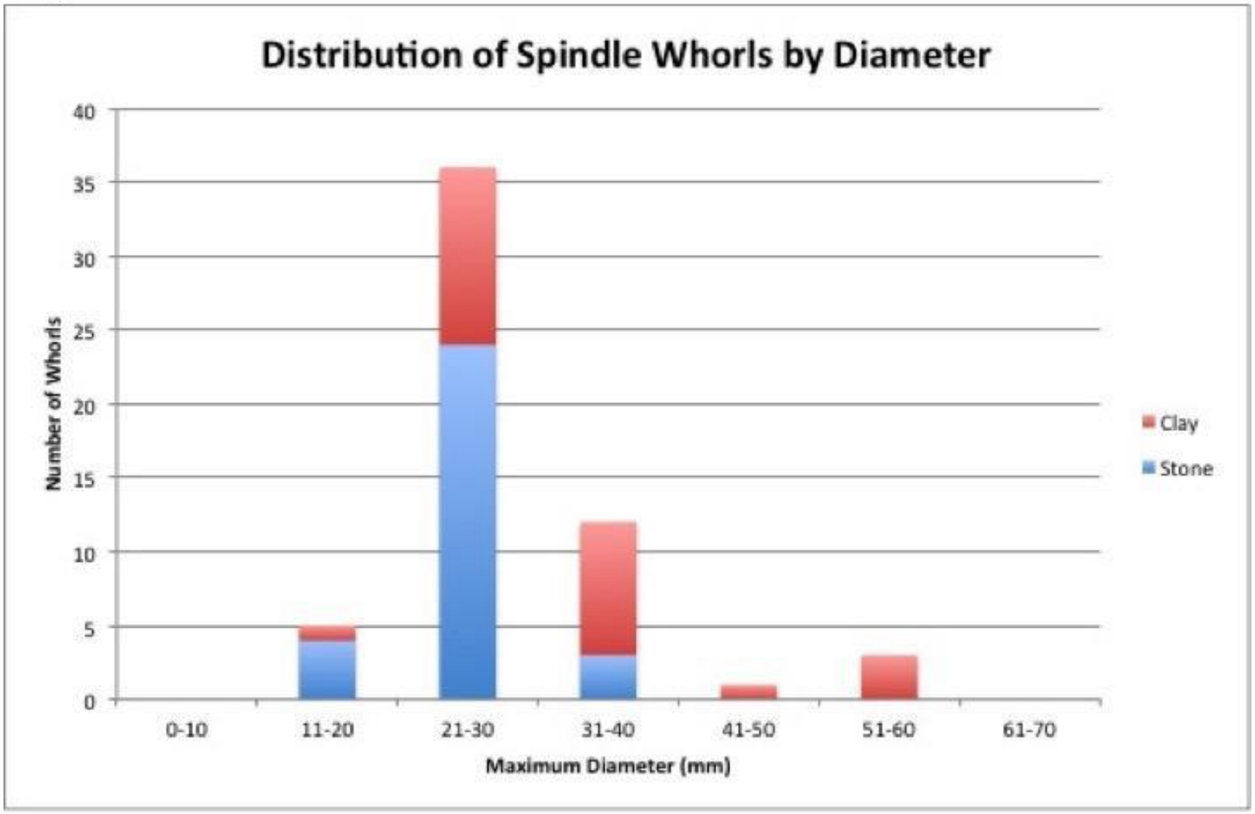


Figure 48

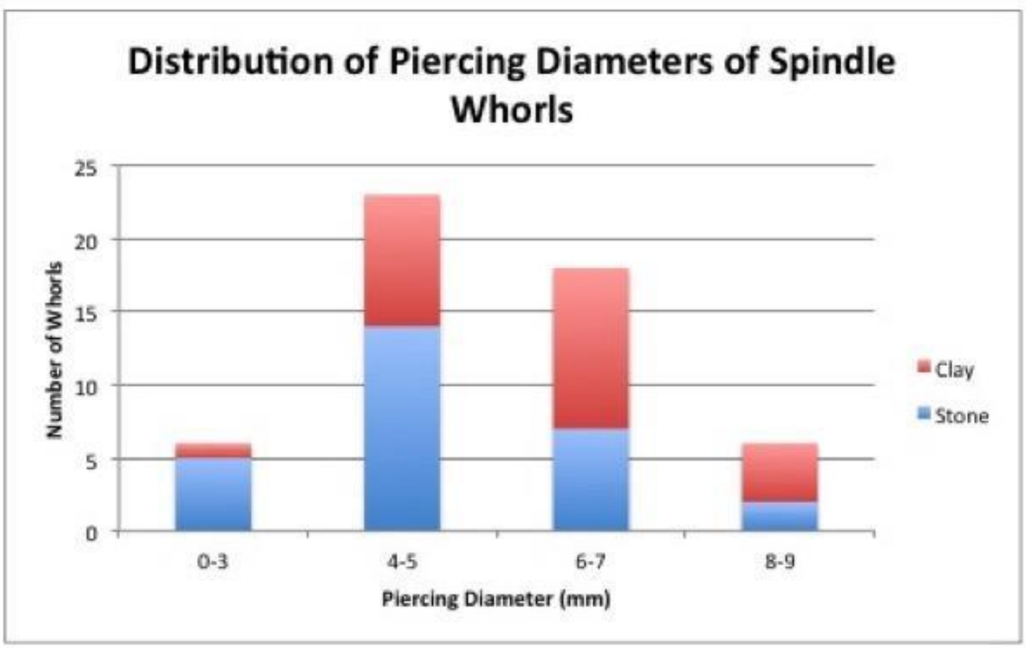


Figure 49

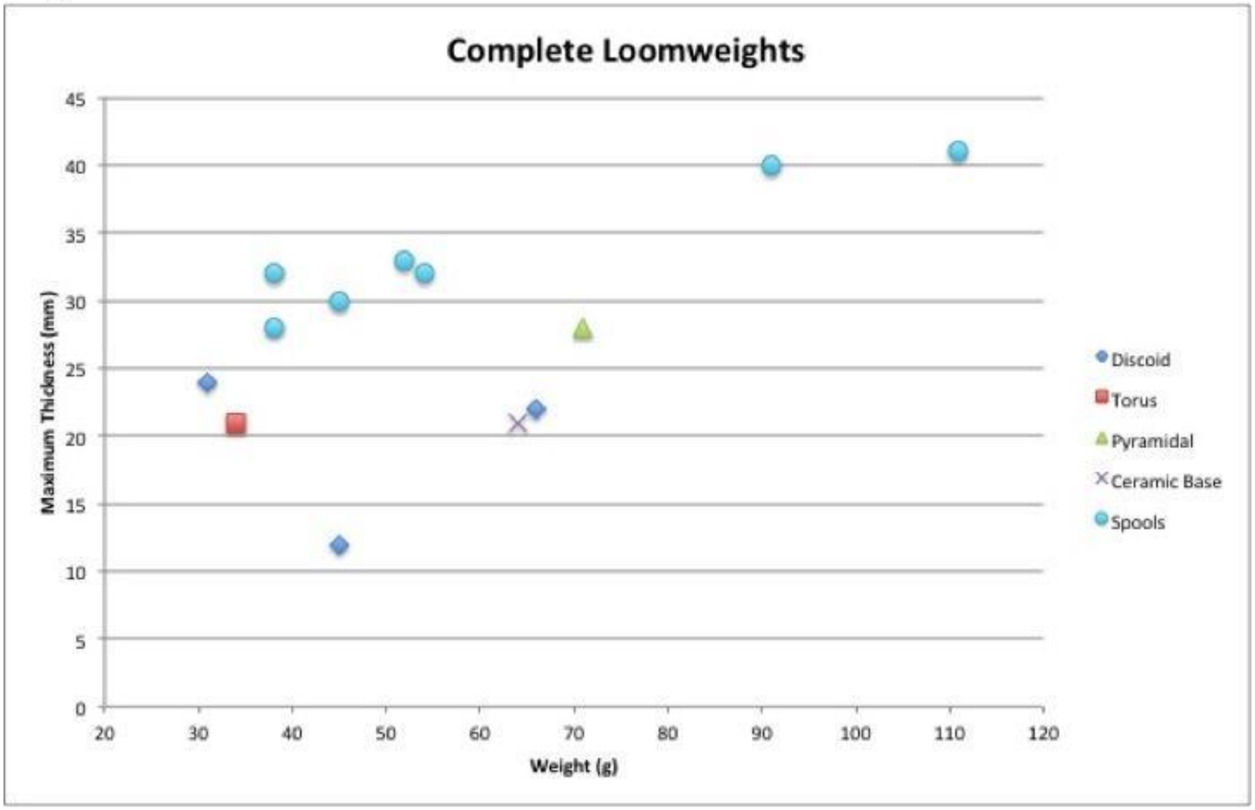


Figure 50

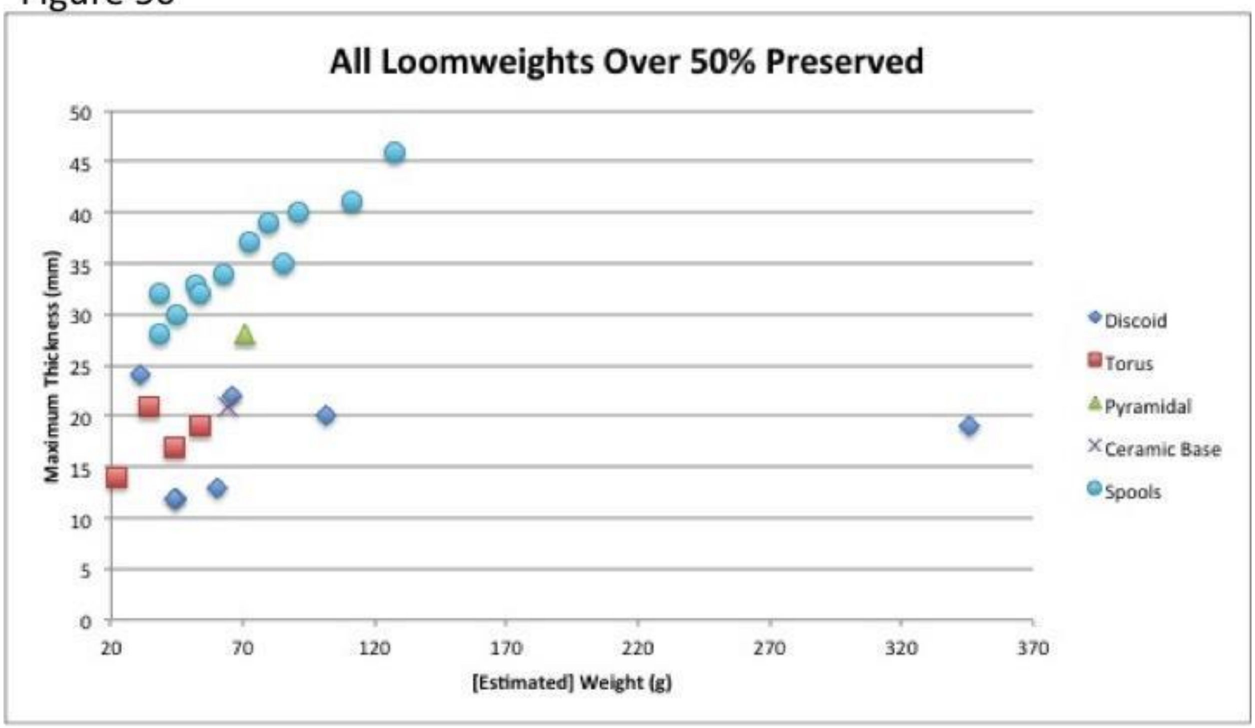
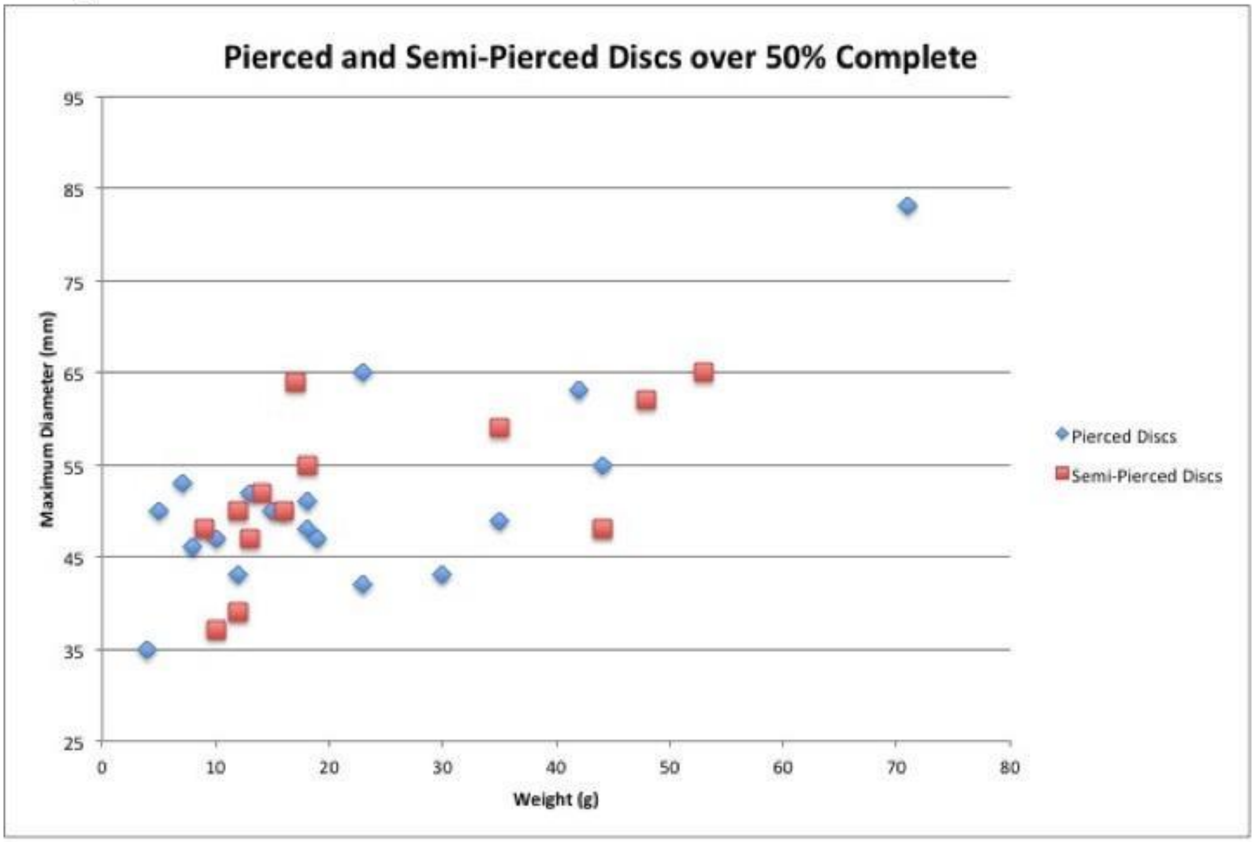


Figure 51


Pierced and Semi-Pierced Discs over 50% Complete
Maximum Diameter (mm)
Weight (g)
Pierced Discs
Semi-Pierced Discs
95
85
75
65
55
45
35
25
0
10
20
30
40
50
60
70
80

Catalogue of Eleon Textile Tools 2011-2016

Legend:
SF# (Significant Find Number), Grid Unit Locus/Lot, EBAP#, Preservation.
H: Height, L: Greatest Length, W: Greatest Width (Thickness), W(waist): Smallest Width, D: Diameter, DH: Diameter (hole), Wt: Weight.
Description. (By Max MacDonald and S. Nikoloudis)
Date (based on pottery assemblage dates). [NDA: No Date Available]

I - Loomweights

A - Spools

001 Spool
SF0469, NWB2c 17/18, #000654, Intact.
L. 5.5 cm, W. 4.0 cm, W. (waist) 3.7 cm, Wt. 91 g.
Unbaked clay. Inclusions. Yellow-beige/brown.
LH IIIC Early.

002 Spool
No SF, NWB2c 17/18, #000654. Half Preserved.
L. n/a, W. 3.7 cm, W (waist) n/a, Wt. 40 g.
Unbaked clay. Inclusions. Yellow-beige/brown. Found together with **1**, with similar dimensions.
LH IIIC Early.

003 Spool
No SF, NWB2c 18/27, #000677. One worn end, otherwise intact.
L. 5.1 cm, W. 2.8 cm, W. (waist) 2.2 cm, Wt. 38 g.
Unintentionally baked clay. Blackened-brown.
LH IIIC Early.

004 Spool
No SF, NWB2c 18/27, #000677. One end Preserved
L. n/a, W. 3.5 cm, W. (waist) n/a, Wt. 34 g
Unbaked clay. Inclusions. Yellow-beige/brown. Hardly any change in width observable.
LH IIIC Early.

005 Spool
SF0468, NWB2c 21/25, #000673. Intact.
L. 5.3 cm, W. 3.0 cm, W.(waist) 2.6 cm, Wt. 45g.
Unbaked clay. Inclusions. Yellow-beige/brown. Impression of thread on each end and on the waist.
LH IIIC Early.

006 Spool
SF0471, NWB2c 21/24, #000665, Missing one side lengthwise.
L. 5.3 cm, W. 3.4 cm, W. (waist) 3.1 cm, Wt. 47 g.
Unbaked clay. Inclusions. Yellow-beige/brown. Found together with **007, 008, 009, 010.**
LH IIIC Early.

007 Spool
SF0472, NWB2c 21/24, #000665, Intact.
L. 5.0 cm, W. 3.2 cm, W. (waist) 3.1 cm, Wt. 54 g.
Unbaked clay. Inclusions. Yellow-beige/brown. Found together with **006, 008, 009, 010.**
LH IIIC Early.

008 Spool
SF0473, NWB2c 21/24, #000665, Intact.
L. 4.7 cm, W. 3.3 cm, W. (waist) 3.1 cm, Wt. 52 g.
Unbaked clay. Inclusions. Yellow-beige/brown. Found together with **006, 007, 009, 010.**
LH IIIC Early.

009 Spool
SF0474, NWB2c 21/24, #000665, Intact.
L. n/a, W. n/a, W. (waist) n/a, Wt. 39 g. One end preserved.
Unbaked clay. Inclusions. Yellow-beige/brown. Found together with **006, 007, 008, 010.**
LH IIIC Early.

010 Spool
SF0475, NWB2c 21/24, #000665, Intact.
L. 5.3 cm, W. 3.2 cm, W. (waist) 2.4, Wt. 38 g.
Unbaked clay. Inclusions. Yellow-beige/brown. Found together with **006, 007, 008, 009.**
LH IIIC Early.

011 Spool
No SF, NWB2c 25/29, #000681, Only small fragments.
Dimensions not recorded.
Unbaked clay. Inclusions. Yellow-beige/brown.
LH IIIC Early.

012 Spool
No SF, SWA4d 6/10, #003761, One end preserved.
L. n/a, W. 3.9 cm, W. (waist) 3.1, Wt. 40 g.
Unbaked clay. Inclusions. Yellow/Reddish-brown.
LH IIIC Middle/Late.

013 Spool
SF0566, SWB2d 9/24, #002972, Intact.
L. 6.3 cm, W. 4.1 cm, W. (waist) 3.7 cm, Wt. 111 g.
Unbaked clay. Yellow-beige/brown. Burned black on one side. Small Inclusions. High weight result of burning?
Probably LH IIIC Early.

014 Spool
No SF, SWB3b 27/53, #004017, One end preserved.
L. n/a, W. 4.6 cm, W. (waist) n/a cm, Wt. 51 g.
Burned black clay. Found in SW LH IIIC Middle Trash Deposit.
Probably LH IIIC Early

015 Pierced Spool
SF0415, SWA1d 33/72, #004794, small breaks at each end.
L. 4.7 cm, W. 1.4 cm, W. (waist) 0.5 cm, Wt. 16 g.
Blackish/Brown. Pierced through the middle, lengthwise, for the thread to be strung through. Possibly a pierced kylix stem.
EBA?

016 Pierced Spool
No SF, SWA2b 27/61, #005124, Half preserved.
L. 3.7 cm, W. 2.5 cm, W. (waist) 1.5 cm, Wt. 11 g.
Blackish/Brown. Similar to **13** in type. Wear along the side, suggesting thread or string was wrapped around it.
EBA?

B - "Torus" Loomweights

017 Torus Loomweight
SF0164, NWB1b 13/16, #001248, Intact.
H. 2.1 cm, D. 4.8 cm, DH. 1.3 cm, Wt. 34 g.
Chipped on one side, could be a leaf decoration, more likely just deterioration.
Otherwise smooth and well made.
LH IIIB/IIIC Early

018 Torus Loomweight Frag.
No SF, SEA2c 5/12, #001461, Half Preserved, mended from 2 frags.
H. 1.7 cm, D. 5.4 cm, DH. 1.7 cm, Wt. 22 g.
Clay. Smooth and well made, though in a poor state of preservation. Similar in many ways to **017**.
LH III through Late Archaic to Classical.

019 Torus Loomweight Frag.
No SF, SEB2c 8/18, #002527, Half Preserved.
H. 1.4 cm, D. 4.1 cm, DH. 1.4 cm, Wt. 11 g.
Clay. Beige fabric with many small inclusions. Smaller than other examples.
LH IIIA - LH IIIC Early/Middle (some medieval)

020 Torus Loomweight Frag.
SF0235, SWA2d 3/4, #002871, About ⅔ preserved.
H. 1.9 cm, D. 5.3 cm, DH. 1.7 cm, Wt. 35 g.
Clay. Smooth and well made,black fabric probably due to fire. Rosette imprint on one side, 11 petals, 1.3 cm in diameter.
LH IIIA-C (some later Archaic/Classical and medieval)

D - Pyramidal Loomweights

021 Pyramidal Loomweight.
SF0160, NWB1b 9/45, #001829, Intact.
H. 7.2 cm, W. (at base) 2.8 cm, DH. 0.7 cm, Wt. 71 g.
Clay. Slightly chipped at the top. Red/Orange clay. X on flat bottom with four dots, one on each side of X.
LH IIIB/C

E - Discoid Loomweights

022 Discoid Loomweight
SF0523, SWA2b 28/64, #005128, Half Preserved.
H. 1.9 cm, D. 11.8 cm, DH. 1.1 cm, Wt. 173 g.
Clay. Orange fabric. Largest example of discoid loomweight.
LHI

023 Discoid Loomweight
SF0232, SWB2d 8/20, #002956, Intact, but well worn.
H. 2.1 cm, D. 6.5 cm(rough), DH. 1.1 cm, Wt. 80 g.
Clay. Orange fabric. Round in shape, with the upper half quite chipped and worn.
Mixed Mycenaean (latest LH IIIC Middle, some A/C/H, medieval)

024 Discoid Loomweight
No SF, SEA1c 7/27, #003520, ca. ½ preserved.
H. 2.0 cm, D. 7.0 cm, DH. 1.3 cm, Wt. 51 g.
Reworked sherd. Red coarse ware. Loomweight.
MH-LH III

<u>II - Spindle Whorls</u>

A - Conical Whorls

025 Conical Whorl
No SF, NWB2a 7/27, #003304, ca. ⅓ preserved.
H. n/a, D. 4.0 cm, DH. n/a, Wt. 16 g.
Clay. Coarse, red fabric, blackened on the bottom half.
LH IIIC Early, NW burnt destruction level.

026 Conical Whorl
SF0268, NWB2a 7/34, #003319, Intact.
H. 2.5 cm, D. 2.9 cm, DH. 0.5 cm, Wt. 18 g.
Clay. Rounded top. Coarse, flakey fabric, blackened, seems to have suffered some burning.
LH IIIC Early, NW unburnt destruction level. destruction level.

027 Conical Whorl
No SF, NWB2d 7/11, #000023, ca. ½ preserved.
H. 1.8 cm, D. 3.0 cm, DH. 0.9 cm, Wt. 7 g.
Clay. Split in half vertically. Blackened from burning, hard to tell the original colour of the fabric.
LH IIIC Early, NW burnt destruction level.

028 Conical Whorl
No SF, NWB2d 20/26, #000155, Intact.
H. 1.5 cm, D. 1.7 cm, DH. 0.4 cm, Wt. 9 g.
Clay. White clay with some small inclusions. Smooth. One chip on the top, otherwise completely preserved.
LH IIIC Early, NW unburnt destruction level. destruction level.

029 Conical Whorl
SF0250, SWA1c 4/9, #002642, ca. ⅔ preserved.
H. 2.9 cm, D. 3.5 cm, DH. 0.5 cm, Wt. 25 g.
Clay. Orange fabric, well worn. One large chunk taken out of top. Bell shaped.
Mixed, mostly LH IIIA2/B1

030 Conical Whorl
No SF, SWB2c 10/32, #003611, ca. ⅓ preserved.
H. n/a, D. 3.5 cm, DH. n/a, Wt. 7 g.
Clay. Coarse fabric with lots of small inclusions, blackened. Very poorly preserved.
Mixed Mycenaean, latest LH IIIC Early

031 Conical Whorl
SF0497, NWA1d 11/27, #005085, Intact.
H. 2.5 g, D. 4.9 cm, DH. 0.8, Wt. 41 g.
Clay. Orange fabric. Poorly made, slightly burned on top. Very worn, chipped on all sides. Caked on soil residue on top.
NDA.

032 Conical Whorl
No SF, SWA2b 26/52, #005502, ca. ⅓ preserved.
H. n/a, D. n/a, DH. n/a, Wt. 13 g.
Clay. Very poorly preserved. Red fabric with small inclusions and slightly blackened.
MHIII-LHI

033 Conical Whorl
No SF, SWA1a 9/14, #005169, Intact.
H. 1.5 cm, D. 2.2 cm, DH. 0.3 cm, Wt. 7 g.
Clay. Brown fabric. Shallow depression surrounding the hole considered hollow top.
NDA.

034 Conical Whorl
SF0166, SWB3c 8/22, #001475, Intact.
H. 2.1 cm, D. 3.5 cm, DH. 0.5 cm, Wt. 22 g.
Clay. Smooth, orange fabric. Top and bottom are not flat, and one side is thicker than the other.
Mixed, but fairly high concentration of LH IIIC

035 Conical Whorl
SF0117, NWB1a 4/11, #001292, Intact.
H. 2.3 cm, D. 3.6 cm, DH. 0.6 cm, Wt. 24 g.
Stone. Found in a NW pit. Brownish-black, coarse fabric. Bottom bit has broken off, but even still the bottom of the whorl has a dramatically decreased diameter from the top.
Mixed, LH IIIA-C Middle.

036 Conical Whorl
SF0167, NWb1b 13/16, #001247, Intact.
H. 1.3 cm, D. 2.2, DH. 0.4 cm, Wt. 7 g.
Stone. Probably steatite. Colours interestingly split almost down the middle with blackish-purple on one side and white on the other. Very smooth and well made.
LH IIIB2/IIIC Early.

037 Conical Whorl
SF0168, NWB1b 20/26, #001628, Intact.
H. 1.5 cm, D. 2.6 cm, DH. 0.4 cm, Wt. 14 g.
Stone, Steatite. Smooth, but worn. Top has many markings that make no discernable pattern, probably just from use.
LH IIIC Early, NW burnt destruction level.

038 Conical Whorl
SF0269, NWB2a 7/33, #003314, Intact.
H. 1.3 cm, D. 2.3 cm, DH. 0.4 cm, Wt. 9 g.
Stone, steatite. Top well worn, but sides are still smooth, bottom slightly chipped.
LH IIIC Early, NW unburnt destruction level. destruction level.

039 Conical Whorl
SF0270, NWB2a 7/33, #003314, Intact.
H. 1.3 cm, D. 2.1 cm, DH. 0.4 cm, Wt. 7 g.
Stone, steatite. Bottom smooth and well preserved. Top very worn, with caked on deposits on chipped sides as well as in the centre piercing.
LH IIIC Early, NW unburnt destruction level. destruction level.

040 Conical Whorl
No SF, NWB2b 8/19, #003071, Intact.
H. 1.5 cm, D. 2.7 cm, DH. 0.8 cm, Wt. 12 g.
Stone, steatite. Top well-worn with chips on one side. Bottom chipped with caked on deposits around the piercing.
LH IIIC Early, NW burnt destruction level.

041 Conical Whorl
SF0053, NWB2c 40/59, #001036, Intact.
H. 2.0 cm, D. 3.1 cm, DH. 0.4 cm, Wt. 22 g.
Stone, green steatite. Smooth all over. Not a perfect cone, slightly skewed to one side.
NDA

042 Conical Whorl
No SF, NWB2c 40/59, #001037, Intact.
H. 1.7 cm, D. 2.9 cm, DH. 0.5 cm, Wt. 18 g.
Stone, steatite. Well-worn with large chip taken out of bottom.
NDA

043 Conical Whorl
No SF, NWB2d 9/13, #000033, ca. 95% preserved.
H. 1.6 cm, D. 2.2 cm, DH. 0.5 cm, Wt. 10 g.
Stone, steatite. Well-worn on top and bottom.
NDA

044 Conical Whorl
No SF, NWB2d 11/19, #000041, ca. ½ preserved.
H. 1.7 cm, D. 3.0 cm, DH. n/a, Wt. 8 g.
Stone, green steatite. Split vertically down the middle. Well-worn all over.
LH III

045 Conical Whorl
SF0081, NWB2d 20/26, #000152, Intact.
H. 1.0 cm, D. 2.8 cm, DH. 0.4 cm, Wt. 8 g.
Stone, steatite. Very worn on all sides, with large chips taken out of the top and bottom. Unusually flat for a stone whorl.
LH IIIC Early, NW unburnt destruction level. destruction level.

046 Conical Whorl
SF0080, NWB2d 22/28, #000164, Intact.
H. 1.2 cm, D. 1.8 cm, DH. 0.3 cm, Wt. 4 g.
Stone, steatite. Smooth and well preserved.
LH IIIB1/IIIC Early, NW unburnt destruction level. destruction level.

047 Conical Whorl
No SF, NWB2d 19/86, #001005, Intact.
H. 1.5 cm, D. 2.7 cm, DH. 0.7 cm, Wt. 14 g.
Stone, steatite. Top side well worn. Quite squat.
NDA.

048 Conical Whorl
SF0267, NWB3c 3/6, #003054, Intact.
H. 0.7 cm, D. 2.1 cm, DH. 0.25 cm, Wt. 5 g.
Stone, green steatite. Well preserved, caked on deposits on top side. Very squat, with a flat bottom.
LH IIIC Early, NW burnt destruction level.

049 Conical Whorl
SF0241, NWC2d 2/3, #002439, Intact.
H. n/a, D. 2.9 cm, DH 0.6 cm, Wt. 12 g.
Stone, green steatite. Very worn, chipped on all sides, and missing bottom.
Mixed Mycenaean, latest LH IIIC Middle (some medieval).

050 Conical Whorl
No SF, NWF1c 2/7, #002180, ca. ⅓ preserved.
H. n/a, D. 2.4 cm, DH. 0.5 cm, Wt. 4 g.
Stone, similar to the green stone, but a light beige colour. A portion of the top preserved, not much else.
Mixed LH IIIC with lots of earlier and medieval.

051 Conical Whorl
No SF, NEA2c 14/70, #002998, ca. 95% preserved.
H. 1.3 cm, D. 1.9 cm, DH. 0.4 cm, Wt. 5 g.
Stone, steatite. Large chip taken out of one side on the top.
Mixed Mycenaean.

052 Conical Whorl
SF0454, SEA5d 2/4, #004525, Intact.
H. 1.1 cm, D. 2.4 cm, DH. 0.7 cm, Wt. 9 g.
Stone, steatite. Short. Well worn, chipped on one side and bottom. Larger hole than usual.
NDA.

053 Conical Whorl
SF0240, SWA1c 4/9, #002633, Nearly Intact.
H. n/a, D. 2.5 cm, DH. 0.2 cm, Wt. 10 g.
Brownish green stone. Missing bottom, and well-worn all over.
Mixed with a lot of LH IIIA2-B, and MH.

054 Conical Whorl
SF0165, SWA2a 3/7, #001347, Intact.
H. 1.7 cm, D. 2.8 cm, DH. 0.4 cm, Wt. 19 g.
Stone, steatite. Rounded bottom, smooth.
Lots of MH III-LHI, latest LH IIIC Early.

055 Conical Whorl
SF0045, SWB3a 13/56, #000811, Very fragmentary.
H. 0.6 cm, D. 2.1 cm, DH. n/a, Wt. 1 g.
Stone? Brownish black colour. Only a small part of the top is preserved.
Mixed Mycenaean.

056 Conical Whorl
SF0042, SWB3a 13/69, #000838, Intact.
H. 1.6 cm, D. 2.5 cm, DH. 0.4 cm, Wt. 13 g.
Stone, green steatite. Smooth, well preserved, with one chip taken out of the top.
Mixed Mycenaean.

057 Conical Whorl
SF0266, SWB3a 35/114, #003606, Intact.
H. n/a, D. 2.3 cm, DH. 0.3 cm, Wt. 6 g.
Stone, steatite. Worn, but well preserved other than missing bottom.
LH II - LH IIIC.

058 Conical Whorl
No SF, SWB3b 1/2. #000065, Extremely fragmentary.
H. n/a, D. n/a, DH. 0.4 cm, Wt. 2 g.
Stone, green steatite. Only a small piece, both top and bottom missing.
Mixed context, MH-medieval.

059 Conical Whorl
SF0116, NWB1a 4/11, #001292, Intact.
H. 2.8 cm, D. 3.8 cm, DH. 0.8 cm, Wt. 36 g.
Stone. Dark brown colour. From a NW pit.
Mixed context, mostly LH III.

060 Conical Whorl
SF0435, SWB3b 67/144, #004405, Intact.
H. 1.1 cm, D. 2.0 cm, DH. 0.4 cm, Wt. 6 g.
Blue and white stone. Small chips on the bottom.
LH IIIB2 - LH IIIC Middle

061 Conical Whorl
No SF, SWB3d 19/41, #001786, ca. ⅓ preserved.
H. n/a, D. 1.9 cm, DH. 0.3 cm, Wt. 1 g.
Stone, steatite. Only half of top preserved, missing most everything else. Smooth.
NDA.

062 Conical Whorl with "hollow top"
SF0113, SWB3c 4/14, #001200, Intact.
H. 0.7, D. 1.6 cm, DH. 0.2 cm, Wt. 2 g.
Stone, steatite. Could be called hollow top or other class… Chip taken out of one side.
Very squat. Perhaps a button rather than a whorl.
Mixed context, LH IIIB2-C, A/C/H.

063 Rounded Conical Whorl with "hollow top"
SF0481, NWB3d 3/5, #003043, ca. ⅔ preserved.
H. 2.6 cm, D. 3.7 cm, DH. 0.6 cm, Wt. 23 g.
Stone. Grey soapy stone or clay. Smooth surface, with a large and wide piercing for a distaff.
LH IIIA - LH IIIC Middle

064 Conical Whorl
No SF, SWA1b 1/2, #003755, ca. ¼ preserved.
H. n/a, D. 2.2 cm, DH. 0.8 cm, Wt. 1 g.
Stone, steatite. Very worn whorl fragment. Neither top nor bottom preserved, classification could be incorrect.
Mixed context.

C - Biconical Whorls

065 Biconical Whorl
SF0430, NWB1b 9/95, #004220, ca. ½ preserved.
H. 2.7 cm, D. 3.5 cm, DH. 0.8 cm, Wt. 11 g.
Clay. Incised top. At least two concentric circles around the piercing and three (preserved) chevrons spreading out from the circles, each with two more chevrons within the first.
Mixed context, lots of EH and MH

066 Biconical Whorl
SF0012, NWB2c 18/28, #000685, Intact.
H. 2.3 cm, D. 3.2 cm, DH. 0.6 cm, Wt. 21 g.
Clay. Yellowish brown fabric. Incised at middle and bottom. Bottom has two concentric circles around the piercing, while the middle has concentric semi-circles dropping from the waist.
LH IIIC Early, NW burnt destruction level.

067 Biconical Whorl
SF0470, NWB2d 20/26, #000153, Intact.
H. 2.5 cm, D. 3.0 cm, DH. 0.6 cm, Wt. 19 g.
Clay. Dark grey/black fabric. One end slightly longer than the other.
LH IIIC Early, NW unburnt destruction level. destruction level.

068 Biconical Whorl
SF0325, SEA1c 10/26, #003519, Intact.
H. 2.1 cm, D. 2.9 cm, DH. 0.5 cm, Wt. 13 g.
Clay. Dark brown fabric. Incised with several deep vertical lines mostly going from the centre hole to the waist.
EH II - LH I.

069 Biconical Whorl
SF00242, SEA2b 11/20, #002630, Intact.
H. 1.8 cm, D. 2.1 cm, DH. 0.4 cm, Wt. 5 g.
Clay. Red-orange fabric. Flat top with a longer, narrower bottom half.
Mixed context.

070 Biconical Whorl
SF0453, SWA1a 5/8, #004386, Intact.
H. 2.3 cm, D. 3.0 cm, DH. 0.6 cm, Wt. 15 g.
Clay. Same pattern as **76**. Three concentric circles around the piercing and eight chevrons spreading out from the circles, each with two more chevrons within the first. Small part of the bottom missing. Dark grey fabric.
LH IIIC Early/Middle

071 Biconical Whorl
SF0464, SWA1d 41/82, #004782, ca. ⅔ preserved, mended from 2 pieces.
H. 2.2 cm, D. 2.7 cm, DH. 0.8 cm, Wt. 7 g.
Clay. Yellow fabric with many inclusions. Split vertically down the middle. Found in a Blue Stone Structure cist. Slightly blackened.
Latest LH I

072 Biconical Whorl
SF0114, SWA2a 1/2, #001338, Intact.
H. 2.8 cm, D. 2.7 cm, DH. 0.5 cm, Wt. 12 g.
Clay. Reddish brown fabric. Shallow "hollow top" with a longer bottom half.
Mixed context.

073 Biconical Whorl
SF0397, SWB3a 45/122, #003790, Intact.
H. 2.4 cm, D. 3.1 cm, DH. 0.6, Wt. 19 g.
Clay. Grey, polished fabric. Shallow "hollow top" with a much longer bottom half.
Mixed SW Structure A/B.

074 Biconical Whorl
No SF, SWB3b 8/15, #000079, Intact.
H. 2.9 cm, D. 2.8 cm, DH. 0.5 cm, Wt. 21 g.
Clay. Pale brown colour. Nearly spherical, but both ends are slightly skewed.
Mixed Mycenaean

075 Biconical Whorl
No SF, SWB3b 10/59, #000304, Intact.
H. 3.1 cm, D. 3.4 cm, DH. 0.6 cm, Wt. 29 g.
Clay. SW trash pit. Reddish brown, rough, crumbly fabric. Blackened. Rounded edges, and some small breaks around the hole on either end.
LH IIIC Middle trash pit.

076 Biconical Whorl
SF0460, SWB3b 85/168, #004686, Intact.
H. 2.0 cm, D. 2.8 cm, DH. 0.5cm, Wt. 14 g.
Clay. Dark brown colour. Blackened. Slightly shallow "hollow top." Longer bottom half.
Mostly Early Mycenaean/LH IIIB, latest LH III C Early

077 Biconical Whorl
SF0529, NEA1a 1/1, #005335, Intact.
H. 2.0 cm, D. 3.0 cm, DH. 0.6 cm, Wt. 20 g.
Clay. Brown fabric. One incised concentric circle around the piercing, with incised lines stemming out from the circle to the edge of the whorl. Rounded bottom, with some small chips broken off.
Topsoil, mixed context

078 Biconical Whorl
SF0207, NWB1a 20/66, #002022, Intact.
H. 1.7 cm, D. 2.0 cm, DH. 0.4 cm, Wt. 8 g.
Stone, Steatite. NW Pit. Smooth surface. One end slightly longer than the other, but otherwise a very plain example.
Mostly LH I, (latest LH IIIA).

079 Biconical Whorl
SF0043, NWB2c 24/31, #000921, Intact.
H. 1.5 cm, D. 2.0 cm, DH. 0.5 cm, Wt. 7 g.
Stone, steatite. Slightly worn, but still smooth. Both ends are nearly the same length.
LH IIIC Early, NW unburnt destruction level.

080 Biconical Whorl
No SF, NWB2c 38/58, #001031, Intact.
H. 1.7 cm, D. 2.2 cm, DH. 0.7 cm, Wt. 9 g.
Stone, steatite. Worn at both ends, and on the sides. Both sides are nearly equal in length.
NDA.

081 Biconical Whorl
No SF, NWB2c 40/59, #001034, ca. ½ preserved.
H. 2.0 cm, D. 2.6 cm, DH. 0.6 cm, Wt. 11 g.
Stone, steatite. Very worn in the middle and on one end. Nearly split in half, but one end is still fully preserved. Both ends are nearly equal in length.
NDA.

082 Biconical Whorl
No SF, NWB2c 40/59, #001034, Intact.
H. 1.6 cm, D. 2.8 cm, DH. 0.6 cm, Wt. 14 g.
Stone, steatite. Very worn all over. Found with **93**.
NDA.

083 Biconical Whorl
SF0239, SWB2d 1/1, #002275, Intact.
H. 1.6 cm, D. 1.9 cm, DH. 0.5, Wt. 6 g.
Stone, steatite. One end slightly worn around the hole. Both ends nearly equal in length.
Topsoil, mixed context.

084 Biconical Whorl
No SF, SWB2d 4/9, #002734, ca. ½ preserved.
H. 1.6 cm, D. 1.7 cm, DH. 0.4 cm, Wt. 2 g.
Stone, steatite. Split vertically in half. Very worn all over. Both ends nearly equal in length.
Mixed context (MH-medieval), mostly Late Archaic/Early Classical.

085 Biconical Whorl
No SF, SWB3b 9/20, #000061, Intact.
H. 1.8 cm, D. 2.4 cm, DH. 0.6 cm, Wt. 11 g.
Stone, steatite. Very worn all over, especially bottom side, but also with large chunks taken out of the top side.
SW LH IIIC Middle floors.

D - Convex Whorls

086 Convex Whorl
SF0115, NWB1a 4/11, #001296, Intact.
H. 2.6 cm, D. 5.1 cm, DH. 0.7 cm, Wt. 66 g.
Clay. NW Pit. Coarse red fabric. Fairly deep "hollow top." Worn on either side, on the lip and the bottom side around the hole.
Mixed context, LH IIIB/C.

087 Convex Whorl
SF0238, NWB2b 5/12, #002410, Intact.
H. 2.5 cm, D. 4.0 cm, DH. 0.9 cm, Wt. 42 g.
Clay. Blackened fabric. Well worn. Bottom half missing.
Mixed Mycenaean, LH IIIB/C Early.

088 Convex Whorl
SF0439, NWB3c 11/21, #004502, Intact.
H. 1.8 cm, D. 2.7 cm, DH. 0.6 cm, Wt. 13 g.
Clay. Orange red fabric with small white inclusions. Rounded bottom, with somewhat flat top.
LH IIIC Early, NW unburnt destruction level. destruction level.

089 Convex Whorl
No SF, NEA1c 9/41, #005286, ca. ½ preserved.
H. 1.5 cm, D. 3.5 cm, DH. 0.7 cm, Wt. 13 g.
Clay. Coarse red fabric with many inclusions. Very worn, especially on edges and bottom. Very little of the bottom half is preserved.
NDA.

090 Convex Whorl
No SF, NWB1a 4/16, #005108, Intact.
H. 1.3 cm, D. 2.6 cm, DH. 0.7 cm, Wt. 13 g.
Stone, Steatite. Found in floatation, from NW pit. Nearly covered in caked on soil residue. Blue/white colour, lighter than other steatite whorls.
LH IIIC Early (latest LH IIIC Middle)

091 Convex Whorl
SF0079, SWB3b 24/64, #000265, Intact.
H. 1.8 cm, D. 2.6 cm, DH. 0.5, Wt. 19 g.
Stone, Steatite. Worn, but well preserved. Flat top and small flat bottom as well. Top has caked on soil residue, but this doesn't seem to be hiding any breaks or chips.
SW LH IIIC Middle Trash.

092 Convex Whorl
No SF, NWB1a 1/7, #004011, ca. ¼ preserved.
H. n/a, D. 5.0 cm, DH. 0.8 cm, Wt. 20 g.
Clay. Coarse red fabric with lots of inclusions, only a portion of the top preserved.
Mixed context.

093 Convex Whorl
No SF, NWB3c 14/27, #004765, ca. ¼ preserved.
H. 3.2 cm, D. 5.0, DH. n/a, Wt. 13 g.
Clay. Coarse red fabric, with some inclusions. A small portion of the hole preserved all the way down to the bottom.
LH IIIC Early, NW unburnt destruction level. destruction level.

094 Convex Whorl
No SF, SEA2c 6/23, #001697, ca. ⅖ preserved, mended from 2 pieces.
H. n/a, D. 5.0 cm, DH. n/a, Wt. 23 g.
Clay. Found in Archaic era pit with female terracotta figurines. Brownish red fabric, with small blackened areas.
Mixed context.

095 Convex Whorl
No SF, SEA3d 1/3, #002709, ca. ¼ preserved.
H. n/a, D. n/a, DH. 0.8 cm, Wt. 15 g.
Clay. Reddish orange fabric, no part of the top lip or the bottom preserved.
Mixed context.

096 Convex Whorl
No SF, SWA1b 9/32, #004152, about ¼ preserved.
H. n/a, D. 5.0 cm, DH. n/a, Wt. 11 g.
Clay. Coarse crumbly fabric, burned black.
EH II - LH I.

E - Cylindrical Whorls

097 Short Cylindrical Whorl
SF0477, SWB3d 2/3, #000755, Intact.
L. 1.7 cm, W. 3.3 cm, W. (waist) 3.2 cm, Wt. 27 g.
Pierced. Wear along the side, suggests thread or string was wrapped around it. Red fabric with many small inclusions, but blacked on one face and sides.
Mixed Mycenaean.

098 Short Cylindrical Whorl
No SF, SEA4c 1/8, #000234, Intact, but very worn.
H. 1.6 cm, D. 3.8 cm, DH. 0.9cm, Wt. 19 g.
Clay. Red clay with small inclusions, very small and worn on all sides.
Mixed context.

099 Short Cylindrical Whorl
SF0476, SWB3b 50/107, #000777, Intact.
H. 0.9 cm, D. 3.0 cm, DH. 0.5 cm, Wt. 9 g.
Red/black burnt destruction level. terracotta. Lots of small white inclusions. Black on one side with some red, but very red on the other side, perhaps burned.
SW Structure B, LH IIIC Early.

100 Short Cylindrical Whorl
SF0234, SWA1d 2/3, #002501, Intact.
H. 0.9 cm, D. 3.2 cm, DH, 0.4 cm, Wt. 8 g.
Clay. Creamy fabric, beige colour, many inclusions, and chipped sides. A small amount of white slip is preserved on one side.
Mixed context.

F - Spherical Whorls

101 Spherical Whorl
SF0271, SWB3a 33/111, #003483, Intact.
H. 2.3 cm, D. 3.5 cm, DH. 0.7 cm, Wt. 29 g.
Clay. Yellowish-red with some inclusions. Crumbly fabric.
Mixed Mycenaean, mostly LH IIIC (Early Myc. - LH IIIC Middle)

G - Discoid Whorls

102 Discoid Whorl
SF0496, SEA5c 1/5, #005105, Half of back side missing.
H. 2.2 cm, D. 5.9 cm, DH. 0.8 cm, Wt. 66 g.
Clay. Orange fabric with few inclusions.
NDA.

103 Discoid Whorl
No SF, SWA1b 2/4, #003881, ca. ½ preserved.
H. 1.3 cm, D. 4.2 cm, DH. 1.1 cm, Wt. 9 g.
Clay. Orange fabric. Flat on one side and slightly rounded on the other. Same type as **102.**
Mixed Context.

104 Discoid Whorl
SF0398, NWC2b 5/14, #003451, Intact.
H. 2.4 cm, D. 3.9 cm, DH. 0.6 cm, Wt. 31 g.
White clay with lots of caked on dirt or calcium characteristic of Eleon's soil.
Early Mycenaean - LH IIIC

105 Discoid Loomweight.
SF0237, SEB3c 14/23, #002692, Half preserved.
H. 1.2 cm, D. 5.3 cm, DH. 0.6 cm, Wt. 22 g.
White clay, with some small inclusions.
LH IIIA2 - IIIB (and some later)

106 Discoid Loomweight.
SF0272, SWB3a 32/108, #003348, Intact.
H. 1.2 cm, D. 5.1 cm, DH. 0.6 cm, Wt. 45 g.
Clay. With similar caking to **104**.
LH IIIA - Late Archaic

107 Pierced Disc
SF0006, NWB2c 1/2, #000442, ca. ½ preserved.
H. 0.7 cm, D. 2.9 cm, DH. 0.5 cm, Wt. 3 g.
Clay. Yellow, almost white, fabric.
Topsoil, mixed context.

H - "Pierced Discs"

108 Pierced Disc
No SF, NWB1b 4/5, #002342, ca. ½ preserved.
H. 1.3 cm, D. 6.2 cm, DH. 1.3 cm, Wt. 30 g.
Clay, possible reworked sherd. Red coarseware fabric with some inclusions. Not very circular. Possible loomweight?
LH IIIB - LH IIIC Early/Middle with some Medieval intrusion.

109 Pierced Disc
SF0523, SWA2b 28/64, #005128, Half Preserved.
H. 1.1 cm, D. 4.3 cm, DH. 0.8 cm, Wt. 12 g.
Reworked sherd. Grey fabric - Grey Minyan?
LH I (Early Myc.)

110 Pierced Disc
No SF, NWB1b 35/60, #004007, Intact.
H. 0.9 cm, D. 5.0 cm, DH. 1.1 cm, Wt. 23 g.
Reworked sherd, black/brown monochrome exterior sherd. Yellow medium ware fabric with some small inclusions.
EH III - LH I.

111 Pierced Disc
SF0478, NWB2c 40/59, #004240, Intact.
H. 0.8 cm, D. 4.7 cm, DH. 1.1 cm, Wt. 16 g.
Reworked sherd, orange colour with some small inclusions.
NDA.

112 Pierced Disc
No SF, SWB3a 11/44, #001100, Intact.
H. 1.4 cm, D. 4.3 cm, DH. 0.5 cm, Wt. 19 g.
Reworked ceramic base. Orange fabric with small inclusions, quite worn with rough edges.
NDA.

113 Pierced Disc
SF0564, SWA2b 28/81, #005421, Intact.
H. 1.6 cm, D. 5.2 cm, DH. 0.6 cm, Wt. 30 g.
Reworked sherd. Grey Minyan base. Three incised concentric circles on the exterior of the base revolving around the piercing. Quite worn on all sides.
MH - LH I

114 Pierced Disc
No SF, NWA1d 5/15, #004980, ca, ¼ preserved.
H. 1.0 cm, D. 8.0 cm, DH. 0.8 cm, Wt. 9 g.
Reworked sherd. Light yellow fabric with small inclusions.
NDA.

115 Pierced Disc
SF0479, NWB1a 16/43, #004010, Intact.
H. 0.8 cm, D. 4.8 cm, DH. 0.7 cm, Wt. 18 g.
Reworked sherd from a linear banded vessel. At least 2 linear bands. Brown, fine ware, fabric.
LH IIIC Early, NW unburnt destruction level. destruction level.
116 Pierced Disc
No SF, NWB1b 33/54, #004006, ca. ⅓ preserved.
H. 0.8 cm, D. 8.0 cm, DH. n/a, Wt. 21 g.
Reworked sherd. Light orange fabric, fine ware. Interior shows wheel marks.
LH I - LH II (latest LH IIIA2-B1)

117 Pierced Disc
No SF, NWB1b 37/67, #004005, ca. ¼ preserved.
H. 1.1 cm, D. 5.5 cm, DH. n/a, Wt. 14 g.
Reworked sherd. Yellow/white fabric with many small inclusions.
MH (latest LH II)

118 Pierced Disc
SF0082, NWB2d 28/39, #000235, Intact.
H. 0.7 cm, D. 4.9 cm, DH. (1) 0.3 cm, DH.(2) 0.3 cm, Wt. 18 g.
Reworked sherd. Double pierced. Orange fabric. Very circular, and only slightly worn.
MH

119 Pierced Disc
No SF, NWC3d 5/7, #003433, ca. ½ preserved.
H. 0.9 cm, D. 6.5 cm, DH. 0.6 cm, Wt. 23 g.
Reworked sherd. Orange and yellow fabric with a lot of small white inclusions.
LH III (some earlier material)

120 Pierced Disc
No SF, SEA1c 11/30, #003781, ca ⅓ preserved.
H. 0.7 cm, D. 5.0 cm, DH. 1.0 cm, Wt. 6 g.
Reworked sherd. Small fragment. Orange fabric with small inclusions.
LH I.

121 Pierced Disc
No SF, SEA2d 10/15, #001815, ca. ¼ preserved.
H. 1.4 cm, D. 6.5 cm (rough estimate), DH. 0.8 cm, Wt. 21 g.
Reworked sherd. Red/orange fabric with some small inclusions. Medium ware.
Mixed context.

122 Pierced Disc
No SF, SWA1b 23/48, #004791, ca. ⅓ preserved.
H. 0.8 cm, D. 5.0 cm, DH. n/a, Wt. 9 g.
Reworked sherd. Brown fabric with small white inclusions. Blackened on one side. Very poorly preserved.
Latest LH I (perhaps LH IIA).

123 Pierced Disc
SF0225, SWA1c 4/9, #002636, Intact.
H. 1.0 cm, D. 5.5 cm, DH.(1) 0.3 cm, DH.(2) 0.3 cm, Wt. 35 g.
Reworked sherd. Double pierced. Orange fineware fabric with a beige slip on the exterior. Two very small piercings.
Mixed with lots of LH IIIA2-B (MH-LH IIIC, medieval).

124 Pierced Disc
SF0233, SWA1d 2/4, #002506, Intact.
H. 1.2 cm, D. 6.3 cm, DH. 0.7 cm, Wt. 42 g.
Reworked sherd. Light brown fabric with very small white inclusions. Possible imprint of the yarn which was wrapped around the spindle and whorl.
Mixed with mostly pre-Mycenaean.

125 Pierced Disc
No SF, SWA1d 16/43, #003783, ca. ⅓ preserved.
H. 1.1 cm, D. 5.0 cm, DH. n/a, Wt. 8 g.
Reworked sherd. Pale orange fabric with small inclusions. One side has a small fresh break.
MH (latest LH I).

126 Pierced Disc
No SF, SWA2b 2/4, #002202, ca. Ca. ½ preserved.
H. 1.0 cm, D. 5.3 cm, DH. 0.6 cm, Wt. 18 g.
Reworked Sherd. Light brown fabric, but mostly blackened from fire. Crumbly and very worn.
Mixed context.

127 Pierced Disc
No SF, SWB2c 10/22, #003156, ca. ½ preserved.
H. 0.6 cm, D. 4.6 cm, DH. n/a, Wt. 8 g.
Reworked sherd. Orange fineware fabric. Lightly incised concentric circle on the exterior side surrounding the piercing.
Latest LH IIIC Middle.

128 Pierced Disc
No SF, SWB3b 27/55, #000277, ca. ½ preserved.
H. 0.8 cm, D. 4.7 cm, DH. 0.5 cm, Wt. 10 g.
Reworked sherd. SW Structure B. Brown fabric with small white inclusions, slightly burnished on one side.
LH IIIC Early.

129 Pierced Disc
SF0169, NWB3d 16/32, #001737, Intact.
H. 1.4 cm, D. 6.0 cm, DH. 0.3 cm, Wt. 44 g.
Reworked sherd. SW trash pit. Red medium ware fabric, slightly blackened on one side. Slightly squared shape.
LH IIIC Middle trash deposit.

130 Pierced Disc
SF0495, SWA2b 28/63, #005122, Intact.
H. 1.0 cm, D. 6.5 cm, DH. 0.9 cm, Wt. 46 g.
Reworked sherd. Light orange fabric. Very circular whorl with a small fresh break on one side. Caked on soil covers the back side. Very well preserved.
LH I.

131 Pierced Disc
No SF, NEA1b 1/1, #005298, ca. ½ preserved.
H. 0.9 cm, D. 5.2 cm, DH. 0.6 cm, Wt. 13 g.
Reworked sherd. Found with **155**. Orange fabric, fineware. Small, very worn. One side has some light brown slip preserved.
NDA

132 Pierced Disc
No SF, NEA1c 1/2, #004875, ca. ½ preserved.
H. 2.9 cm, D. 8.3 cm, DH. 1.0 cm, Wt. 71 g.
Reworked sherd. Orange fabric with lots of small inclusions.
NDA

133 Pierced Disc
No SF, NEA1c 11/33, #005236, ca. ½ preserved.
H. 0.7 cm, D. 3.5 cm, DH. 0.5 cm, Wt. 4 g.
Reworked sherd. Brown fabric with small black inclusions.
NDA.

134 Pierced Disc
No SF, NEA1c 11/33, #005236, ca. ½ preserved.
H. 1.1 cm, D. 6.0 cm, DH. 0.9 cm, Wt. 16 g.
Reworked sherd. Grey fabric, black painted sherd. Possibly burned as well.
NDA

135 Pierced Disc
No SF, SEA1c 53/112, #005375, ca. ⅓ preserved.
H. 0.7 cm, D. 4.0 cm, DH. n/a, Wt. 5 g.
Reworked sherd. Light orange fabric with lots of inclusions, white slip on the other side.
NDA.

136 Pierced Disc
No SF, NWA1d 6/16, #004982, ca. ½ preserved.
H. 0.5 cm, D. 5.0 cm, DH. 0.4 cm, Wt. 5 g.
Reworked sherd. Dark brown fabric, burnished on one side.
NDA

137 Pierced Disc
No SF, NEA1c 5/29, #005213, ca. ½ preserved.
H. 1.0 cm, D. 5.3 cm, DH. 0.9 cm, Wt. 15 g.
Reworked sherd. A failed attempt at a whorl, the sherd probably broke apart while trying to pierce the sherd. Orange fabric with inclusions, with a darker slip on top.
NDA

138 Pierced Disc
No SF, NWA1d 10/25, #005086, ca. ⅓ preserved.
H. 0.8 cm, D. 5.5 cm, DH. 0.8 cm, Wt. 14 g.
Reworked sherd. Brown medium ware fabric with lots of inclusions.
NDA

139 Pierced Disc
No SF, SWA2b 31/77, #005503, ca. ¼ preserved.
H. 0.7 cm, D. 5.5 cm, DH. n/a, Wt. 8 g.
Reworked sherd. Black painted interior and exterior, possibly EBA?
Latest LH I.

140 Pierced Disc
No SF, NEA1a 2/2, #005340, ca. ⅖ preserved.
H. 1.0 cm, D. n/a, DH. n/a, Wt. 10 g.
Reworked sherd. Orange fabric. Very fragmentary.
NDA.

141 Pierced Disc
No SF, SEA1c 7/13, #003780, ca. ½ preserved.
H. 0.7 cm, D. 4.2 cm, DH. 0.6 cm, Wt. 7 g.
Reworked Sherd. Orange fineware fabric with slightly lighter slip on one side.
Mixed with lots of EH III - LH I.

I - Semi-Pierced Discs

142 Semi-Pierced Disc
No SF, NWB1b 43/74, #004008, ca. ½ preserved.
H. 0.7 cm, D. 5.2 cm, DH. 0.6 cm, Wt. 14 g.
Reworked Sherd. Thin coarseware, grey fabric. Possibly a reused cooking potsherd.
MH (Latest LH I).

143 Semi-Pierced Disc
No SF, SEA1c 37/86, #004861, ca. ½ preserved.
H. 1.8 cm, D. 6.2 cm, DH. 1.9 cm, Wt. 48 g.
Reworked sherd. Reddish-brown medium ware fabric with many small black inclusions.
Latest LH I.

144 Semi-Pierced Disc
No SF, SWA2b 2/4, #002202, Intact.
H. 1.8 cm, D. 4.8 cm, DH. 1.2, Wt. 44 g.
Reworked sherd. Brown medium ware fabric with dark grey slip on each side. More square than round. The attempted piercing seems to have been abandoned early, which is why the sherd is intact.
Mixed (latest medieval).

145 Semi-Pierced Disc
No SF, SWA1d 37/77, #004792, ca. ½ preserved.
H. 1.2 cm, D. 3.9 cm, DH. 1.2 cm, Wt. 1.2 g.
Reworked sherd. Yellowish-red medium ware with lots of small inclusions. Sherd seems to have broken before the piercing was completed.
Latest LH I.

146 Semi-Pierced Disc
No SF, NWF1c 2/6, #004009, ca. ½ preserved.
H. 0.8 cm, D. 6.4 cm, DH. 0.7 cm, Wt. 17 g.
Reworked sherd. Light brown fine ware, no inclusions. Not very circular edges.
Mixed, mostly LH IIIC and medieval.

147 Semi-Pierced Disc
No SF, SEA3d 5/5, #003867, Intact.
H. 0.8 cm, D. 3.7 cm, DH. 0.4 cm, Wt. 10 g.
Reworked sherd. Red fabric, fine ware. Only a very small start of a piercing on either side.
Mixed context.

148 Semi-Pierced Disc
No SF, NWB1b 54/101, #005581, ca. ½ preserved.
H. 1.7 cm, D. 6.5 cm, DH. 0.1 cm, Wt. 53 g.
Reworked sherd. Orange coarse ware with inclusions. Burned on one side, probably from a cooking potsherd.
Latest LH I.

149 Semi-Pierced Disc
No SF, NEA1b 5/6, #005681, Intact.
H. 0.4 cm, D. 5.0 cm, DH. (1) 0.6 cm, DH.(2) 0.4 cm, Wt. 16
Reworked sherd. Orange fine ware, but still with many small black inclusions. A light brown slip on the exterior, and the start of two small peircings on the interior.
NDA.

150 Semi-Pierced Disc
No SF, SWA2b 31/75, #005504, ca. ½ preserved.
H. 0.9 cm, D. 5.5 cm, DH. 1.3 cm, Wt. 18 g.
Reworked sherd. Orange fine ware fabric. Small fresh break on the exterior, piercing doesn't go very deep.
LH I.

151 Semi-Pierced Disc
No SF, SWA2b 30/73, #005143, ca. ½ preserved.
H. 1.3 cm, D. 4.7 cm, DH. 0.9 cm, Wt. 1.3 g.
Reworked sherd. Yellow fabric with many large inclusions. Very circular, but the piercing barely scratches the surface of the sherd.
Latest LH I.

152 Semi-Pierced Disc
No SF, NWA1d 4/11, #005618, ca. ½ preserved.
H. 1.3 cm, D. 5.9 cm, DH. 1.3 cm, Wt. 35 g.
Reworked sherd. Cooking potsherd. Blackened coarse ware fabric with lots of inclusions.
NDA.

153 Semi-Pierced Disc
No SF, NEA1c 9/39, #005309, ca. ½ preserved.
H. 0.7 cm, D. 5.0 cm, DH. 0.9 cm, Wt. 12 g.
Reworked sherd. Orange fine ware fabric, wheel marks visible on both sides.
NDA.

154 Semi-Pierced Disc
No SF, NEA1b 1/1, #005298, ca. ½ preserved.
H. 0.8 cm, D. 4.8 cm, DH. 0.7 cm, Wt. 9 g.
Reworked sherd. Minyan ware. Dark grey fine ware fabric.
NDA.

III - "Spindle Stands"

155 Spindle Stand
SF0247, NWB2c 11/41, #000947, Intact.
H. 6.7 cm, D. 17. cm, DH. 2.2 cm, Wt. 1877 g.
Clay. Large "cheese wheel" shape, with a light grey slip around the entire stand. Crumbly fabric with lots of inclusions.
LH IIIC Early, NW burnt destruction level.

156 Spindle Stand
SF0248, NWB2c 14/14, #000596, complete, but in 5 mendable fragments.
H. 6.7 cm, D. 17.0 cm, DH. n/a, Wt. 1701 g.
Clay. Large "cheese wheel" shape, with a light grey slip around the entire stand. Crumbly fabric with lots of inclusions.
LH IIIC Early, NW burnt destruction level.

157 Spindle Stand
SF0249, NWB2c 14/14, #000596, under ½ complete, mended from several fragments.
H. 6.4 cm, D. 17.0 cm, DH. 2.2 cm, Wt. 597 g.
Clay. Large "cheese wheel" shape, with a light grey slip around the entire stand.
Crumbly fabric with lots of inclusions.
LH IIIC Early, NW burnt destruction level.

IV - Bone and Antler Textile Tools

158 Bone Point
SF0425, SEA1a 13/20, #004187.
L. 4.7 cm, W. 0.7 cm, Wt. 3 g.
Antler/Bone. Possibly bone. Broken on one side, pointed on the other.
Mostly EH III - LH I (latest LH IIIA).

159 Bone Point
SF0440, SWA1a 4/7, #004382.
L. 6.2 cm, W. 0.7 cm, Wt. 3 g.
Antler/bone. Broken on one end, pointed on the other.
Mixed with lots of LH IIIC Middle (EH-medieval).

160 Bone Point
SF0423, SAWA1b 9/19, #004250.
L. 3.2 cm, W. 0.9 cm, Wt. >1 g.
Antler/Bone. Tip of a possible awl, looks like bone rather than antler.
Mixed Context.

161 Bone Point
SF0428, SWA1b 9/39, #004276.
L. 6.3 cm, W. 1.2 cm, Wt. 3 g.
Antler/Bone. Sharper than the other awls, but squared at one end in a similar way.
NDA.

162 Bone Point
SF0467, SWB3b 52/117, #001117.
L. 11.5 cm, W. 1.2 cm, Wt. 17 g.
Antler/Bone. Broken on one end, pointed on the other.
LH IIIB.

163 Needle
SF0274, SEB3d 14/19, #003240.
L. 11.1 cm, W. 0.5 cm, Wt. 3 g.
Bone. Missing only the very top, but the eye is preserved with a diameter of 0.2 cm.
Mixed with mostly LH IIIB (latest Archaic).

164 Needle
SF0152, SWB3b 63/129, #001601.
L. 3.2 cm, W. 0.4 cm, Wt. >1 g.
Bone. Small, nicely polished fragment. Blackened. Top completely intact, missing bottom (pointed end).
LH IIIB2 Late - LH IIIC Early

V - Dress Weights

165 Green Steatite Dress Weight
SF0044, SWB3a 20/83, #001059. Intact, small chip on shank.
H. 1.3 cm, D. 2.5 cm, DH. 3.0 cm, Wt. 5 g.
Stone, green steatite. Well made, nicely polished "dress weight." Furumark (1941) would describe this as a "shanked button."
NDA.

166 Dress Weight
SF0273, SWB3a 35/114, #003496, Intact.
H. 1.1 cm, Thickness. 0.3 cm (head); 0.5 cm (shank), DH. 0.2 cm, Wt. 2 g.
Possibly bone or clay. White colour. Small, possibly a votive offering.
NDA.

Eleon Textile Tools

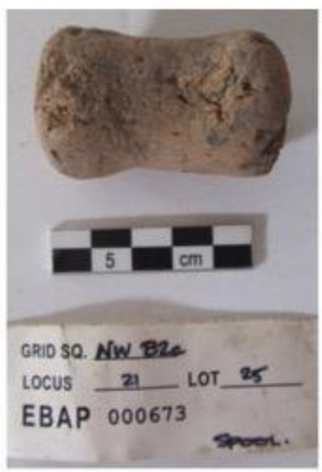
Photos by Max MacDonald
Drawings by Tina Ross and Alicia Walsh

001

002

003

004



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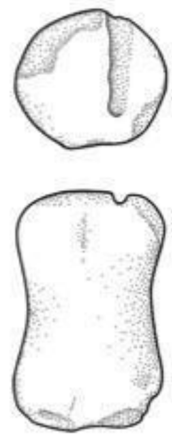

SF0468

0 5cm

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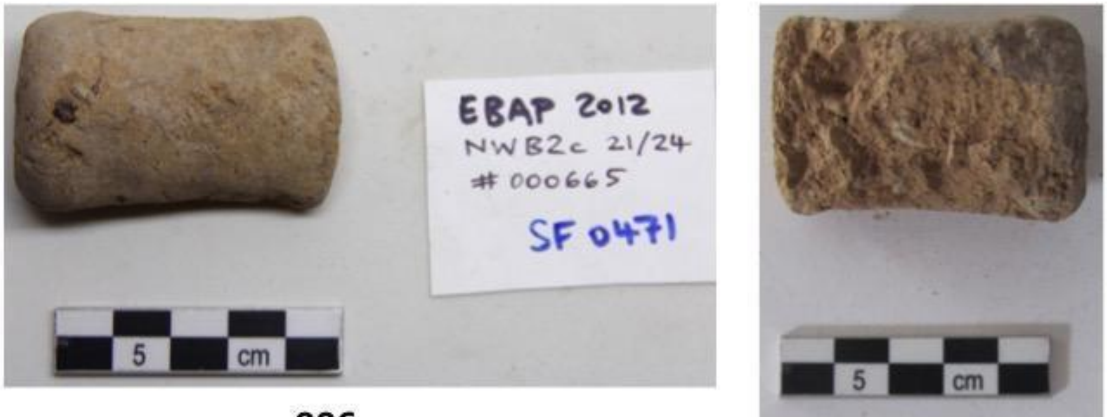
006-010



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SF0566
0
5cm
GRID SQ.
LOCUS 9 LOT 24
EBAP 002972
SF 0566

013


5 cm
GRID SQ. SWB3b
LOCUS 27 LOT 53
EBAP 004017
5 cm
GRID SQ. SWB3b
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EBAP 004017

014


10
cm
GRID SQ. SWA11
D.
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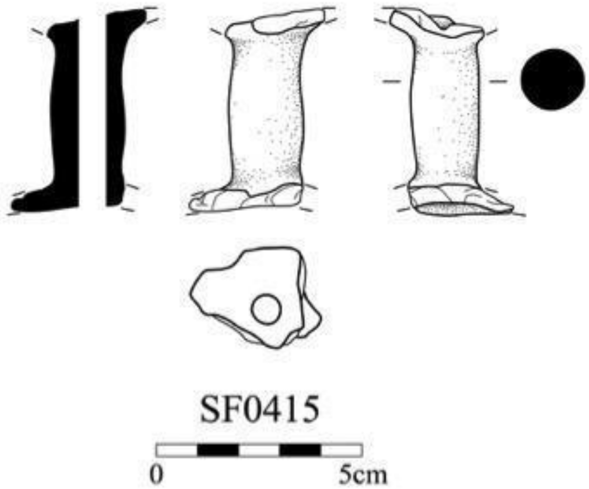
SF 0415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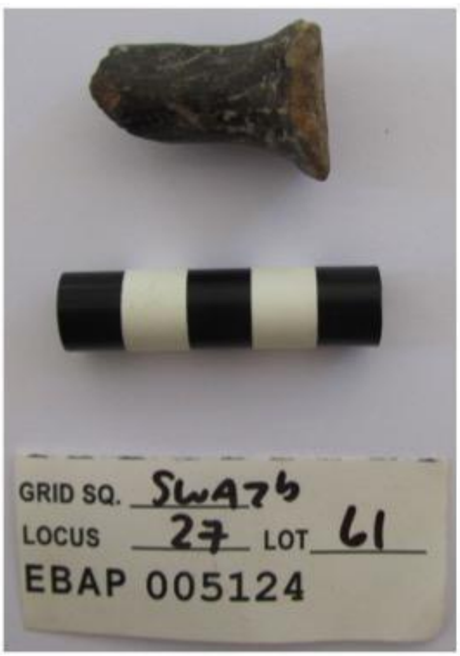
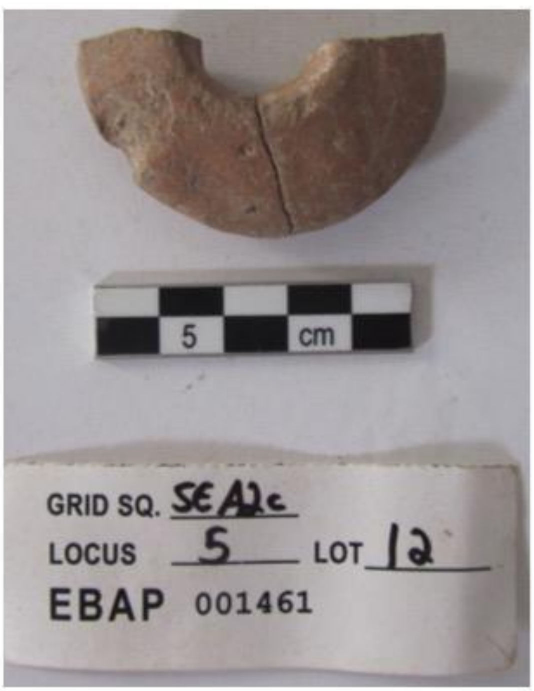

GRID SQ. SWA7b
LOCUS 27 LOT 61
EBAP 005124

016


CM
GRID SQ. NWB1b
D.
LOCUS 13 LOT 16
EBAP 001248
SF 0164

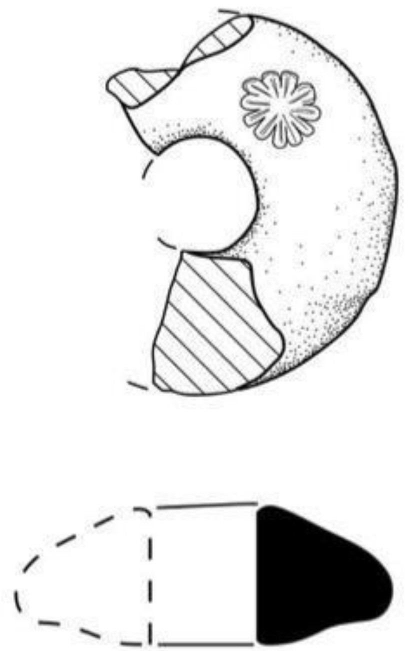
017


5 cm
GRID SQ. SEA2c
LOCUS 5 LOT 12
EBAP 001461


10 cm
GRID SQ. SEB2c
LOCUS 8 LOT 18
EBAP 002527

018

019



020

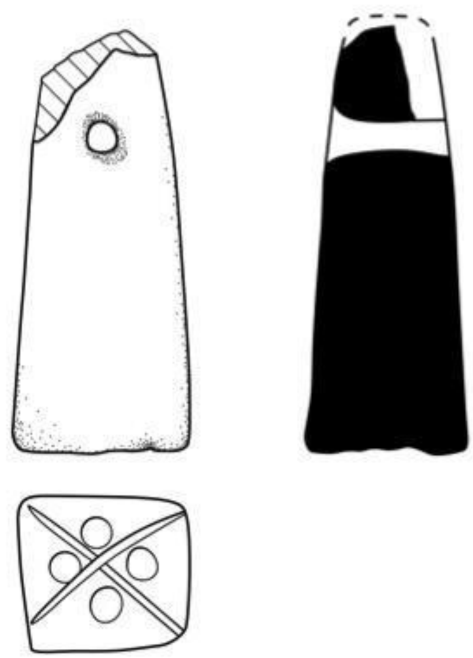
SF0235

0 5cm


10 cm
GRID SQ. NWB16
LOCUS 9 LOT 45
EBAP 001829
SF 0160
D.


10 cm
GRID SQ. NWB16
LOCUS 9 LOT 45
EBAP 001829
SF 0160
D.


CM
GRID SQ. NWB16
LOCUS 9 LOT 45
EBAP 001829
SF 0160
D.



SF0160


0
5cm

021


GRID SQ. SWA2b
LOCUS 28 LOT 64
EBAP 005128
SF 523
SF 524

022


CM
GRID SQ. SWB2d
LOCUS 8 LOT 20
EBAP 002956
SF0232

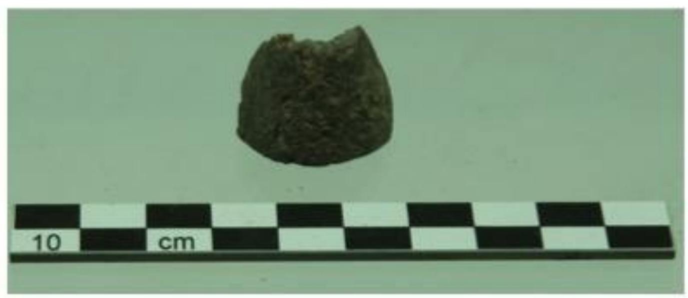
023


10 cm
GRID SQ. SEA1c
LOCUS 7 LOT 27
EBAP 003520

024

025

026



027

028

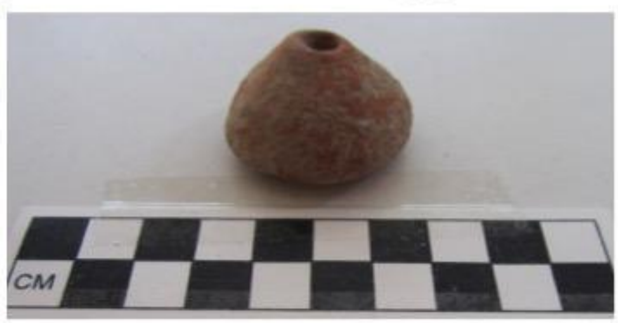
029

030

031

032

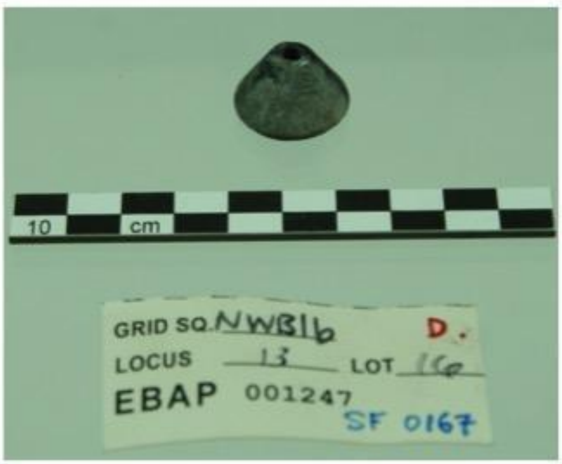
033

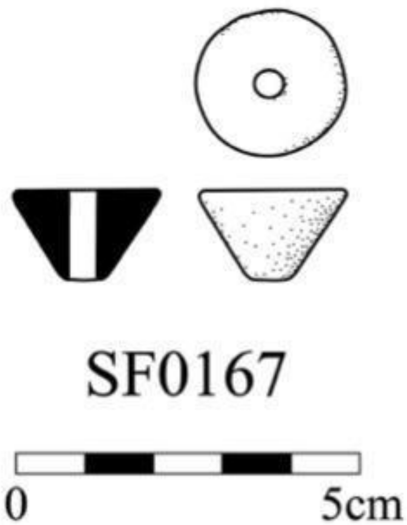


034


CM
GRID SQ. NW BJa
LOCUS 4 LOT 11
EBAP 001292

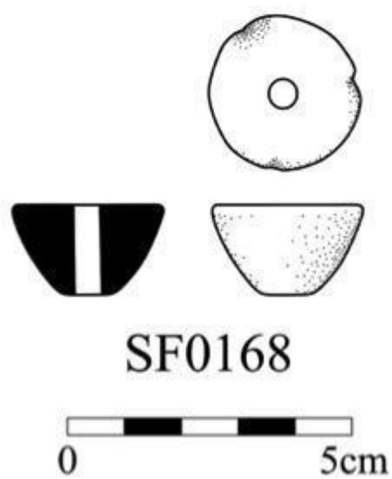
035


10 cm
GRID SQ. NWB1b D.
LOCUS 13 LOT 16
EBAP 001247
SF 0167


SF0167
0
5cm

036


10 cm
GRID SQ. NWB1b
LOCUS 20 LOT 26
EBAP 001628
SF 0168 D.


SF0168
0
5cm

037

038 and 039

038

039

040

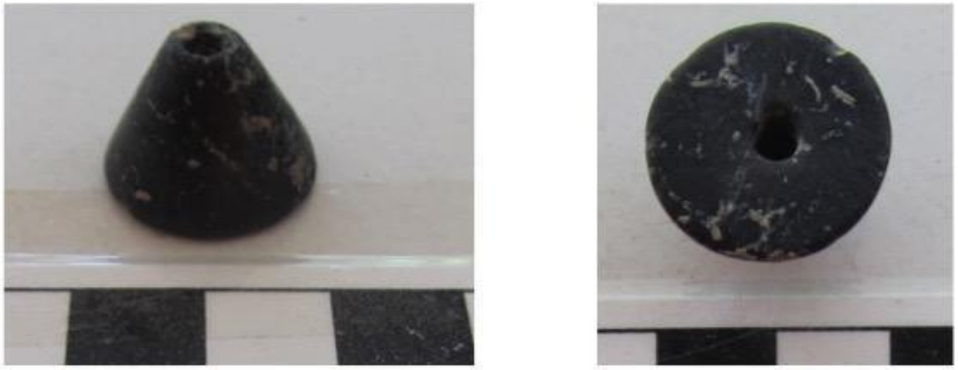
041

042

043

044

045

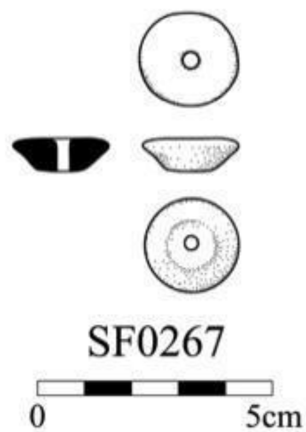


046

047

048

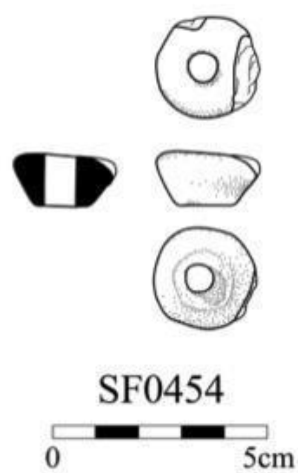
048



049

050

051



052

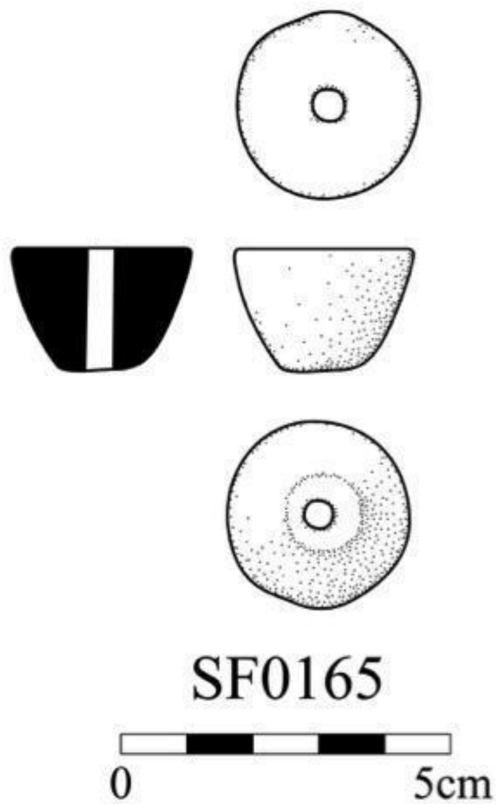

10 cm
GRID SQ. SWA1c
LOCUS 4 LOT 9
EBAP 002633
SF 0240


10 cm
GRID SQ. SWA1c
LOCUS 4 LOT 9
EBAP 002633
SF 0240

053


CM
GRID SQ. SWA2a D-
LOCUS 3 LOT 7
EBAP 001347
SF 0165


CM
GRID SQ. SWA2a D-
LOCUS 3 LOT 7
EBAP 001347
SF 0165

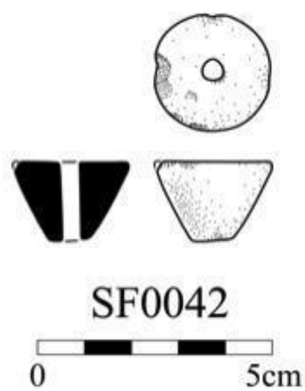

SF0165
0
5cm

054

055

056

056



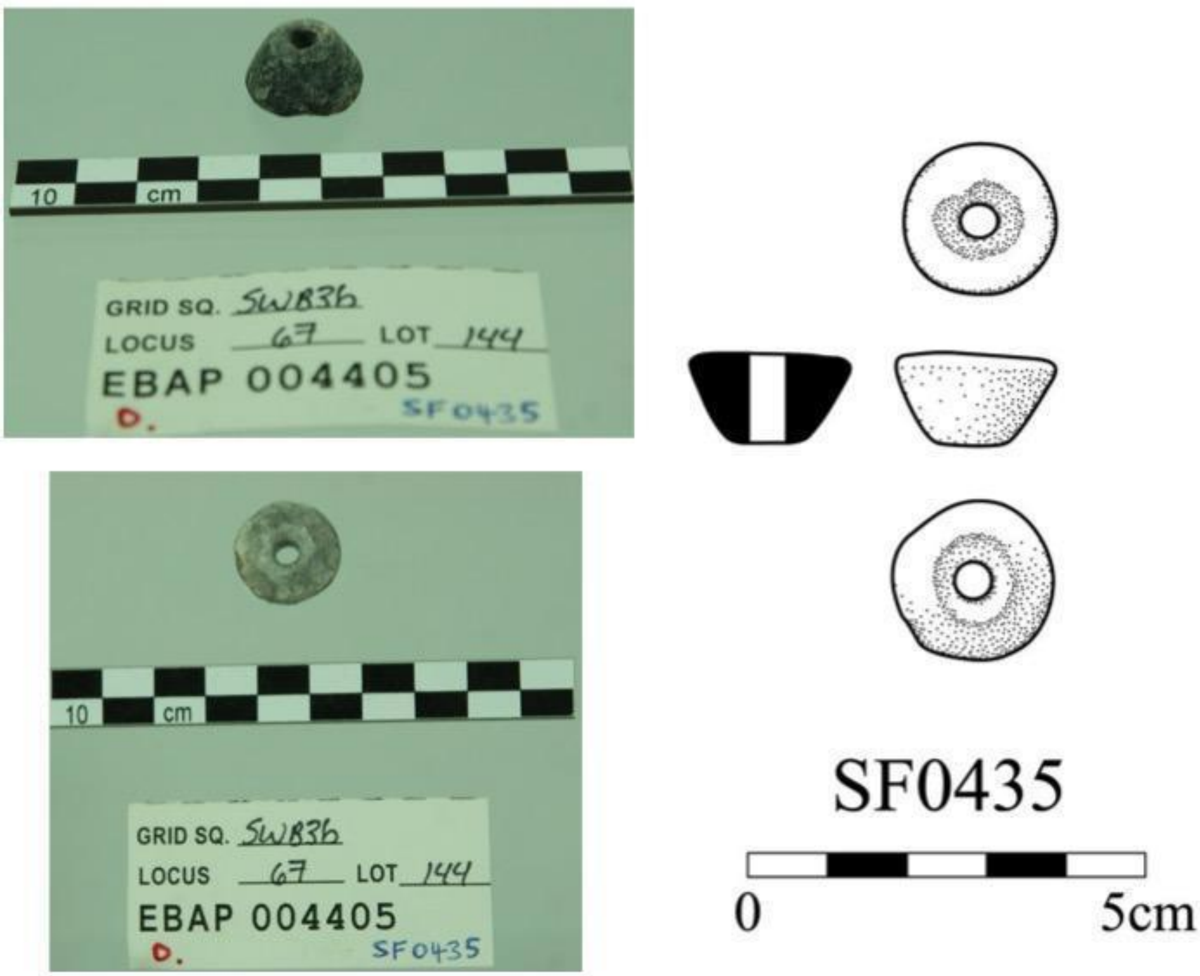
057


LOCUS 1 LOT 2
EBAP 000065
SW B3b

058


CM
GRID SQ. NW BJa
LOCUS 4 LOT 11
EBAP 001292

059


10 cm
GRID SQ. SWB3b
LOCUS 67 LOT 144
EBAP 004405
SF0435
10 cm
GRID SQ. SWB3b
LOCUS 67 LOT 144
EBAP 004405
SF0435
SF0435
0
5cm

060


5 cm
GRID SQ. SWB3d
LOCUS 19 LOT 41
EBAP 001786

061

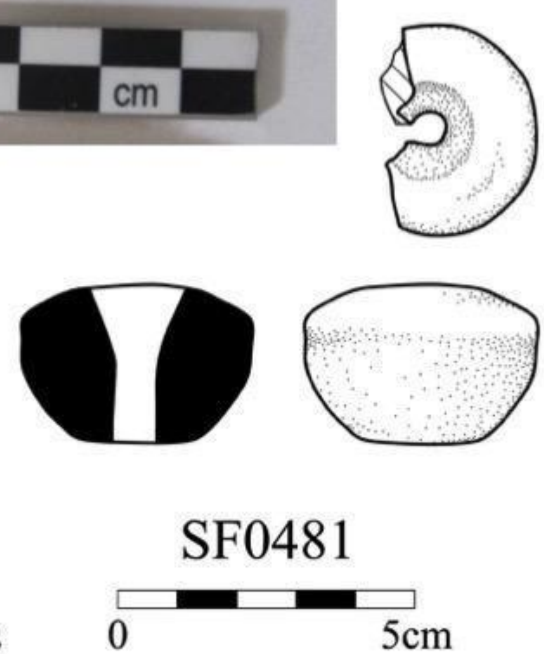

CM
GRID SQ. SWB3c D.
LOCUS 4 LOT 14
EBAP 001200
SF0113

062


5 cm
GRID SQ. NWB3d
LOCUS 3 LOT 5
EBAP 003043


5 cm


5 cm

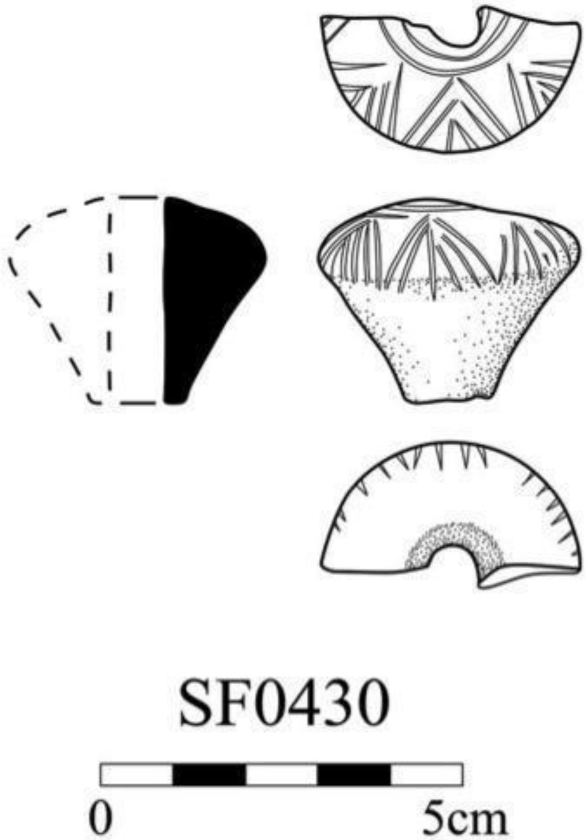

SF0481
0
5cm

063

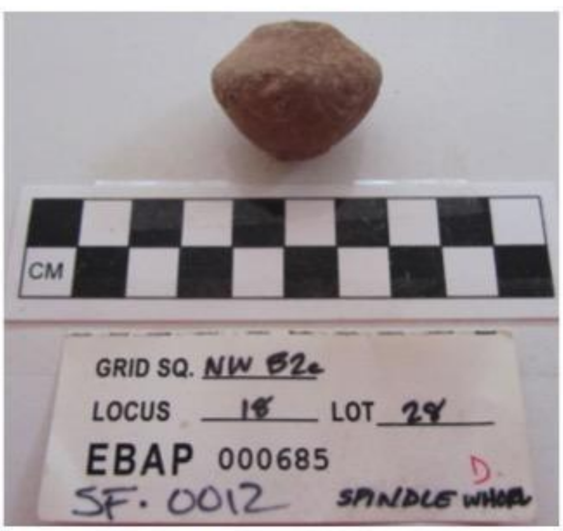

10 cm
GRID SQ. SWA16
LOCUS 1 LOT 2
EBAP 003755

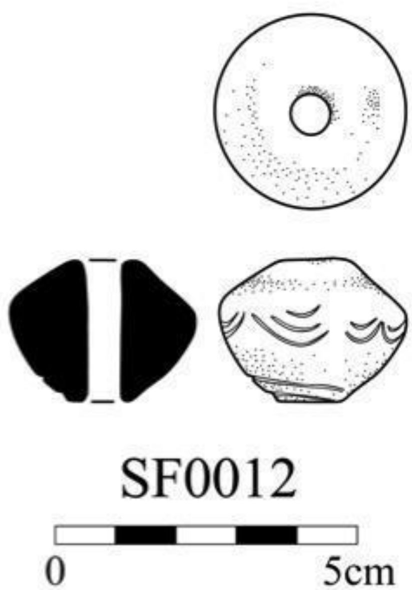
064


10 cm
GRID SQ. NWB16 D.
LOCUS 9 LOT 95
EBAP 004220
SF0430


SF0430
0
5cm

065


CM
GRID SQ. NW B2c
LOCUS 18 LOT 28
EBAP 000685 D.
SF. 0012 SPINDLE WHORL


SF0012
0
5cm

066


10 cm
LOCUS 20 LOT 26
EBAP
000153
SF 0470


10 cm
LOCUS 20 LOT 26
EBAP
000153
SF 0470

067


CM
GRID SQ. SEA2c
LOCUS 10 LOT 26
EBAP 003519
SF0325 D.


CM
GRID SQ. SEA2c
LOCUS 10 LOT 26
EBAP 003519
SF0325 D.


SF0325
0
5cm

068


cm

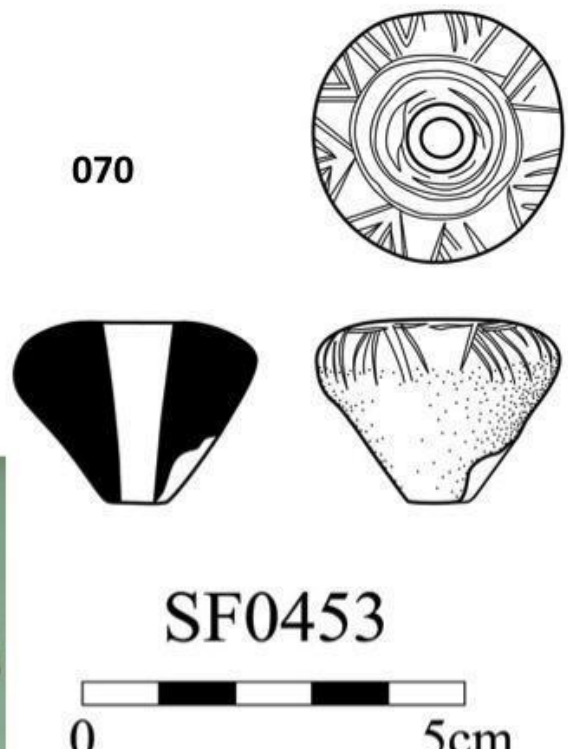

CM
GRID SQ. SEA26 D.
LOCUS 11 LOT 20
EBAP 002630
SF 0242


CM
GRID SQ. SEA26 D.
LOCUS 11 LOT 20
EBAP 002630
SF 0242

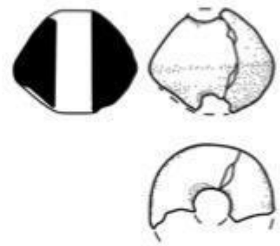
069


10 cm
GRID SQ. D.
LOCUS 5 LOT 8
EBAP 004386
SF 0453

070


SF0453
0
5cm

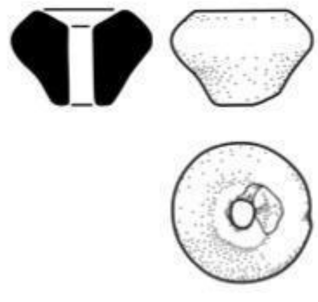

10 cm
GRID SQ. D.
LOCUS 5 LOT 8
EBAP 004386
SF 0453



SF0464

0 5cm

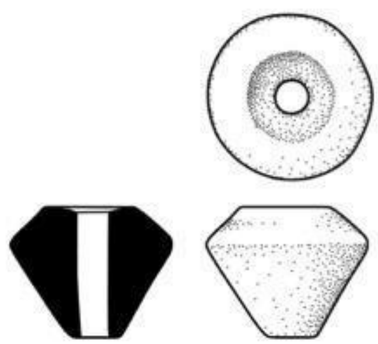
071



SF0114

0 5cm

072



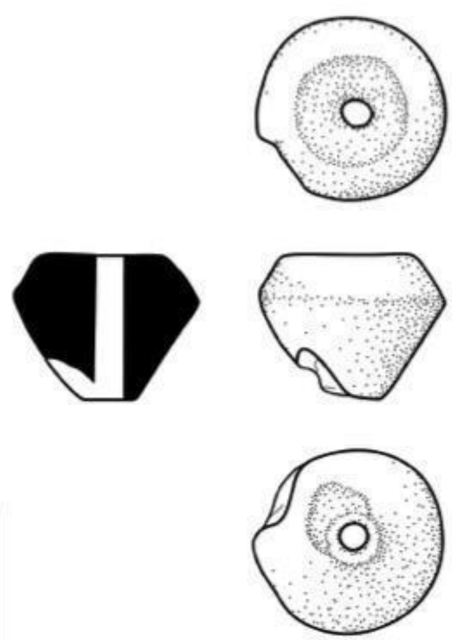
SF0397

0 5cm

073

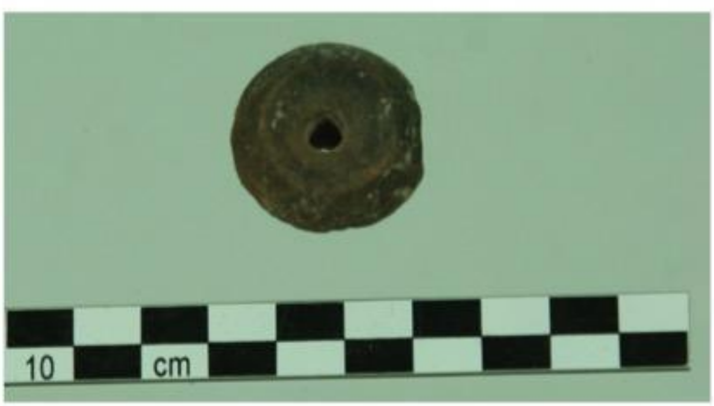
074

075

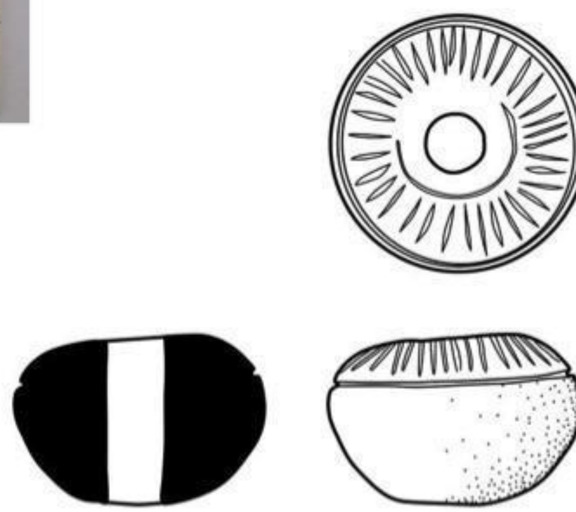


SF0460

0 5cm

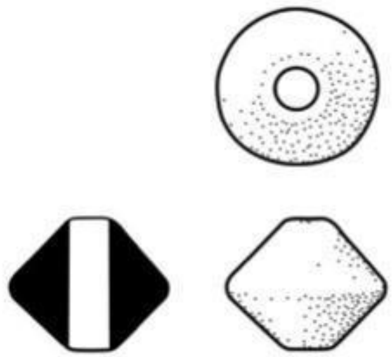


076

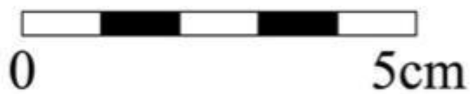


SF0529

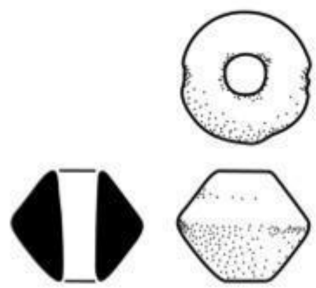
077



SF0207



078



SF0043

079

080

081

082 + 081

082


CM
GRID SQ. SWB2d
D.
LOCUS 1 LOT 1
EBAP 002275
SF 0239

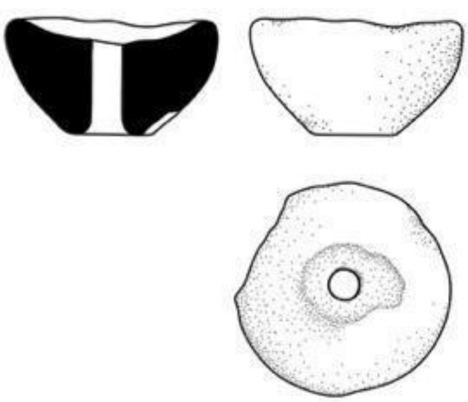
083


5 cm
GRID SQ. SWB2d
LOCUS 4 LOT 9
EBAP 002734

084


10 cm
LOCUS 9 LOT 20
EBAP
SW B36
000061

085

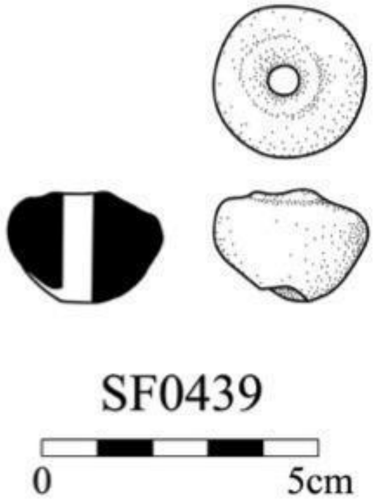


SF0115

0 5cm

086

087


SF0439
0
5cm


10 cm
GRID SQ. NW B3c
D.
LOCUS 11 LOT 21
EBAP 004502
SF0439

088


GRID SQ. NEA1c
LOCUS 9 LOT 41
EBAP 005286

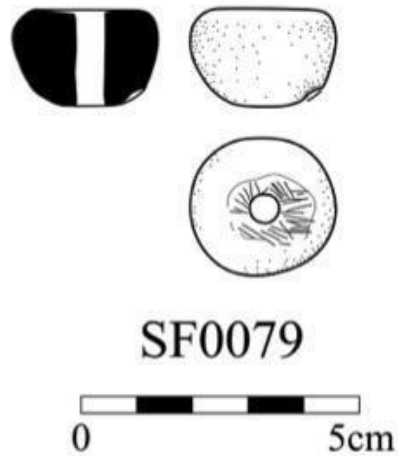

GRID SQ. NEA1c
LOCUS 9 LOT 41
EBAP 005286

089


10 cm
GRID SQ. NWB1a
LOCUS 4 LOT 16
EBAP 005108


10 cm
GRID SQ. NWB1a
LOCUS 4 LOT 16
EBAP 005108

090



091

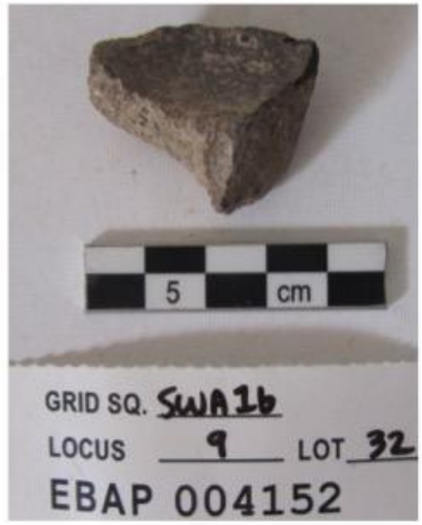
092

093

094


5 cm
GRID SQ. SEA3d.
LOCUS 1 LOT 3
EBAP 002709

095


5 cm
GRID SQ. SWA1b
LOCUS 9 LOT 32
EBAP 004152

096


10 cm
GRID SQ. SWB3d
LOCUS 2 LOT 3
EBAP 000755
SF 0477 D.
10 cm
10 cm
GRID SQ. SWB3d
LOCUS 2 LOT 3
EBAP 000755
SF 0477 D.
SF0477
0
5cm

097


CM
LOCUS 1 LOT 8
EBAP 000234

098


5 cm
GRID SQ. SWB3b
LOCUS 50 LOT 107
EBAP 000777

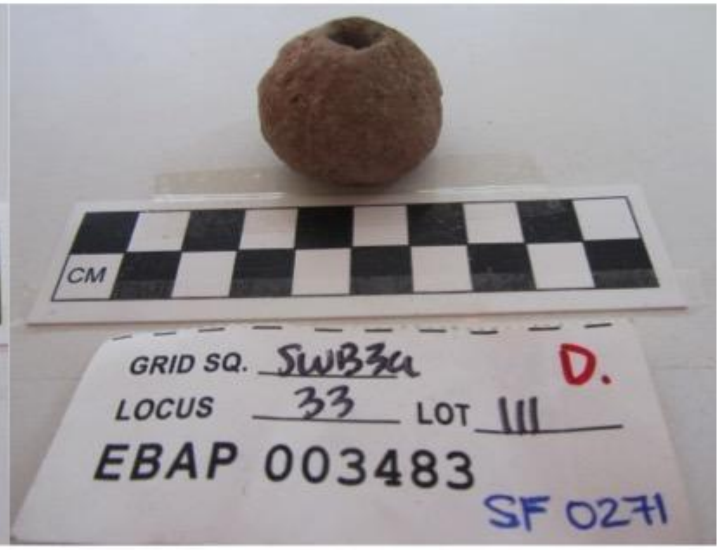
099


5 cm
GRID SQ. SWB3b
LOCUS 50 LOT 107
EBAP 000777

099

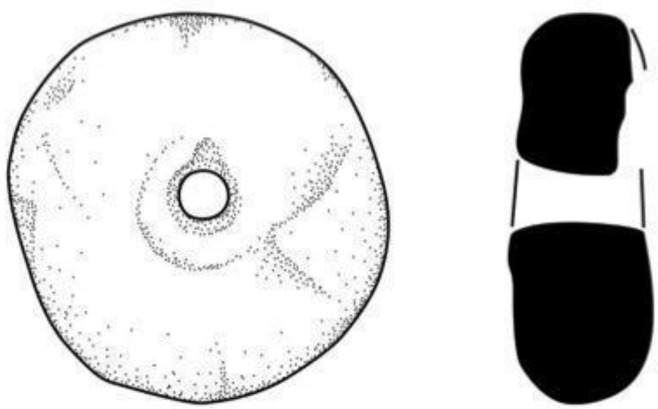

SF0476
0
5cm

100



101

102



SF0496


5 cm
GRID SQ. SWA16
LOCUS 2 LOT 4
EBAP 003881

103


CM
GRID SQ. NWC26
LOCUS 5 LOT 14
EBAP 003451
SF 0398

104


CM
GRID SQ. [redacted] SE B3c
LOCUS [redacted]M LOT [redacted]23
EBAP 002692
SF0237

105


CM
GRID SQ. SWB3a
LOCUS 32 LOT 108
EBAP 003348
SF0272
SF0272
0
5cm

106


CM
NW B2C
LOCUS 1 LOT 2
EBAP 000442
SF.0006
SF0006
0
5cm

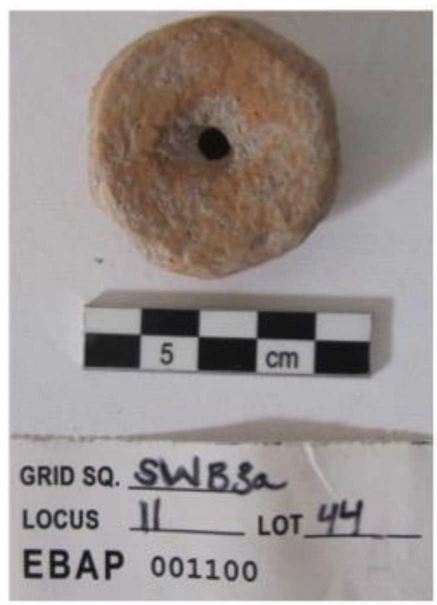
107

108

109

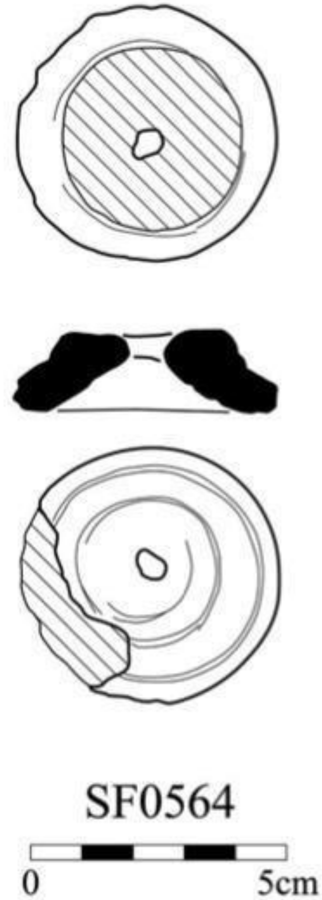
110

111



112

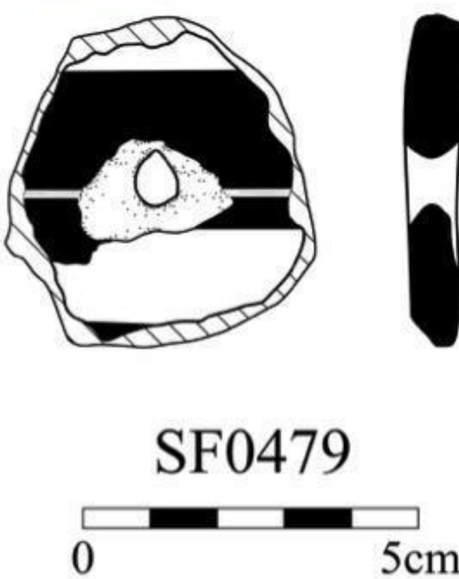

GRID SQ. (SWA2b)
LOCUS 28 LOT 81
EBAP 005421
SF 0564
GRID SQ. (SWA2b)
LOCUS 28 LOT 81
EBAP 005421
SF 0564


SF0564
0
5cm

113


CM
GRID SQ. NW A1d
LOCUS 5 LOT 15
EBAP 004980

114


SF0479
0
5cm


10
cm
GRID SQ. NW B1a
LOCUS 16 LOT 43
EBAP 004010
SF 0479

115


10 cm
GRID SQ. NWB1b
LOCUS 33 LOT 54
EBAP 004006

116


10 cm
GRID SQ. NWB1b
LOCUS 37 LOT 67
EBAP 004005

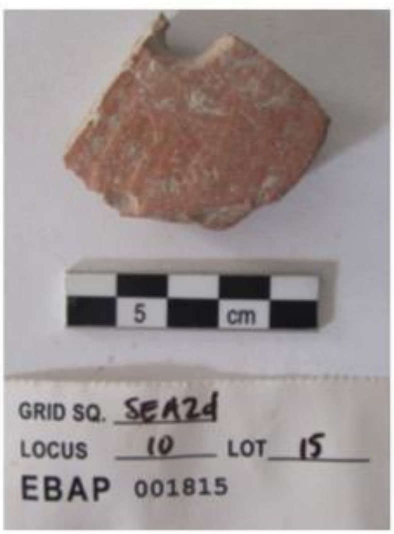
117


CM
LOCUS 23 LOT 39
EBAP 000235
NW B2d SF0082 D.
SF0082
0
5cm

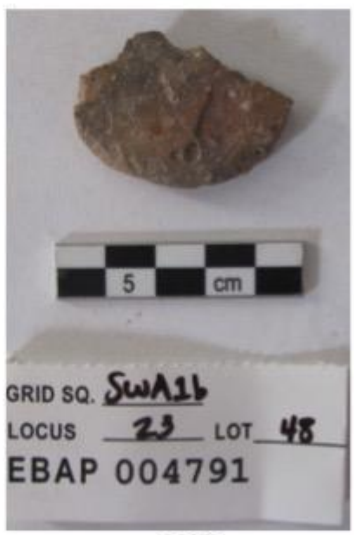
118

119

120

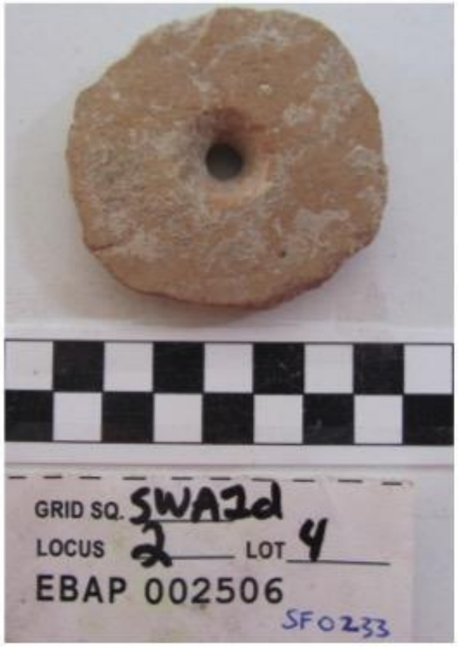


121



122

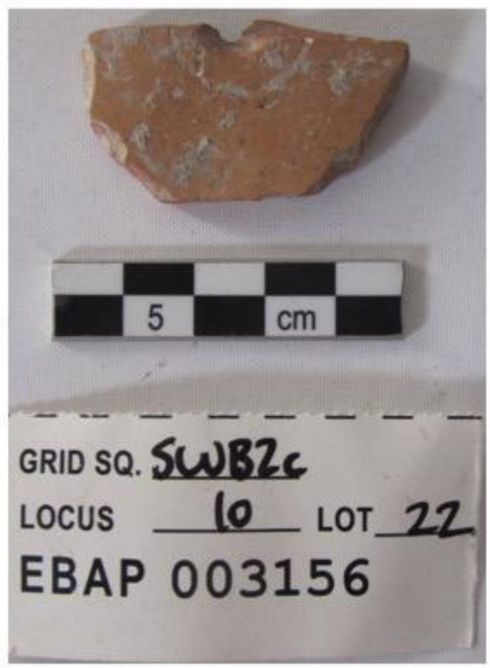
123



124

125

126



127

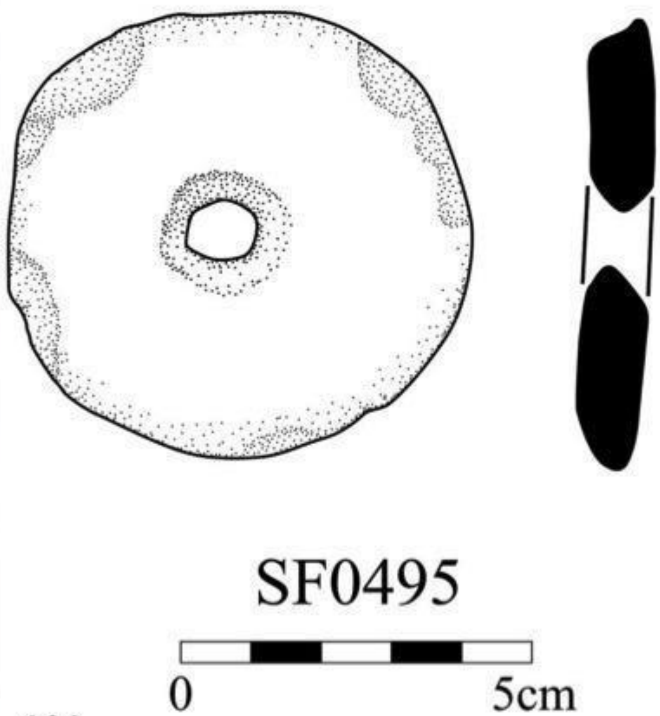

CM
LOCUS 27 LOT 55
EBAP SWB3b 000277

128


CM
GRID SQ. SWB3d D.
LOCUS 16 LOT 32
EBAP 001737
SF 0169

129

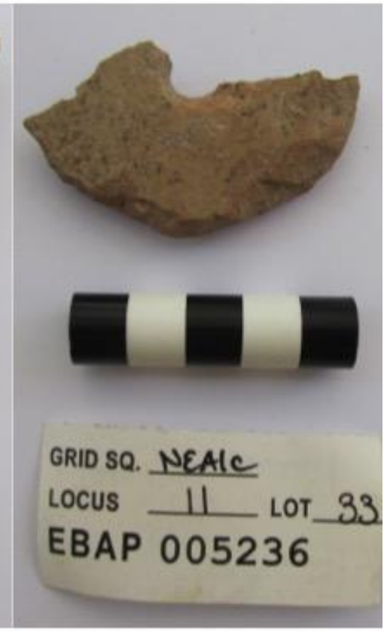

GRID SQ. SwA2b
LOCUS 28 LOT 63
EBAP 005122
SF0495


SF0495
0
5cm

130

131

132



133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149


GRID SQ. SwA2b
LOCUS 30 LOT 73
EBAP 005143

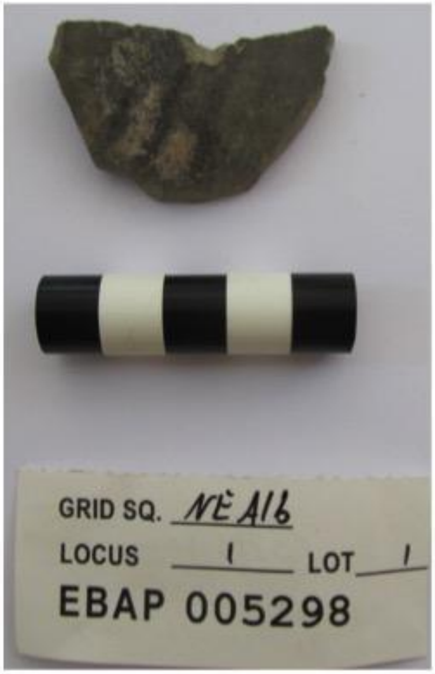
150


GRID SQ. NW A1d
LOCUS 4 LOT 11
EBAP 005618


GRID SQ. NEA1c
LOCUS 9 LOT 39
EBAP 005309

151

152


GRID SQ. NE A16
LOCUS 1 LOT 1
EBAP 005298

153


10 cm
GRID SQ. NWB1b
LOCUS 54 LOT 101
EBAP 005581

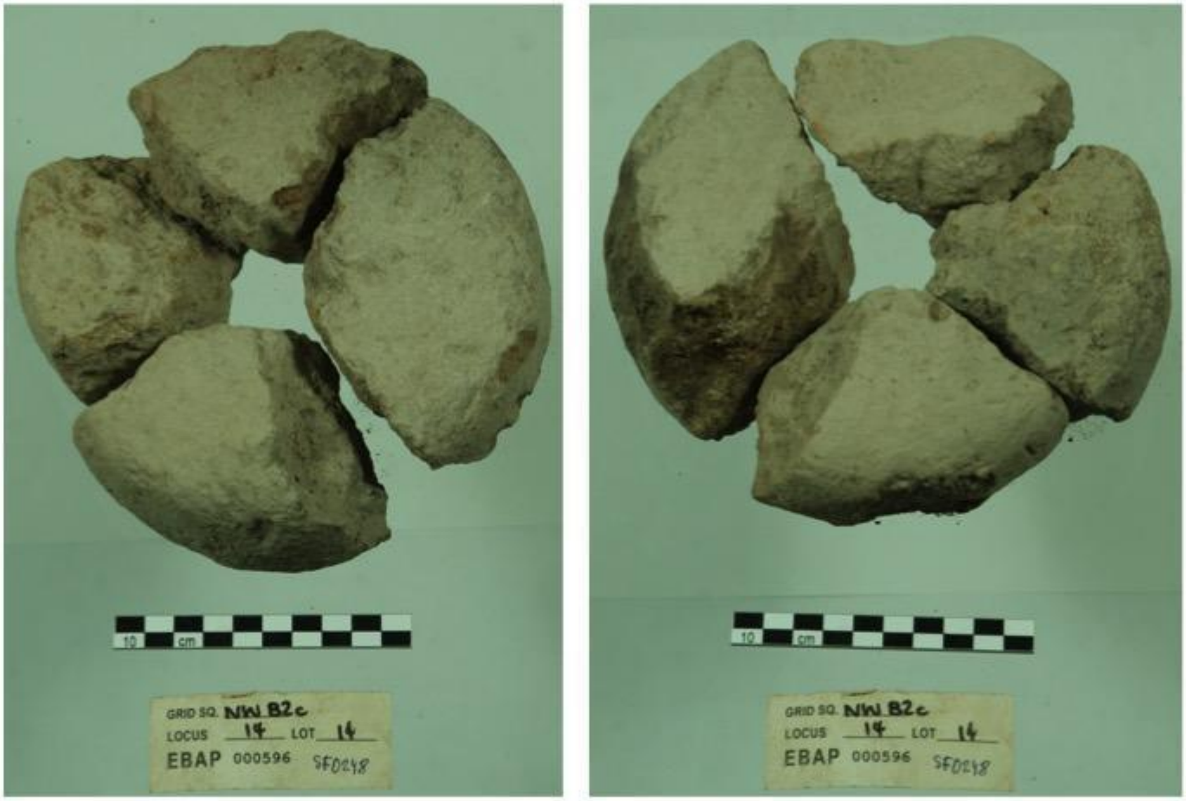
154


10 cm
GRID SQ. NW B2c
LOCUS 11 LOT 41
EBAP 000947


10 cm
GRID SQ. NW B2c
LOCUS 11 LOT 41
EBAP 000947


10 cm

155


10 cm
GRID SQ. NW B2c
LOCUS 14 LOT 14
EBAP 000596 SF0248
10 cm
GRID SQ. NW B2c
LOCUS 14 LOT 14
EBAP 000596 SF0248

156

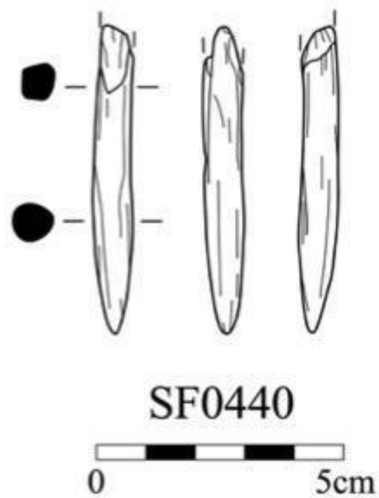

10 cm
Grid SQ: NWB2c
Locus/Lot: 14/14
EBAP Tag # 596
Description:
SFD249

157

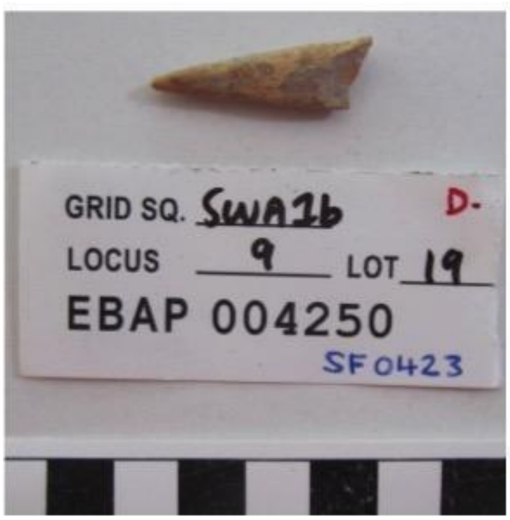

10
cm
GRID SQ. SEA1a
LOCUS 13 LOT 20
EBAP 004187
SF 425, 426, 427

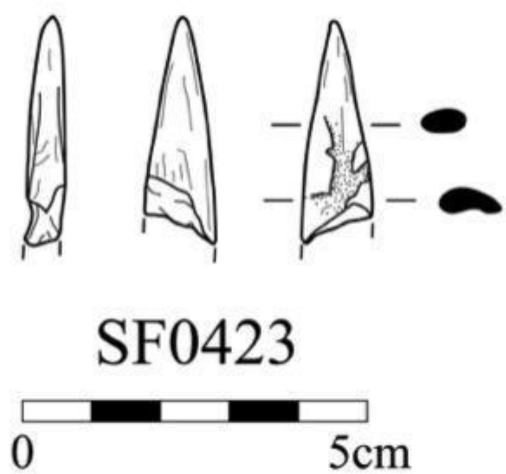
158


10
cm
GRID SQ. SWA1a
LOCUS 4 LOT 7
EBAP 004382
D.
SF0440


SF0440
0
5cm

159

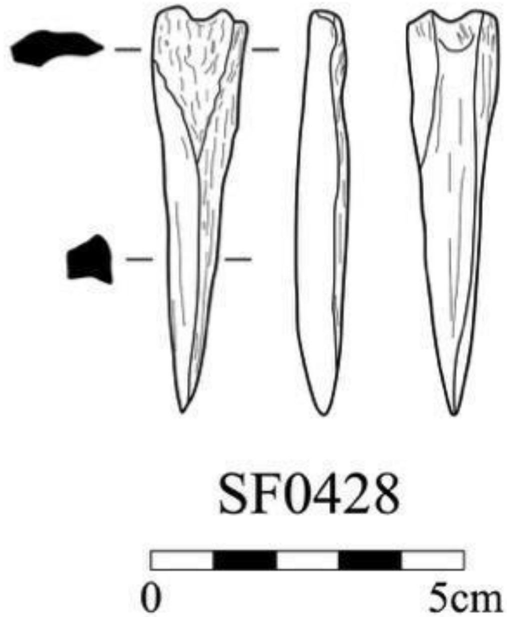

GRID SQ. SWA1b
D.
LOCUS 9 LOT 19
EBAP 004250
SF0423


SF0423
0
5cm

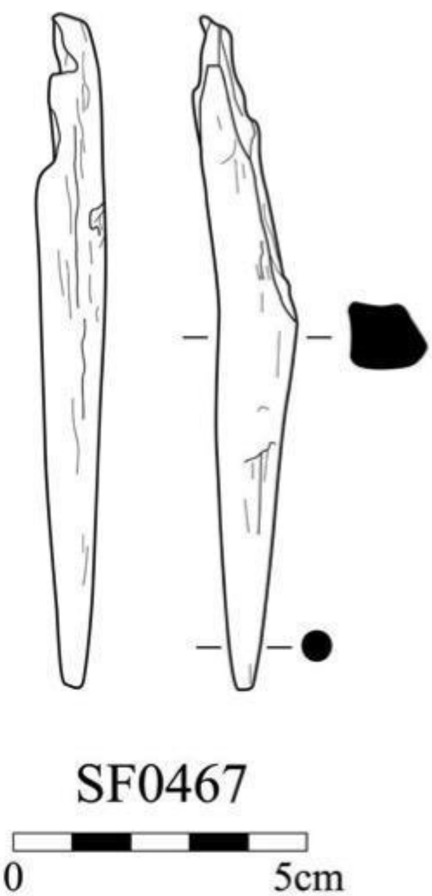
160


10 cm
GRID SQ. SWA1b
LOCUS 9 LOT 39
EBAP 004276
D.
SF 0428

161


SF0428
0
5cm


10 cm
GRID SQ. SWB3b
LOCUS 52 LOT 117
EBAP 001117
SF 0467
D.
10 cm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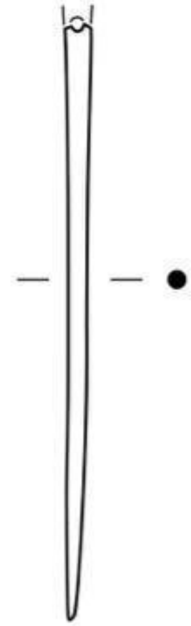
162



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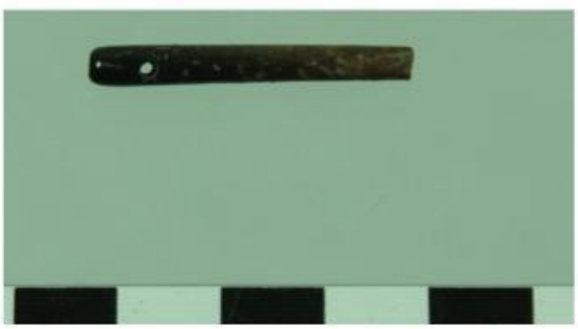
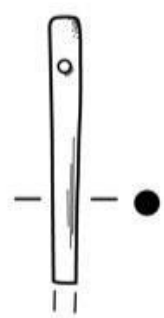
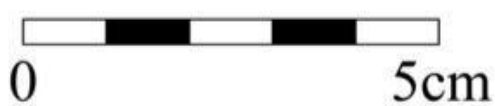




SF0152



164


GRID SQ. SWB3a
LOCUS 20 LOT 83
EBAP 001059
SF·44


SF0044
0
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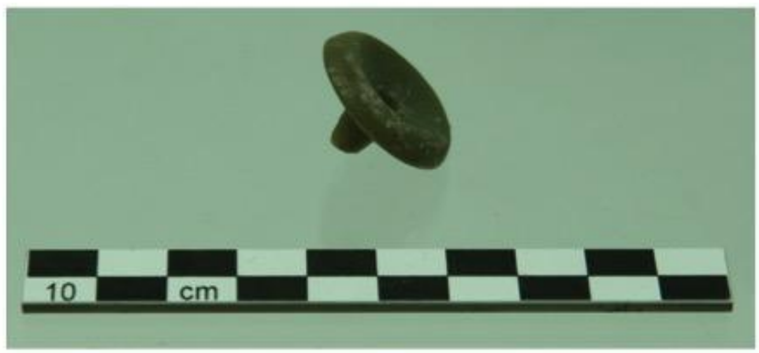
10 cm

165


10 cm
GRID SQ.
D.
LOCUS 35 LOT
EBAP 003496

166

Appendix - Ancient Chronologies

Greek Mainland	Crete	Date Range (BCE)
Early Helladic	Early Minoan	c.a. 3200/3000-2000
Middle Helladic	Middle Minoan	2000-1700
Late Helladic I	Late Minoan I	1700/1650-1550
Late Helladic II	Late Minoan II	1550-1400
Late Helladic IIIA	Late Minoan IIIA	1400-1300
Late Helladic IIIB	Late Minoan IIIB	1300-1200
Late Helladic IIIC	Late Minoan IIIC	1200-1100
Submycenaean	Submycenaean	1100-1050