Cupellation at Kea: Investigating Potential Applications of the Minoan Conical Cup

A Thesis
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Master of Arts

by
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ABSTRACT

For several decades, a full understanding of the Minoan Conical cup, its uses, and the social environment in which it was used has remained largely a mystery. Appearing first in the Early Minoan Period (EM; 3100-2100/2050 BCE), the conical cup seems to have been a vessel which was prevalent in the daily life of those living in the Bronze Age Aegean. It is not until the Late Minoan Period (LM; 1700/1675-1075/1050 BCE), that the conical cup production standardizes and vessels are found in large concentrations across the Aegean from Crete, Kea, Kythera, and Melos, to Thera, Mainland Greece, and portions of Western Anatolia (Gillis 1990b, 1). Yet over the past thirty years, physical descriptions and discussions of production of the conical cups have outnumbered explanations of their use and influence. Studies of standardization (Davis 1985; Gillis 1990b; Gillis 1990c; Berg 2004; Hilditch 2014), transmission (Gillis 1990a; Gillis 1990c; Knappett 1999) and regional distribution (Wiener 1984; Gillis 1991a; Gillis 1990b; Wiener 2011) are more numerous than those which address questions surrounding their use (Schofield 1990b).

This thesis seeks to understand the spatial distribution and application of the handleless cup/conical cup in daily social practices taking place in the context of House A at Ayia Irini, Kea during the Period VI occupation (LM IA, LH I, LC I)[1]. These materials from Ayia Irini may reveal something of what it meant to be a part of an increasingly 'Minoan' or at the very least 'Minoanizing' world. This thesis will address how patterns in the distribution of handleless cups at House A and their association with other finds therein can inform the intended uses of and the social practices for which these ceramics were reserved and the degree to which these daily routines conformed to, or deviated from, social practices known from contemporary sites elsewhere in the Aegean. These questions are important because they can contribute to wider debates on what constituted shared experience in what has come to be called a 'Minoan' or 'Minoanizing' world and may finally provide a compelling (albeit partial) explanation for

[1] See Table 1.

the prevalence of the Minoan conical cup. In pursuing the answer(s) to these questions I propose that, in addition to other possible of uses, the handleless cup at Ayia Irini was a vessel well-suited to 1) use in the process of silver cupellation and 2) use as a receptacle for various dyes used in textile production. These claims will be supported by artifact distribution and density maps of the Period VI structure that reveal the spatial relationships between objects and features.

BIOGRAPHICAL SKETCH

William J. Mastandrea is a graduate student studying the archaeology and ceramic materials of the Aegean Bronze Age. During his undergraduate education at Lycoming College, William studied Aegean and Near Eastern Archaeology culminating in a senior honor's thesis entitled "The Bronze Age Thera Eruption: A Reconciliation of Scientific, Archaeological, and Literary Evidence of the Period." William continued his research at Cornell University studying the Minoan Conical Cup at Ayia Irini, Kea culminating in a Master's thesis entitled "Cupellation at Kea: Investigating Potential Applications of the Minoan Conical Cup."

To my father who taught me,
'as long as you love what you do and work hard,
everything else will fall into place.'

and

To my mother,
for her love, encouragement, and never-ending support.

Thank you.

ACKNOWLEDGEMENTS

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"The range of understandings of a material, and its potential ways of utilising that material, are collapsed into the object, such that it conveys a sense of its appropriate use; in such cases then, the artifact is rather a nexus, a point of articulation between maker and user."

-P.M. Graves[1]

Introduction:

An understanding of the coarseware Minoan conical or handleless cup, has long eluded Aegean archaeologists, despite the longevity of their production and use, and prevalence. This small, undecorated, coarseware vessel appears in great numbers at nearly all Minoan and Minoanizing sites throughout the Aegean, first appearing early in the Early Minoan Period (EM; 3100-2100/2050 BCE) on the island of Crete. By the early Late Minoan Period (LM; 1700/1675-1075/1050 BCE) the handleless cup had spread across the Aegean to Kea, Kythera, Melos, Thera, Mainland Greece, and portions of Western Anatolia in staggering numbers (Gillis 1990b, 1). From its earliest appearance in the EM, the conical/handleless cup form was not strictly a utilitarian one. Between the EM and the Middle Minoan I period (MM I; 2100/50-1875/50 BCE) handleless cups "went from being perhaps a somewhat uncommon object, usually painted, handmade, to a 'professionally' made, [locally] standardized, more utilitarian item, found more frequently and less glamorously", likely because of the introduction of wheel production on Crete (Gillis 1991b, 28). In contrast to the late EM and Early MM period, by the LM IA period the handleless cup likely lost any potential cultural associations with prestige and became *specifically* a utilitarian form (Gillis 1990b, 28, 145). It is in this period that the handleless cup form becomes standardized at Ayia Irini, Kea, in response to both "internal developments, such as increasing competition" between local potting groups and a possible "demand of customers for a united, recognisable product with specific dimensions or volume" (Berg 2004, 75; 82).

This thesis seeks to understand the spatial distribution and application of the handleless cup/conical cup in daily social practices taking place in the context of House A at Ayia Irini, Kea during the Period VI occupation (LM IA, LH I, LC I)[2]. These materials from Ayia Irini may reveal something of

[1] (Graves 1994, 158-171)
[2] See Table 1.

what it meant to be a part of an increasingly ‘Minoan’ or at the very least ‘Minoanizing’ world. Such descriptors can be difficult to parse as the line between what is characteristically ‘Minoan’ and ‘Minoanizing’ is very blurred. The descriptor ‘Minoan’ refers to objects made on Crete, by inhabitants of Crete, as well as the roughly ‘pan-island’ way in which people produce, interact, and live. The descriptor ‘Minoanizing’ refers to objects made in non-Cretan contexts that seem to emulate, either whole or in part, forms customarily associated with Crete. This does not preclude items made by people from Crete resident elsewhere than Crete. though the ethnicity of craftspeople is a challenging topic to address with certainty (Broodbank 2004, 51; Abell 2014b, 556). This thesis will address how patterns in the distribution of handleless cups at House A and their association with other finds therein can inform the intended uses of and the social practices for which these ceramics were reserved and the degree to which these daily routines conformed to, or deviated from, social practices known from contemporary sites elsewhere in the Aegean. These questions are important because they can contribute to wider debates on what constituted shared experience in what has come to be called a ‘Minoan’ or ‘Minoanizing’ world and may finally provide a compelling (albeit partial) explanation for the prevalence of the Minoan conical cup. In pursuing the answer(s) to these questions I propose that, in addition to other possible of uses, the handleless cup at Ayia Irini was a vessel well-suited to 1) use in the process of silver cupellation and 2) use as a receptacle for various dyes used in textile production. These claims will be supported by artifact distribution and density maps of the Period VI structure that reveal the spatial relationships between objects and features. However, in order to understand better the world from which the conical cup comes, theoretical, geographical, and chronological background information will be provided so as to orient the reader theoretically, spatially, and temporally.

The Conical Cup in Context:

For decades conical cups were a nuisance to excavators, appearing in large concentrations, and were thus “dumped or discarded, seldom acknowledged and rarely catalogued” (Gillis 1990b, 1)**.** Such heavy-handed sampling practices attest to the little interest in explaining the prevalence and regional distribution of these vessels. Over the course of the last thirty years, the handleless cups have received

more attention, beginning with the observations of Malcolm Wiener in his 1984 publication *Crete and the Cyclades in the LM I: The Tale of the Conical Cup*. Wiener's interest in the conicals cups brought to the forefront numerous questions surrounding these cups. Since Wiener's important study, scholarly interest in this ubiquitous vessel type has steadily increased (Schofield 1990a; 1990b; 2011; Davis 1985; 1986; Berg 2004; Gillis 1990a; 1990b; 1990c; Knappett 1999; Rupp and Tsipopoulou 1999; Hilditch 2014).

Yet over the past thirty years, physical descriptions and discussions of production of the conical cups have outnumbered explanations of their use and influence. Studies of standardization (Davis 1985; Gillis 1990b; Gillis 1990c; Berg 2004; Hilditch 2014), transmission (Gillis 1990a; Gillis 1990c; Knappett 1999) and regional distribution (Wiener 1984; Gillis 1991a; Gillis 1990b; Wiener 2011) are more numerous than those which address questions surrounding their use (Schofield 1990b)**.** It is generally agreed that the conical cup is an object with a multiplicity of possible applications. Theorized uses have included improvised oil lamps, cooking vessels, funnels, lids, stoppers, ritual repositories, receptacles for food and drink, loom weights, spindle whorls, containers for pigments, paints or dyes, as well as a staple in the "Minoan Dining Kit" (Wiener 1984, 20; Wiener 2011, 361; Knappett 1999, 419; Schofield 1990, 205; Gillis 1990b, 133; Berg 2004, 77; Davis 1985, 79)**.** "Such a multiplicity of uses, however, cannot in itself explain the presence of such vast numbers" (Wiener 2011, 361). An estimated one million conical cups are thought to have been present at Knossos on Crete and other staggering numbers are found elsewhere across the Aegean (Wiener 2011, 355; Cummer & Schofield 1984, 47). The LM I period is a period likely spanning 200 years time. If these vessels were required to fulfill a multiplicity of purposes, it stands to reason that there would be even more present in the archaeological record. However, if there was some activity or application preventing the cups from reaching the discard stage of the archaeological formation process, it would modify (at least in part) the numbers of cups which physically remain intact in the present stratigraphic record. Is it quite possible that there are applications of these multipurpose enabling vessels that are being overlooked.

Minoanization is a term used to describe the proliferation of characteristic features of Cretan Minoan culture, tangible or intangible, to regions beyond Crete, including, the Cyclades, Mainland

Greece and, in some rarer instances, the coast of Anatolia. This process was named after the socially constructed label ‘Minoan’ given to the Bronze Age inhabitants of Crete by Sir Arthur Evans (1921, 1). Evans, a late antiquarian and early culture-historian, excavated on Crete at Knossos between 1900 and 1905 (MacGillivray 2000, 236). A pioneer in the study of Minoan civilization, he, along with his colleague Duncan Mackenzie, was one of the first observers of the Minoanization process. While Minoanization is an old concept rooted in the diffusionary tradition of culture-historical archaeology, the perceptions, applications, and interpretations of this process have changed and grown over time (Berg 2000; Branigan 1981; Broodbank 2004; Davis 1979; Renfrew 1972). These shifts have emerged in parallel with wider developments in archaeological thought. Although some modern scholars maintain that the term Minoanization is too heavily laden with antiquated notions of cultural homogeneity, cultural supremacy, unidirectional imposition of culture, and Victorian-era British imperialism, I suggest Minoanization can yet be a useful term in studies of the Aegean Bronze Age provided that its deployment centers on the the complex and multi-faceted ways Aegean peoples interacted their materials, their environment, and with one another. In order to redeem the validity and usefulness of the term, new approaches and modes of thinking must be incorporated and applied to the existing conceptualization of Minoanization.

To engage with Minoanization as an interpretive tool, it is crucial to understand the qualities of this process that make Minoanization both useful and potentially problematic. Evans is responsible for bestowing the name ‘Minoan’ onto the ancient inhabitants of Crete. This was a choice rooted in the classical tradition; based on references by Thucydides, Hesiod, and Herodotus to King Minos, ruler of Crete. The first, and arguably most important, classical influence was Thucydides; Book I of his History of the Peloponnesian War. John Papadopoulos illustrates the connection between Classical Greece and Evans’ Britain,

> “It is ironic that the myth of the thalassocracy of Minos was probably invented by and/or for Athenian overseas hegemony in the Classical period. Be that as is may, for anyone living in Victorian or Edwardian England, at the very brink of modernity, in a Europe largely determined and defined by Empires, Kings, Tsars, and Kaisers, the legendary founder of the first colonies, and the first to organize a navy, must have seemed the prototype of the Super-Briton.” (Papadopoulos 2005, 94)

Within this cultural context, in which Britain was using the classical Greek world as an ancient parallel, what Evans accomplished by granting a label to the entirety of the ancient Cretan inhabitants was a sense of cultural homogeneity (likely the result of drawing on his own perceptions of late 19th early 20th century Britain), which later would be understood as an incorrect perception of the past and a misrepresentation of ancient Cretan interactions during the Bronze Age (Renfrew and Cherry 1985; Berg 2007). Thus, Evans' interpretations of Minoan culture across the island would be considered uniform - a passive nod to the idea of a politically unified and culturally homogenous entity - now understood as a problematic interpretation (Berg 2000 (Ch.1), 2; Evans 1921, 1; 2-3;). The resulting idea of a Minoan Thalassocracy, based on written accounts about King Minos, became the dominant explanation for the widespread nature of Minoan finds. It was only later that this was understood as falsely representing the complex and multi-faceted ways Cretans interacted with the Aegean (Berg 2000 (Ch.1), 4; Niemeier 2009, 13).

Many key thinkers in the discussion about Minoanization have helped to guide the progression of the usefulness of the concept to the present-day. In 1979, Jack Davis published a seminal work *Minos and Dexithea: Crete and the Cyclades in the Later Bronze Age,* in which he investigated the "duration, geographical extent, magnitude, and organization of the exchange goods between Crete and the Cyclades" (Davis 1979, 143). He claimed that an exchange network existed along a 'Western String' of Aegean islands (Crete to Thera, Thera to Melos, Melos to Keos) as evidenced by the presence of particular artifacts (pottery, metals, stone, etc.) and changes in local production practices (Davis 1979, 146). While each island that comprised his model for exchange differed in the distribution of artifacts and expression of 'Minoanized' practices, Davis cited environmental variability among the Cycladic islands as influencing the adoption of certain facets of Minoan culture (i.e. the lack of proper stone deposits on Keos do not lend themselves to ashlar construction as seen on Crete) (Davis 1979, 148-149). Looking at the distribution of artifact finds (and architecture) as an extra-somatic means of adaptation allowed Davis to provide arguments as to how and why the islands in this exchange chain were changing. Through this,

Davis was able to develop a model which explained trade and exchange relations along a prominent Aegean seaway during the Bronze Age.

In 1981, Keith Branigan attempted to create a model by which Minoan settlements could be identified abroad, that is, beyond Crete (Branigan 1981, 23). Within Branigan's model existed three types of colonies: governed, settlement, and community. Governed colonies are "existing settlements which have a foreign administration or government imposed upon them by force" (Branigan 1981, 25). This colony type can be considered most in line with what the culture-historical tradition understood as 'The Minoan Thalassocracy'. While scholars such as Evans and Mackenzie would have understood all 'Minoanizing' settlements as evidence for a far reaching maritime empire managed politically and militarily by the Cretan Minoans, Branigan conceded that not all, but perhaps some settlements in the Cyclades could be of this traditional type. Settlement colonies are "towns or cities founded by a foreign people on unoccupied land and populated by people resettled there from the foreign homeland" (Branigan 1981, 26). A good example of this colony-type is Kastri on Kythera. Broodbank states that Kastri shows "a wide range of Minoanising traits" from as early as EM II onward (Broodbank 2004, 73). The excavators believe that from the EM II period onward Kastri represents a sort of Minoan colony "of Cretans who arrived in the middle of the third millennium BC and persisted until the end of the Neopalatial" (Broodbank 2004, 74). Though this is markedly different from a governed colony and differs slightly from the notion of a 'Minoan Thalassocracy,' it seems clear that Branigan's settlement colony draws heavily on both the standard model of Archaic Greek colonization and the imperialist notions of Evans' time. Again, Branigan concedes that not all, but perhaps some settlements in the Cyclades could fit this colony-type. Community colonies are settlements "in which a significant element of a settlement's population is comprised of immigrants from a foreign place" (Branigan 1981, 26). This colony-type was probably the most influential of Branigan's three types (governed, community, and settlement). Settlement colonies, while still somewhat imperialist in nature, assumed the movement of local and foreign people, the horizontal and vertical transmission of production knowledge, and overall merging of two or more different culture systems. Though it was unclear in 1981 what the implications of Branigan's

definition for settlement colony were, it certainly played a significant role in the development of future theoretical models.

Much like Davis, and in accordance with the processual tradition, Branigan developed a model that could be used in Aegean studies to systematically identify different types of Aegean settlements on the basis of "the material expression of different social, economic, and cultural behaviors" (Brangian 1981, 27). While many other examples exist of theoretical models and their application to the Aegean (for a few examples see Renfrew 1972; Renfrew and Cherry 1986; Wiener 1984) the development of these models for understanding are a product of decades of research and innovation, building upon and from that which came before.

In the new millennium, Ina Berg presented a new theoretical approach toward Minoanization beginning in her doctoral dissertation (Berg 2000). The model presented in Berg's work was the first step toward a fully inclusive explanatory model - that is, not 'Creto-centric'- for Minoanization, attempting to combine the human agentive factors of both Cretan Minoan and the previously unacknowledged 'recipients of Minoan culture' in order to explain in greater detail the intricacies of cultural interaction and change (Berg 2000 (Ch.2), 1). Berg's approach urges archaeologists to engage both the functional material and human agentive facets of Minoanization beginning at the micro-scale (individual sites) and expanding to the macro-scale (pan-Aegean context). Berg argued that the deployment and use of Minoanization as an interpretive tool should be reassessed, as

> "it projects a sense of cultural homogeneity that simply does not exist in the MBA-LBA Cyclades; additionally the way of combining what have been shown to be diverse and active individual island communities with various social attitudes into unified and simplified terms such as 'Western String' [Davis 1979] or 'Community colonies' [Branigan 1981] downplays the inherent individuality expressed through the acceptance or rejection of various Minoan, or for that matter mainland, materials" (Berg 2007, 170).

With Berg's recommendation in mind, the subject of the Minoan conical cup/handleless cup, its 'hyper-abundance' at both Cretan Minoan and Minoanizing sites, its widespread distribution across the Aegean, and the proposed applications of these vessels at Ayia Irini, Kea can all be approached in a way which more accurately represents the diverse socio-cultural climate of the Late Bronze Age Cyclades.

Ayia Irini, Kea and its Geographical Context

The settlement of Ayia Irini lies about twenty-one miles off the coast of Attica on a small promontory in the bay of Agios Nikolaos. Many have argued for the importance of Ayia Irini as a nexus point for production and exchange between mainland Greece and the Cyclades (Abell 2014b, 567; Davis 1979; Branigan 1981; Wiener 1984; Broodbank 2000). The inhabitants likely participated in and benefitted from inter-island trade, travel, and exchange from the earliest periods of occupation to the LM; though it should be noted that, as with other Cycladic islands, it was certainly not isolated from people and products from neighboring or far-reaching places - neither was it dependent on them. These interactions were important for both economic and social reasons, certainly affecting the way of life at the settlement. Abell highlights a social aspect of trade and exchange activities centered on the fostering and maintaining of positive social relationships between the inhabitants of different island communities. "At Ayia Irini, a community whose entire existence seems to be predicated on participation in exchange networks, creating and maintaining such social bonds with people who moved through the Aegean was vital, and key to the longevity and prosperity of the settlement" (Abell 2014b, 568)[3]. An effective way of fostering such positive relations among island communities would be taking part in the production and exchange of metal products, a resource with a great deal of social significance in the Bronze Age Aegean.

The importance of metals and metal-working in the Aegean can be observed as early as the Early Bronze Age, when tangible evidence for the stages of metal production first appear. This includes such finds as furnaces, bellows, blowpipes, slags, crucibles, prills, molds, and stone tools (Sherratt 2007, 251; 259). Many EBA daggers, objects thought to have had great cultural significance, show evidence of production with copper-arsenic alloy. The use of this alloy provided both functional and aesthetic benefits for the consumer (Sherratt 2007, 253-4). It is likely that the 'silvering' effect, resulting from the smelting of copper and arsenic together, was intended to be emulative of silver itself (Sherratt 2007, 254).

[3] It should be noted that while interaction and engagement with neighboring entities was not necessary for the survival of the people of Ayia Irini, the key to its continued prosperity lied in its ability to integrate into the social and economic network.

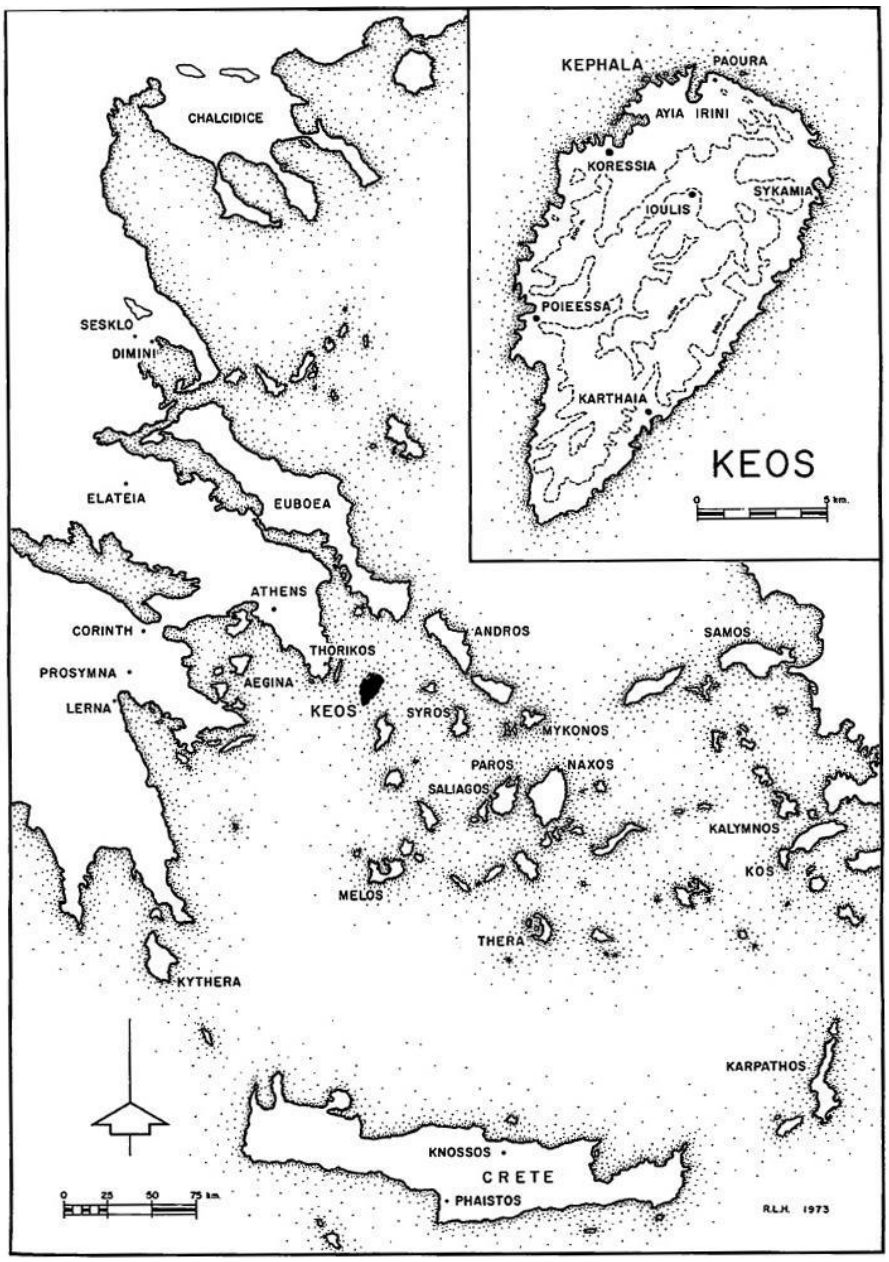


Figure 1. A Map of the Aegean Showing Location of Kea Relative to Mainland Greece and the Cyclades (Cummer and Schofield 1984, PLATE 1).

Were this the case, it stands to reason that the use of and preference for metals with the aesthetic properties of silver were highly valued in the Bronze Age Aegean cultural sphere. This preference for silver may have provided a regional incentive for the desire of silver. If specialized knowledge of metal-working was not universal this would create a gap between the producer and consumer, where value is artificially ascribed to an object by the act of withholding the means of production to the consumer base.

Nakou suggests that "those who acquired or possessed knowledge that was not universal would keep it and use it to their advantage to foster a reliance differential" socially and/or economically (Nakou 1995, 18). Abell (2014b, 576) suggests that it is possible that some of the inhabitants of Ayia Irini could have fostered such a reliance differential by acting as middlemen for raw, refined, and/or worked metal products.

For this reason, the geographic location and role of Ayia Irini is of great interest, since it provided a point of access best-suited for the Cycladic world to the metal deposits at Lavrion, a geologically rich region bearing silver, lead, and possibly copper on the Attic peninsula. Noel H. Gale and Zofia Stos-Gale have conducted numerous studies concerning the provenance of Aegean metals and metal finds, several of which are directly associated with the metals from Lavrion (see Gale et al 1984 and Stos-Gale & Gale 1982). In their 1984 study, they observed that during the Early Cycladic period (EC/EM) the island of Siphnos was a major (perhaps primary) source of lead and silver. But by the Late Cycladic (LC/LM), the metal source at Siphnos would be surpassed by the sole exploitation and use of Lavrion metals (Gale et al 1984, 390). It comes as no surprise that between the MBA and the LBA, when Ayia Irini begins Minoanizing more intensely, the use and exploitation of the mines at Lavrion increase. Increased evidence of metal-working at Ayia Irini is also observed: evidence for the cupellation of silver in the form of slag and litharge, formal crucibles forms, and lead finds - "as the production of lead is often, perhaps usually, associated with the production of silver" - are all sourced at Lavrion (Davis 1986, 89; 99; Cummer & Schofield 1984, 38; 140). The Lavrion silver resources and Ayia Irini's location likely provide the most direct and cost-efficient conduit connecting Lavrion silver to the Cycladic world, making Ayia Irini an important location for not only many of the Northern and Central Cycladic islands (Naxos, Keros, Syros), but also far-reaching communities in the Southern Aegean (Thera and Crete) and on the coast of Mainland Greece (Aegina). This does not preclude the use of other conduits from Lavrion to the Aegean, such as through Kolonna on Aegina. Despite the small size of the settlement, it is possible that - while the small scale, perhaps seasonal, manufacture of silver did occur - Ayia Irini could have been a main conduit

for the transport of silver manufactured elsewhere, that is, on the peninsula or closer to the mines themselves (Abell 2014b, 555; Knappett 2011, 1014, 1016).

An Overview of Ayia Irini

Ayia Irini	Contemporary Chronological Designations	
Period Numeral	**Relative**	**Absolute**
I	The earliest occupation; dates not secure; likely FN-EM/EC/EH transition	ca. 3100 BCE
II	EC II/EH II	ca. 2650-2500 BCE
III	The late phase of the EBA	ca. 2200-2100/2050 BCE
IV	MM I-II and greater part of the MC and MH	ca. 2100-1750/00 BCE
V	MM III, late MC and MH	ca. 1750/00-1700/1675 BCE
VI	LM IA, LC I and LH I	ca. 1700/1675-1625/00 BCE
VII	LM IB, LC II and LH II	1625/00-1470/60 BCE
VIII	Aegean LBA (LH IIIA-LH IIIC)	ca. 1420/10-1075/50 BCE

Table 1. Periods of Occupation at Ayia Irini, Kea -
Adapted from Caskey, 1979; Cummer and Schofield 1984; Manning 2010, and Abell 2014

Excavations at Ayia Irini began in 1960 under the direction of Jack Caskey from the University of Cincinnati. Several small soundings were made in an attempt to see if further exploration, either in the form of survey or excavation, was justified (Coleman 1977, vi). These soundings revealed portions of LM I fortification walls, and a portion of the central rooms of what came to be called House A, two of the largest architectural features on-site to date. In the years following the initial soundings, many scholars participated in the management and excavation of Ayia Irini. Lloyd E. Cotsen and Elizabeth Schofield, beginning in the 1961 season, A. Colin Renfrew, in the 1963 season, William W. Cummer and M. R. Popham beginning in the 1970 season, and Jack L. Davis beginning in 1974 (to name just a few) have all contributed greatly to the excavation and publication of materials from Ayia Irini.

The chronological system used at Ayia Irini, created by excavator Jack Caskey, comprises a series of Roman numerals indicating marked periods of occupation and has been established so as to orient the viewer in terms of both physical occupation and chronology. The numerals I-VIII range temporally from the earliest occupation of the site in the FN-EM/EC/EH transition to the LM III/LC III/LH III (Caskey 1979, 412; Abell 2014b, 3).

Ayia Irini was subject to various stages of settlement, abandonment, and resettlement making the identification of the inhabitants with a particular people very difficult. The most that can be said of the inhabitants of the Period I settlement is that there is nothing to suggest that they originate from anywhere other than Kea. Any claims greater than this in favor of a specific people are largely speculative. Successfully identifying ethnicity in the archaeological record is very difficult and at times is near impossible to ascertain as shown by Broodbank (Broodbank 2004, 51). Period II is a resettlement period characterized by a growth in size of Ayia Irini as well as local interactions with Cycladic and Mainland communities, parallelled by an increase in the volume and distribution of material goods from nearby Keros and Syros (Abell 2014b, 4; Broodbank 2000, 139; 223).

The Period III occupation seems to coincide with a shift and increase in Aegean trade. It is during this period that Ayia Irini was one of the major trade hubs along with Chalandriani on Syros and Dhaskalio-Kavos on Keros (Broodbank 1993, 316; Broodbank 2000, 223). These particular sites are larger than most of the surrounding settlements and provide a great deal of evidence for the movement of goods such as marble, pottery, and metals as well as evidence for the production of metal objects (Broodbank 1993, 318). Period III most probably ends with the abandonment of the site, consisting of only a relatively short hiatus.

Period IV begins with the resettlement of Ayia Irini indicated by the presence of a markedly different people, whose vestiges of identity are evidenced by a distinct change in material culture from Period IV onward (Abell 2014b, 4-5). Evidence for both metal finds and metal-working continue in the Period IV occupation; it is likely that the purposes for the Period IV settlement are twofold: one as a location from which to exploit the nearby metal resources at Lavrion on the Attic peninsula and another as a trade hub, much like in the preceding period (Abell 2014a, 5; Abell 2014b, 553; Broodbank 1993, 316). During this period, the first fortification wall at Ayia Irini is constructed surrounding the settlement on three sides (the land sides) which interestingly coincides with large-scale construction of fortifications on the island of Crete and Kolonna on the island of Aegina (Davis 1979, 3; McCreery 2010, 17; Burke 2010, 4, 8, 14).

There are five defining characteristics of the Period V occupation of Ayia Irini: 1) an earthquake, which damaged a portion of the site, 2) an increase in the overall settlement size, 3) the construction of new and the repair of old fortifications, 4) a continuation of importance as a producer of Aegean metals (silver, lead, copper, bronze), and 5) the beginning of the Minoanizing period for Ayia Irini in which Cretan Minoan objects and 'ways of doing' are first adopted and emulated by the Keian inhabitants. These factors contributed to the social and economic conditions of the LM IA occupation that allowed Ayia Irini to prosper.

Period VI is contemporary with the LM IA, a period of increasing adoption of Cretan Minoan technologies (potter's wheel, system of weights, etc), importation of Cretan Minoan goods, emulation of desirable Cretan Minoan goods, and the incorporation of facets of the Cretan Minoan decorative repertoire into local products (Abell 2014b, 6; Berg 2007, 122). Major building projects were initiated during this period which resulted in the construction of Houses F and C in the Western sector as well as House A and House B further to the south. There is evidence for an increase in household industries during this period regarding items such as "metals, pigments, aromatics, as well as...textiles and ceramics" (Schofield 1990b, 207).

Period VII is characterized by continued imports of Cretan Minoan goods, an increase of interaction with mainland communities, the fallout of the infamous Thera eruption - likely a contributor to a shift in the concentration of traffic along Aegean trade patterns, and finally an earthquake that wreaked major havoc on the settlement resulting in its final Bronze Age abandonment (Abell 2014b, 6; Cummer and Schofield 1984, 33-34; Knappett 2011, 1014, 1016). The final periods of occupation at Ayia Irini show a marked decline in size and prosperity following the Period VII destruction.

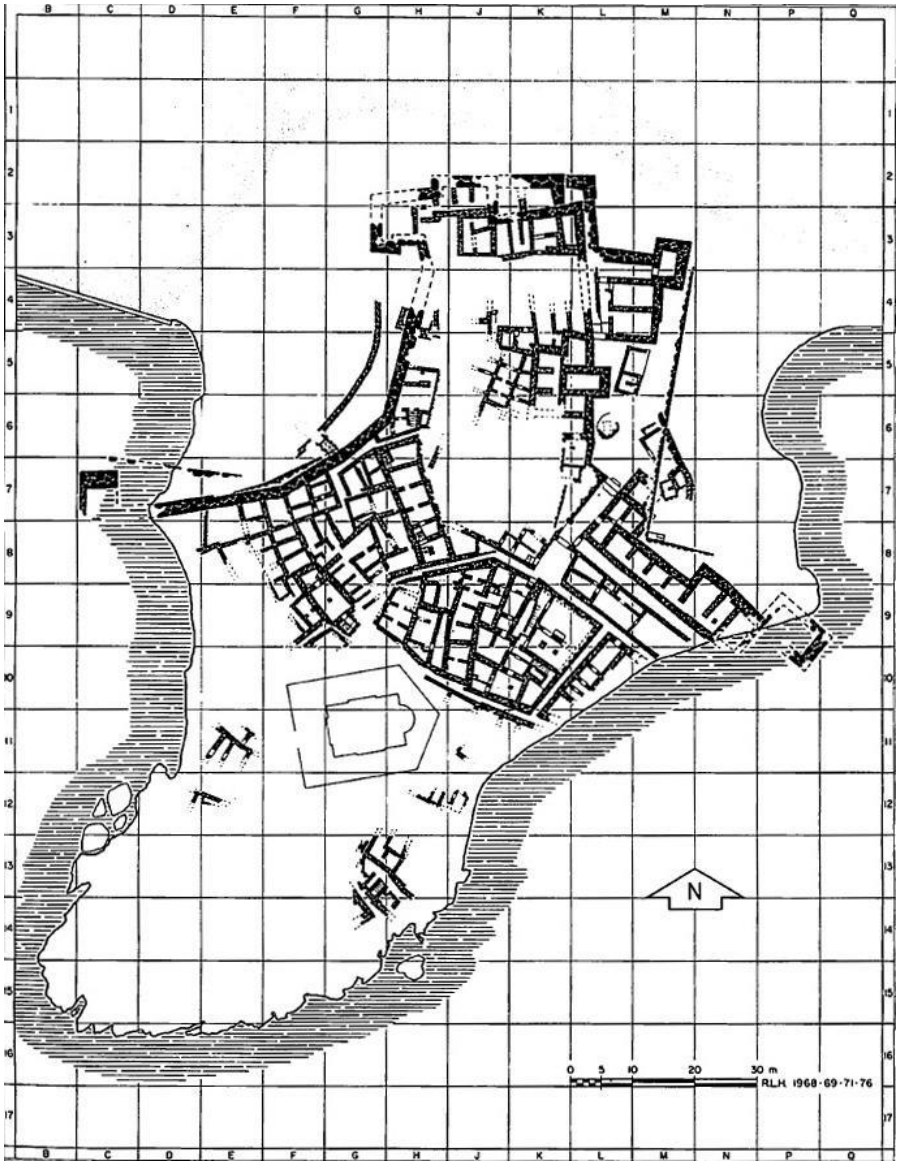


Figure 2. A General Site Plan of the Late Bronze Town at Ayia Irini (Cummer and Schofield 1984, PLATE 3)

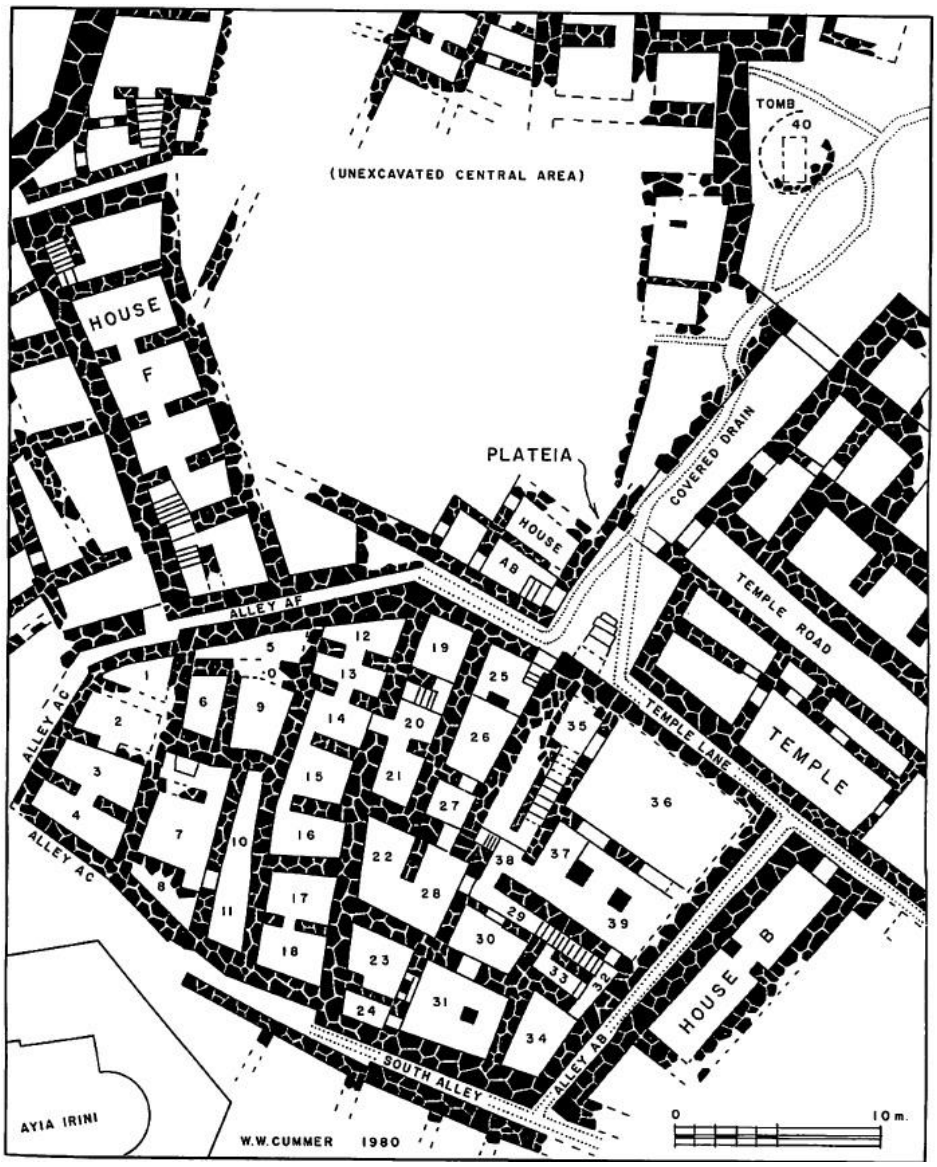


Figure 3. A Site Plan Showing the Relationship of House A to the Surrounding Structures at Ayia Irini (Cummer and Schofield 1984, PLATE 5)

Contextualizing House A

House A was chosen as the architectural context for this study of handleless cups for a number of reasons. In terms of significance, House A is the largest building of all Ayia Irini's Bronze Age occupations, "no other building on the site approaches it in size and complexity; and indeed the number of contemporary buildings throughout the Aegean world that can rival it is not large" (Cummer & Schofield 1984, 1). The excavators, Lloyd Cotsen and Elizabeth Schofield, believe it to be what they term 'a royal residence.' At the very least, House A may have been the seat of some influential governing figure or

body, though it is unclear whether or not House A was a single residence or a conglomeration of several housing units (Cummer & Schofield 1984, 1). House A is roughly centrally located and served a number of functions for the community, ranging from large-scale storage of material goods to a space for several small, perhaps household, industries. Ayia Irini housed only a small population as it is a settlement that occupies less than one hectare. House A is a centrally located structure - the largest in the settlement - and is known to have housed particular industrial activities. Therefore, it stands to reason that House A likely featured significantly in the lives of those living and working at Ayia Irini, in and around this structure.

House A was chosen for this thesis as it provided a discrete and bounded social space from which to draw artifact samples and observe artifact distributions. House A provides a sufficient sample of handleless cups as, across all periods of occupation, over 8000 handleless cups were found within it. Of the Period VI deposits, 1661 handleless cups were found and just under 6000 are present in the Period VII destruction deposits. The data presented below will show that the distribution of these handleless cups and other finds cluster in specific areas of House A, conveying something of their application in daily life pertaining to the cupellation of silver and the production of textiles. Thus, House A is an excellent, controlled context for a study of the use of handleless cups. The sole problem in dealing with House A is the complexity of the stratigraphy, as during the final destruction in Period VII both the upper and ground-floor levels collapsed into the basement rooms (Cummer & Schofield 1984, 32-33).

The construction of House A began during Period V but large-scale building activity took place between Periods VI and VII. Period V saw the construction of rooms 12 and 13, which went out of use by the following period. During Period VI, rooms 35-39, 17-18, 5, 6, and 9, 25-27, 19-21, and 14-16 were constructed, most likely in that order (Cummer & Schofield 1984, 30). By the time of its destruction in Period VII, House A was composed of thirty-nine rooms which are grouped into seven separate areas: The Northeast Corner, the Eastern Basement, the Stairway and Bath, the Lightwell and Toilet, the Central Basement, the Earlier Central Rooms and the Western Quarter.

Area	Corresponding Rooms	Floor Levels
The Northeast Corner	35-39 (plus entrances)	Basement and Ground
The Eastern Basement	22; 25-27; 28-31	Basement, Ground, and Upper
The Stairway and Bath	32-34	Basement and Ground
The Lightwell and Toilet	23-24	Ground
The Central Basement	14-16; 19-21	Basement and Ground
The Earlier Central Rooms	12-13; 17-18	Ground
The Western Quarter	1-11	Ground

Table 2. Space and Room Designations for House A, Ayia Irini, Kea - Adapted from (Cummer & Schofield 1984, 30)

The present study is concerned with the Period VI construction and occupation of House A which includes twenty-one rooms: the entirety of the Northwest corner, the earlier central rooms, the central basement, rooms 25-27 of the Eastern basement, and rooms 5, 6, and 9 of the Western Quarter. Period VI is a previously under-researched occupation at Ayia Irini. The destructions which took place at the end of Periods VII and VIII make studying materials of the latter periods much easier as they provide a distinct point in which occupation shifts. While more difficult stratigraphically, by studying the Period VI layers in House A a better understanding of the rooms and social activities conducted therein can be obtained. The dates assigned to the deposits of each period are largely obtained by the relative dating of the pottery found. Concerning room function, Schofield has made it clear that we can only be certain of room functions pertaining to the time just before the final destruction in Period VII and that "it would be rash to assume that the same activities necessarily continued…" from one period of occupation to another (Cummer & Schofield 1984, 37). Given the architectural changes made to the building as well as the greater social and economic changes that occur between Periods VI and VII such assumptions are, in fact, rash without the support of additional evidence. However, the gap between Periods VI and VII amounts to no more than one hundred years. While this is a sufficient enough amount of time for major room functions to change, it is also quite possible that rooms in which industrial activities that would be pertinent to Ayia Irini's socio-economic role as a nexus for exchange, certainly metal-working (and perhaps other crafts), might remain constant over this span of time. The focus on the Period VI deposits

stems from an interest in the longevity of these activities which may have been pertinent to Ayia Irini's socio-economic role as a nexus for exchange.

The excavators claim the basement rooms were too dark and confining to be useful for anything other than storage, a problem easily fixed with the deployment of lamps. As highlighted by the excavators, Rooms 17-18 and Courtyard 36 to Room 39 are thought to be areas of everyday production, consumption, and/or storage activities. Based on the artifacts found, Schofield has suggested that in both Period VI and VII metal-working activities took place, certainly in Rooms 17-18, but also to a degree in rooms 19-20 (Cummer & Schofield 1984, 38). Additionally, ample evidence in the form of loom weights and whorls has led Schofield to consider that some kind of textile production took place in Rooms 17-18, either alongside or separate from, metal-working (Cummer & Schofield 1984, 38; PLATE 25; Schofield 1990b, 209). While it is not always clear what activities took place on which floor-level, especially during the Period VI occupation, it is likely that metal-working took place on the ground-floor level and textile production alongside it or perhaps even on the rooftop above. Courtyard 36 is an open court with a large clay hearth in the center, which Schofield argues was used in conjunction with the columned hall (Rooms 37 and 39) for formal receptions. Most of what the excavators have interpreted here seems rather likely, however upon the presentation of the following evidence some of these interpretations may be further supported or modified in regard to the Period VI occupation.

Presentation of the Data

The method employed in this study was inspired and adapted from the work of Whitelaw as well as Rupp and Tsipopoulou (Whitelaw 2007; Rupp and Tsipopoulou 1999). The methods used in these publications have shown that a micro-scale analysis of the concentration and distribution of material finds at a site, or series of buildings within a site, can reveal information about the use and application of materials in a given space or spaces. For example, rather generalizing non-detailed and non-context-specific studies of EM Fournou Korifi prior to Whitelaw's work led scholars to believe the site was a single Cretan-Minoan proto-palace structure. However, when the concentration and distribution of the material finds at the site were observed and compared room-to-room it became clear that Fournou Korifi

was a collection of separate housing units rather than a single Cretan-Minoan proto-palace structure (Whitelaw 2007, 76). Similarly, the work of Rupp and Tsipopoulou has provided a compelling interpretation for the application of conical cups at LM I Petras as a drinking vessel used in ritual exchange activities based on the concentration and distribution of material finds there (Rupp & Tsipopoulou, 734-735). Thus, an analysis of the materials at the local level within House A is valuable as it may yet reveal something of the application of the handleless cup in the daily activities of the Bronze Age inhabitants there.

In the present study, data on the location and number of objects associated with industrial activity within House A from Period VI deposit levels is compiled from the site reports which are published by Cummer and Schofield. Their concentration within and distribution throughout House A are mapped both separately and together to illustrate possible spatial relationships between the objects of interest and their find spots. Of these finds, 6 classes of objects stand out as possessing probable use-related relationships with the handleless cups: crucibles, metal finds (including finished metal products, metal slags, and litharge), stone molds, obsidian blades, loom weights, and spindle whorls. These objects can be separated into two distinct groups likely pertaining to household industrial activity. Crucibles, metal finds, and stone molds likely correlate with metalworking activities as inferred by Cummer and Schofield (1984, 140) Davis (1986, 103) and others (Evely et al 2012, 1821). Obsidian blades, loom weights, and spindle whorls likely correlate with the production of textiles as inferred by Cummer and Schofield (1984, 25), Burke (2010, 27-28), and others (Davis 1986, 106).

Across all Period VI deposits in House A excavations uncovered 1661 handleless cups, the vast majority of which are complete, concentrating most heavily in Rooms 17-18. Of the 1661 Period VI handleless cups, 1310 (78.87%) are found within the confines of these two rooms; Room 17 bearing 490 (29.50%) and Room 18 bearing 820 (49.37%), both of which are above the significance level of 15.05%[4] as outlined by Schofield. No other rooms from the Period VI deposit layers contain a volume of

[4] This figure was calculated based on guidelines provided by Elizabeth Schofield (1990b, 205). Schofield claims that groups of more than 250 conical cups found within a bounded space are especially significant as "anything fewer than that is commonplace, at least on Kea" (Schofield 1990b, 205).

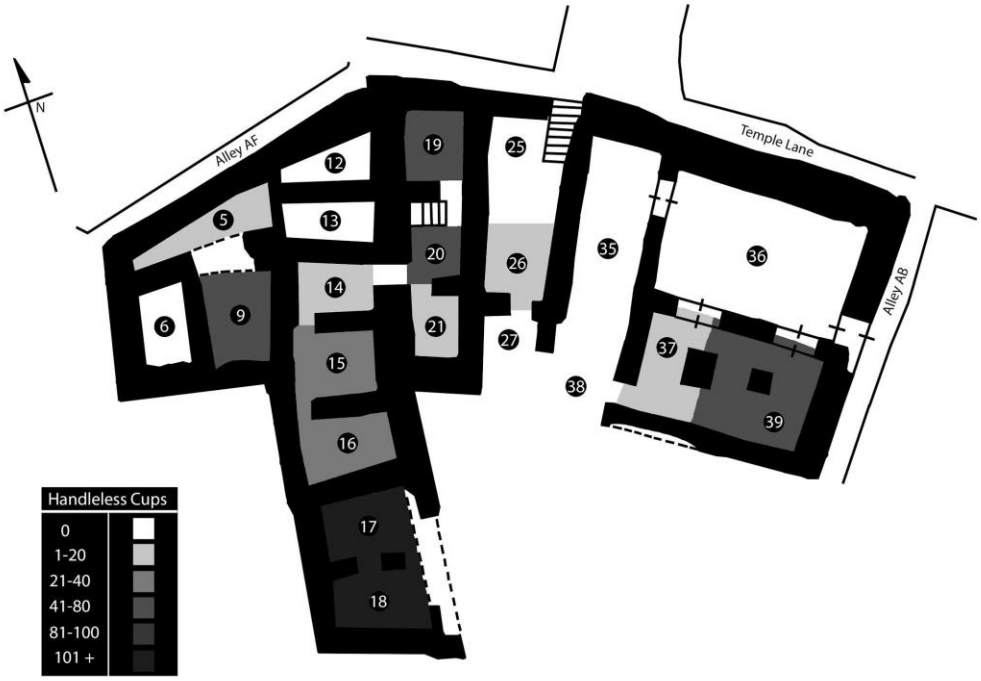
handleless cups above the calculated significance level, the next highest figure being from Room 20, bearing 77 cups (4.64%) of the Period VI assemblage. It is for this reason that Rooms 17-18 are of greater interest than the surrounding rooms.

Many of the cups uncovered show evidence of scorching or blackening, partially or entirely, though the majority seem to be in remarkably good condition. While merely speculative until investigated further (by means of x-ray fluorescence or other modes of surface analysis), the scorch-marks on these vessels could be the result of a combination of usage as lamps and possible fire damage resulting from the collapse of Room 18 at the end of Period VI (Cummer & Schofield 1984, 32; 140; Gillis 1990b, 133). Schofield has asserted that "there is no good evidence that storage and industry shared the same space" though it stands to reason that items relevant to a particular activity would appear in a storage space near the location of said activity (Schofield 1990b, 209). Therefore, the most reasonable explanation for such a high concentration of handleless cups in a (relatively) small space would be storage. This does not seem uncommon, as evidenced by the storage practices of conical cups at Petras (Rupp & Tsipopoulou 1999, 733). It has already been mentioned that the basement levels were likely primarily storage spaces and that some sort of industrial activities, likely metalworking and/or textile production, took place on the ground floor level of Rooms 17-18. The cups are not slipped. The majority of which seem unused or used infrequently (that is, no visible evidence of physical use such as scorch-marks on a rim, or internal/external wear which can be associated with frequent usage), further supporting these cups as being in a storage location, that is prior to being used.

While such high concentrations of the handleless cups in a storage area is not out of the ordinary, the location of this storage space is of interest. At LM I Petras, Rupp and Tsipopoulou (1999, 733) determined that the conical cups present there concentrated in great number in small storage spaces near entryways to the building as well as entryways to large, possibly communal, spaces. Their reasoning for the storage of these cups in these locations was predicated on the proposed need to quickly and easily access the conical cups for the purpose of gifting a small amount of liquid, likely alcohol, to visitors as part of a ritual of exchange (Rupp & Tsipopoulou 1999, 734-735). However, at House A the highest

concentration of handleless cups is far removed from either of the Period VI entryways: one more public entrance from Alley AB into Courtyard 36 and another less public entrance from Temple Lane down a staircase into basement Room 25. Thus, it would seem that while the storage of handleless/conical cups is similar in volume at both sites, the location of the storage spaces - and perhaps the intended use of these objects - may differ. Rupp and Tsipopoulou concluded that conical cups at Petras were being stored in specific locations in order to facilitate their application in a specific ritual activity. Since the storage location of handleless cups in House A does not correspond to that found at Petras, perhaps the vessels in House A were also intended to be used in a specific, albeit different, activity.

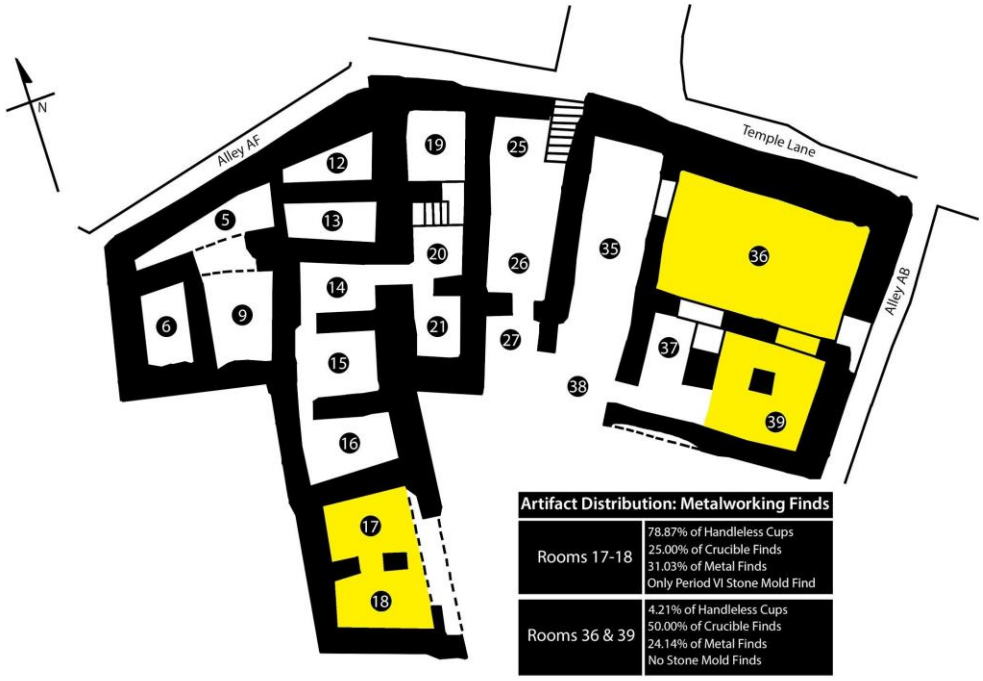
Schofield (1990b, 205) has already considered the possible use of the handleless cup in industrial contexts, however, it remains unclear for what activities the cups have been useful. In an effort to explore this possibility let us turn to the data. Figure 4 shows that the highest percent concentration of handleless cups resides in Rooms 17-18, comprising 78.87% of the Period VI assemblage. Beginning with metalworking finds, Figure 5 shows that the only Period VI stone mold is found in Room 17. The highest concentration of metal finds (20.69%) and crucibles (50.00%) reside in Room 39 and Courtyard 36 - at the center of which is a rectangular hearth. Rooms 17 and 19 tie for the second highest concentration of metal finds (17.24% each) as Rooms 18 and 26 do for crucibles (25.00% each). Turning to textile production finds, Figure 6 shows that the highest concentrations of both loom weights and spindle whorls (50.00% and 33.33% respectively) reside in Rooms 17 followed closely by Room 18 (19.23% and 20.00% respectively). The highest concentration of obsidian blades (20.00%) resides in Room 39 followed closely by Courtyard 36 (18.64%) and Room 17 (15.45%).



House A	Room 5	Room 6	Room 9	Room 14	Room 15	Room 16	Room 17	Room 18	Room 19	Room 20
Number of Cups	6	0	41	20	31	29	490	820	42	77
Percent of Total	0.36%	0%	2.47%	1.20%	1.87%	1.75%	29.50%	49.37%	2.53%	4.64%
Significance Level	#'s ≥ 250	Percent Significance: 15.05%								

House A	Room 21	Room 25	Room 26	Room 27	Room 35	Room 36	Room 37	Room 38	Room 39	Totals
Number of Cups	19	0*	14	0	0*	0	2	0*	70	1661
Percent of Total	1.14%	0%*	0.84%	0%	0%*	0%	0.12%	0%*	4.21%	100%
Significance Level	#'s ≥ 250	Percent Significance: 15.05%								
* Indicates rooms that showed no clear evidence Period VI deposits and whose data was thereby excluded.										

Figure 4. The Percent Concentration, Distribution, and Comparative Significance Levels of Handleless Cups Throughout Period VI House A.

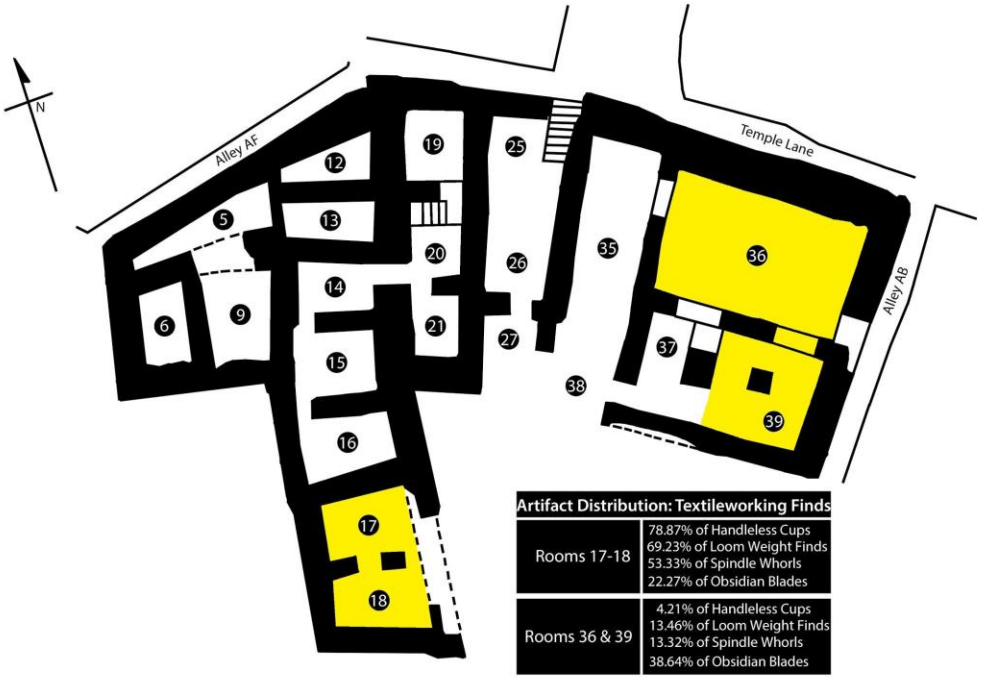


House A	Room 5	Room 6	Room 9	Room 14	Room 15	Room 16	Room 17	Room 18	Room 19	Room 20
Crucibles (#)	0	0	0	0	0	0	0	1	0	0
Crucibles (%)	0%	0%	0%	0%	0%	0%	0%	25.00%	0%	0%
Metal Finds (#)	0	0	0	0	0	1	5	4	5	2
Metal Finds (%)	0%	0%	0%	0%	0%	3.45%	17.24%	13.79%	17.24%	6.90%
Stone Molds (#)	0	0	0	0	0	0	1	0	0	0
Stone Molds (%)	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%

House A	Room 21	Room 25	Room 26	Room 27	Room 35	Room 36	Room 37	Room 38	Room 39	Totals
Crucibles (#)	0	0*	1	0	0*	2	0	0*	0	4
Crucibles (%)	0%	0%*	25.00%	0%	0%*	50.00%	0%	0%*	0%	100%
Metal Finds (#)	0	0*	2	0	0*	1	3	0*	6	29
Metal Finds (%)	0%	0%*	6.90%	0%	0%*	3.45%	10.34%	0%*	20.69%	100%
Stone Molds (#)	0	0*	0	0	0*	0	0	0*	0	1
Stone Molds (%)	0%	0%*	0%	0%	0%*	0%	0%	0%*	0%	100%

* Indicates rooms that showed no clear evidence Period VI deposits and whose data was thereby excluded.

Figure 5. The Percent Concentration and Spatial Relationship between Handleless Cups and Objects Associated with Metalworking Activity.



House A	Room 5	Room 6	Room 9	Room 14	Room 15	Room 16	Room 17	Room 18	Room 19	Room 20
Loom Weights (#)	1	0	3	0	0	1	26	10	0	3
Loom Weights (%)	1.92%	0%	5.77%	0%	0%	1.92%	50.00%	19.23%	0%	5.76%
Spindle Whorl (#)	0	2	2	1	1	0	15	9	2	2
Spindle Whorl (%)	0%	4.44%	4.44%	2.22%	2.22%	0.00%	33.33%	20.00%	4.44%	4.44%
Obsidian Blade (#)	2	1	27	7	8	1	34	15	10	5
Obsidian Blade (%)	0.91%	0.45%	12.27%	3.18%	3.64%	0.45%	15.45%	6.81%	4.54%	2.27%

House A	Room 21	Room 25	Room 26	Room 27	Room 35	Room 36	Room 37	Room 38	Room 39	Totals
Loom Weights (#)	0	0*	0	0	0*	5	1	0*	2	52
Loom Weights (%)	0%	0%*	0%	0%	0%*	9.62%	1.92%	0%*	3.85%	100%
Spindle Whorl (#)	1	0*	4	0	0*	2	0	0*	4	45
Spindle Whorl (%)	2.22%	0%*	8.89%	0%	0%*	4.44%	0%	0%*	8.89%	100%
Obsidian Blade (#)	1	0*	10	0	0*	41	14	0*	44	220
Obsidian Blade (%)	0.45%	0%*	4.54%	0%	0%*	18.64%	6.36%	0%*	20.00%	100%

* Indicates rooms that showed no clear evidence Period VI deposits and whose data was thereby excluded.

Figure 6. The Percent Concentration and Spatial Relationship between Handleless Cups and Objects Associated with Textile Production.

A Proposed Application of the Handleless Cups in Period VI House A: Cupellation

What emerges from the data are two zones which bear the highest concentrations of artifacts associated with industrial activities: Rooms 17-18, and Courtyard 36 to Room 39. The ground level of Rooms 17 and 18 were likely accessed by walking through neighboring Rooms 14, 15, and 16. There is no evidence for a basement doorway from Room 16 to Room 17, nor is there evidence of a formal

basement stair in either Room 17 or 18. There may have been a trapdoor feature which provided access to these basement rooms (Cummer & Schofield 1984, 31). Courtyard 36 and Room 39 could be easily accessed via the entrance from Alley AB. Given the spatial relationship between these two different sections of House A as well as the concentration of artifacts therein, an argument can be made for 1) the role of handleless cups in both metalworking and textile production activities and 2) the primary locations for these activities, those being Rooms 17-18 and Courtyard 36 to Room 39.

Cummer, Schofield, and Davis have all claimed that there is evidence for the smelting of ore and the cupellation of silver within House A, supported by crucible, slag, and litharge remains (Cummer & Schofield 1984, 149-150; Davis 1986, 89; 99). "Cupellation is a high-temperature metallurgical operation aimed at refining the noble metals contained in a larger metal matrix, normally dominated by lead" (Martinón-Torres et al 2008, 60). Metals, such as argentiferous lead ores, are heated under oxidizing conditions causing the lead to form lead oxide (PbO) which then bonds with other base metals that are present (Martinón-Torres et al 2008, 60). This process chemically separates nobles metals like silver (Ag) from base metals like lead (Pb) as noble metals do not react with either oxygen or metal oxides. Cupellation can be done on a large scale, taking place in a location such as a hearth or kiln, or on a smaller scale in small vessels or later specialized vessels called cupels.

Customarily, cupels are small, shallow, cone-shaped 'cups' with a low rim made primarily of bone ash. While the process of cupellation itself was known since the Bronze Age it is not until later periods that we see specialized 'cupel' vessels and specialized clay fabrics for metallurgical ceramics (Bayley & Rehren 2007, 51; Martinón-Torres et al 2008, 64-65). While cupellation may be done in any receptacle, lead oxide tends to bind with clay silicates of which a ceramic vessel is partially composed, forming lead silicates, which prevent the all-important absorption of PbO and other metals into the walls of a cupel (Martinón-Torres et al 2008, 60). The specialized utility of the cupel lies in the presence of bone ash, more specifically the presence of calcareous materials - that is, materials containing calcium carbonate ($CaCO_3$) - which prevent the binding of lead with clay silicates and facilitate the separation of noble metals from others. $CaCO_3$ can also be found in limestone, crushed shells, antler, and sometimes

wood ashes. Cupels may be used in ore assay - the testing of raw materials for the degree of richness of precious metals, metal assay - an investigation of the purity of metals, or recycling - retrieving precious metals from broken or scrap materials (Martinón-Torres et al 2008, 61). Inherent in the process of cupellation is the absorption of metals into the walls of the cupel including the metals being purified (i.e. silver). This makes a cupel, or any vessel used in cupellation, a single-use object. The absorption of metals, both base and noble, into the vessel wall creates potential and incentive for the destruction of these vessels for the purpose of recycling. The vessels would be ground down, using one of the many stone pounders/grinders present, and added back into later raw materials to obtain any metals lost into the vessel walls. Cupels are by nature fragile objects and likely would be manufactured locally rather than transported over large distances (Martinón-Torres et al 2008, 64-65). Perhaps some of the same characteristics that make the cupel a useful vessel in silver cupellation are present in the handleless cups at Ayia Irini.

The handleless cups from House A seem to be consistently made of the same clay fabric for two reasons: functionality, for use in activities involving heating, and appearance, as a conscious effort to imitate an original Cretan product. Kea, along with the other islands that form the North-Central Cyclades (Kithnos, Seriphos, Siphnos, Paros, Naxos, and Amorgos) have similar geology. Local clay deposits in these locations abound with limestone and schist of a pale brown or orange color (Berg 2004, 79). Limestone, calcite, and marine shells are all sources of the mineral compound calcium carbonate ($CaCO_3$). Calcareous clays, clays containing $CaCO_3$, used in pottery production provide "a very distinctive property that affects its usefulness in fired clay bodies" (Rice 1987, 98). $CaCO_3$ decomposes when fired at about 870^0C. When sufficiently heated, the calcium oxide (CaO) of the $CaCO_3$ absorbs atmospheric moisture (H_2O) expelling carbon dioxide (CO_2). This results in volume expansion, a process sometimes referred to as 'lime popping'. This method increases the porosity of a vessel which improves the thermal properties. Though this can potentially compromise the strength of the vessel as well as its ability to hold or store liquid for extended periods of time. To prevent $CaCO_3$ from decomposing vessels can be fired at lower temperatures (Rice 1987, 98; Gillis 1990b, 75). The majority of the handleless cups

from Ayia Irini were produced of a pale brown fabric, likely calcareous. This coincides with what is reported of the conical cups found in House A by Cummer and Schofield (1984, 47). Berg claims that the choice of pale brown clays for production of handleless cups is a targeted emulation of the original Cretan handleless cup form. Culturally, this can be explained as an effort to cater to "the desire of the consumer to purchase a perfect copy of a desirable Cretan object" (Berg 2004, 79). This targeted emulation of appearance is also evident in other imitations of Minoan ceramic forms at Ayia Irini. From a cultural perspective, an object that is - at its core - *non-local* may have equated to *exotic* and therefore *desireable*. It can be said that objects that function in this way function as social capital, which have the potential to convey a number of messages to various members of a given community. While the conical cup itself is not a glamorous or beautiful vessel aesthetically, the desirability of the conical cup may have resided in its functional benefits rather than its aesthetic ones.

While Berg suggests the choice of pale brown clay is only a conscious effort to appeal to the aesthetic preferences of the consumer, there is evidence for the use of this clay for functional as well as aesthetic purposes. Warren estimates that (at Knossos on the island of Crete) there are upwards of one million handleless cups present (Wiener 2011, 355). In 1990 as part of her doctoral dissertation, Carole Gillis observed the physical properties of 412 conical cups from both palatial and elite contexts at Knossos dated to the LM IA period (Gillis 1990b, 39). The fabric of these vessels was dominated by either a buff or light to medium brown color with large inclusions. The use of calcareous material such as limestone, either present in the clays naturally or added as temper, is supported by the presence of large pores, what Gillis terms 'explosion holes', likely the result of the volume expansion associated with lime popping (Gillis 1990b, 39). Evidence for lime popping in the walls of handleless cups and use of white-colored tempers can also be found at LM IA Mallia (Gillis 1990b, 62), Palaikastro (Gillis 1990b, 75), and Myrtos Pyrgos (Gillis 1990b, 97). It could be argued that the potters producing handleless cups at Ayia Irini are emulating not only the appearance of the clay used but perhaps the functional properties granted by the inclusion of calcareous material in the fabric of locally produced handleless cups. This would reinforce Berg's claim that "potters outside Crete imitated the whole conical cup 'package' instead of

selectively choosing specific features" (Berg 2004, 80). If this is in fact a conscious choice, perhaps the properties granted by the use of pale brown calcareous clays factor into a cultural "desire to be seen participating in the Minoan cultural sphere" as well as a technological one affecting application of these handleless cups.

Handleless cups are famously known for being hyper-abundant and having a multiplicity of uses. They are a highly standardized product (See Berg 2004; Davis 1985), locally produced in large quantities - from similar clay types, either naturally calcareous or tempered with calcareous materials, and discarded after either a single-use or a short duration of use. In addition to the many other functions of the handleless/conical cup as a lamp, a ritual drinking vessel, funnel, pot-lid, etc. it seems possible that the handleless cups in House A could have been used as makeshift 'cupels' for the purposes of silver purification. Based on the above data, the vessels would have been stored in basement Rooms 17-18 with other materials used for metal production, a short distance from the ground floor level where ore or metal assay could be employed in small quantities (Schofield 1990a, 760). Once a cup was 'spent' it would be crushed down using one of the many stone pounders/grinders present throughout House A in order to recycle the metal absorbed by the walls of the vessel.. Eight of the total eleven pounders/grinders (72.72%) are found in the areas of interest: Rooms 17 and 18 and Courtyard 36 and Room 39 - four in each of these two zones. Zofia Stos-Gale has commented on the use of the Minoan conical cups as makeshift cupels, indicating "at least in the case of silver, the inside of the cup would be blackened, somewhat irregular and shiny - that there would be no mistaking the unusualness of the cup" (Gillis 1990b, 100). Be that as it may, the act of recycling the conical cups in an effort to acquire the silver lost in the vessel walls lends itself to the possibility of a lack of remaining positive evidence, i.e. blackened and shiny internal walls. In addition to its other utilities, this would provide a reason for the constant need and the high concentration of handleless cups in Rooms 17-18. To the East, in Courtyard 36, the central hearth could have been used for larger-scale cupellation. Within the hearth (0.30 m high), were two pits about 0.30m deep lined with wood ash - perhaps an attempt at lining the clay pit with a material intended to prevent the binding of lead with the clay silicates (Cummer & Schofield 1984, 7). This would explain the

high concentration of crucibles (used in ore smelting prior to cupellation) and metal finds, the waste or finished products of smelting and cupellation. If the hearth was the center of larger-scale cupellation in House A, handleless cups would not be needed in Courtyard 36 for cupellation, providing an explanation for the low concentration of handleless cups there.

A Proposed Application of the Handleless Cups in Period VI House A: Textile Production

Evidence for textile production differs from that of metalworking as the finished products and organic materials used to create them are perishable and therefore rarely remain in the archaeological record. Because thread and textiles themselves are rarely found, the equipment used in the production of textiles constitutes the limited pool of evidence from which to draw conclusions (Renfrew 1999, 713). Textile production does not necessarily equate to 'weaving'. Several stages are involved in textile production: planning and design, acquisition and preparation of materials to be woven (fleece, flax, etc.), acquisition of plants used for dyes, preparation of dyes, and preparation of a loom, among others (Nixon 1999, 564-565). Because of the perishability of the materials used and the portability of activity involved in textile production we are granted only a small window into but one or two stages of the entire process. It is with this in mind that I interpret the evidence from House A.

The presence of obsidian blades, loom weights, and spindle whorls likely correlates with the spinning of thread and the weaving of cloth, but their numbers do not necessarily imply any industrial activity greater than that of the household level. Ten or more loom weights would have been sufficient to operate a single loom (Davis 1986, 98; Burke 2010, 57). In all of Period VI House A there are 52 loom weight finds, 36 of which (69.23%) are found in Rooms 17-18. It could be argued that, at most, three looms could have been worked on the ground-level of Rooms 17-18. In all of Period VI House A there are 45 spindle whorls, 24 of which (53.33%) are found in Rooms 17-18. The fact that both the loom weights and spindle whorls concentrate in the same room is interesting, as Burke indicates that, at least on the island of Crete, after the EM period "no longer are spinning and weaving tools found together as they were in Prepalatial sites" (Burke 2010, 31). It is possible then that the co-occurrence and perhaps usage

side-by-side of spinning and weaving equipment is a non-Minoan, and therefore local, practice. But what of the handleless cups? What is their proposed role or roles in textile production?

Evidence from Petras in East Crete supports a link between the conical cup and textiles. The contents of Neopalatial House II at Petras (dye vats, water channels, loom weights, and tripod vessels) are more than likely evidence of large-scale textile production. In the same context, two conical cups were found which bear the ideogram for cloth, the same ideogram that appears on some of the loom weights found (Burke 2010, 61). The evidence from Petras provides strong support for a contextual link between cloth, cloth dyes, and handleless cups, though the exact role the cups played is unclear. Schofield (1990b, 209; 205) has already suggested that pigment-grinding was but one of the industrial activities conducted in House A based on the presence of coloring matter in some of the vessels. The presence of coloring matter within handleless cups can also be found on the island of Crete at LM I Knossos and LM I Myrtos Pyrgos (Gillis 1990b, 40; 99). At Knossos and Myrtos Pyrgos, several of the handleless cups contain a red pigment (either dry or liquid state), likely colored with red ochre. Gillis (1990b, 134) has suggested that to create such a pigment ochre was crushed, mixed with a liquid (perhaps oil?), and heated. In addition to the red pigment, the creation of other pigments, purple - from the murex snail - and yellow - from saffron, requires the application of heat during production (Burke 2010, 35; Renfrew 1999, 712). If these dyes were stored in a dry form, as is possible for both the red and yellow pigments, the handleless cup could have been used for the preparation of small amounts of dyes needed for the textiles being produced in Rooms 17-18. Based on the numbers, textile production was likely a much smaller industry than metalworking within House A. There is nothing to suggest the production of dyes within House A, aside from the presence of loom weights, as it lacks the characteristic water channels, spouted tubs, and dye vats associated with a dyeing industry (Burke 2010, 37). Based on the characteristics discussed above it is likely that the handleless cups in House A were used as containers for the preparation of clothing dyes.

Conclusion

The application of the handleless cups within House A as containers for dyes is but one of the multiplicity of proposed uses. Because of the poor survival of highly perishable textiles the proposed uses

associated with the handleless cup may remain speculative at best. It is only the use of these vessels as makeshift ‘cupels’ that may explain, from start to finish, the reasons for: the standardization of production in both form and fabric, a plausible link with the cupellation of silver; the phenomenon of localized production; the exorbitant quantities of handleless cups, as 1) their single-use application ends in the destruction of the vessel in order to preserve the metals absorbed during cupellation, and 2) the myriad of other applications which meant these vessels needed to always be easily accessible; and finally the spatial relationships between other artifacts as well as architectural features. Elsewhere in Ayia Irini the spatial, relationship between handleless cups, metalworking objects, and particular architectural features (such as courtyards and hearths) is observed. Schofield’s observations of the surrounding structures provide a glimpse of additional support if investigated further. For example, “House L includes a courtyard with a hearth full of bits of bronze, while the rooms immediately to the east...produced metallurgical equipment” and Room 23 of House W contains a large concentration of “lead objects and litharge, ten miniature jugs, and 627 conical cups” (Schofield 1990b, 209) Even so, this proposed use and application is largely speculative until the handleless cups from House A are subject to fabric analysis.

While the handleless cup is a vessel that performs a multiplicity of functions, particular sets of functions (as the ones proposed above) are likely locally specific and may not apply to other Aegean settlements. In order to understand better the role the handleless cup plays in the lives of the inhabitants of Cycladic communities, rather than just Ayia Irini, analyses of the object (form and fabric) as well as its distribution must be conducted at the micro-scale to see if the percent concentration and spatial relationships as observed above remain comparable or differ from one location to another. In future studies of handleless cups, if a varied pattern of use emerges at different sites, Minoanization of a vessel form may not in every case equate to the Minoanization of vessel function. This further challenges traditional conceptions of Minoanization. Upon further investigation of the Minoan conical cup, should a varied pattern of use emerge, it stands to reason that the current interpretations of other Minoanizing vessels could also be challenged, and with them conventional perceptions of the nature of Minoanization. The original intent of the term, as defined by Evans, can no longer solely explain Cretan-Minoan

interactions with the Aegean but would be forced to accommodate the social agency of ***all*** Aegean communities (Cretan, Cycladic, and Mainland) as contributors to a widespread and diverse cultural and social nexus of interaction facilitated by the use, distribution, and implementation of material objects in production, consumption, and other types of activity.

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