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ARACHNE'S WEB: WOMEN, WEAVING AND NETWORKS OF KNOWLEDGE IN THE BRONZE AGE SOUTHERN AEGEAN

by †Joanne Cutler

The appearance of loom weights at a number of southern Aegean sites in the Middle and early Late Bronze Age is indicative of the adoption of a new weaving technology: the use of the warp-weighted loom. The specific type of loom weight (discoid) recovered is a Cretan form, and this evidence of Cretan influence is also seen in a wider range of material culture features at these settlements during this period. Weaving is a complex skill and learning requires contact between novice and expert practitioner over an extended period of time; the introduction of a new weaving technology therefore raises the question of how the necessary technical knowledge and know-how was transferred from one individual or community to another. The archaeological indicators of this new technological practice, the loom weights themselves, are objects that very rarely travel, except with their owners; the presence of loom weights manufactured from non-local ceramic fabrics at some of the southern Aegean sites can therefore provide a window into the patterns of mobility through which the new technology is likely to have spread. Both in the Bronze Age and subsequent Archaic and Classical periods, weaving was closely associated with women. Loom weights thus constitute archaeological markers for the craftswomen who used them. This paper explores the insight they can offer into female networks of teaching, learning and craft practice in the second millennium BC.

INTRODUCTION

The appearance of loom weights at a number of southern Aegean sites in the Middle and early Late Bronze Age is indicative of the adoption of a new weaving technology: the use of the warp-weighted loom. The specific type of loom weight (discoid) recovered is an earlier Cretan form, and this evidence of Cretan influence corresponds with the adoption of a wider range of Cretan and Cretan-style material culture features at these settlements, a phenomenon known as 'Minoanisation' (Broodbank 2004; Davis 2008; Hägg and Marinatos 1984; Macdonald, Hallager and Niemeier 2009; Gorogianni, Pavúk and Girella 2016).

The transmission of weaving skills requires contact between novice and expert practitioners over an extended period of time, and the introduction of a new weaving technology therefore raises the question of how the necessary technical knowledge and know-how were transferred from one individual/community to another. By examining how technological skills are learnt and considering possible mechanisms for their transmission, this article explores the processes through which Cretan weaving techniques may have been adopted abroad.

TEXTILES AND LOOM TECHNOLOGY IN THE BRONZE AGE SOUTHERN AEGEAN

In the Bronze Age Aegean, as in many other regions and time periods, textiles would have constituted a significant component of the material and visual environment. The demand for cloth would have been considerable; textiles were needed for a wide variety of purposes, such as clothing, bedding, wall-hangings, canopies, coverings for furniture and floors, sails, bags, sacks and wrappings. In contrast to modern, industrialised societies in which individuals engage with cloth as consumers rather than as producers (with textiles largely having come to be taken for granted as a result), most of the textiles used in pre-industrial societies were produced within a domestic context. The textile production process, from the acquisition and preparation of the raw material to the finished fabric, is highly labour intensive and involves a number of separate stages (see overview in Andersson Strand 2015); meeting the need for cloth within Aegean

Bronze Age communities would have required a substantial investment of time, as well as specialised craft knowledge.

Cloth can be woven on a number of different types of loom. In the Bronze Age eastern Mediterranean, there is evidence for the use of three loom types: the horizontal ground loom, the vertical two-beam loom and the warp-weighted loom (Barber 1991, 83–116). The looms themselves rarely leave any archaeological trace, since they were made of wood. However, on the warp-weighted loom, loom weights (usually made of clay) were used to apply tension to the warp threads, which hung from the upper beam of the loom (Fig. 1). The presence of loom weights therefore indicates the use of this particular type of loom. On Crete and the Greek mainland the warp-weighted loom was already in use in the Neolithic period (Barber 1991, 99–100; Carington Smith 1975, 122–6, 135–8, 154–9; Andersson Strand and Nosch 2015, 362).

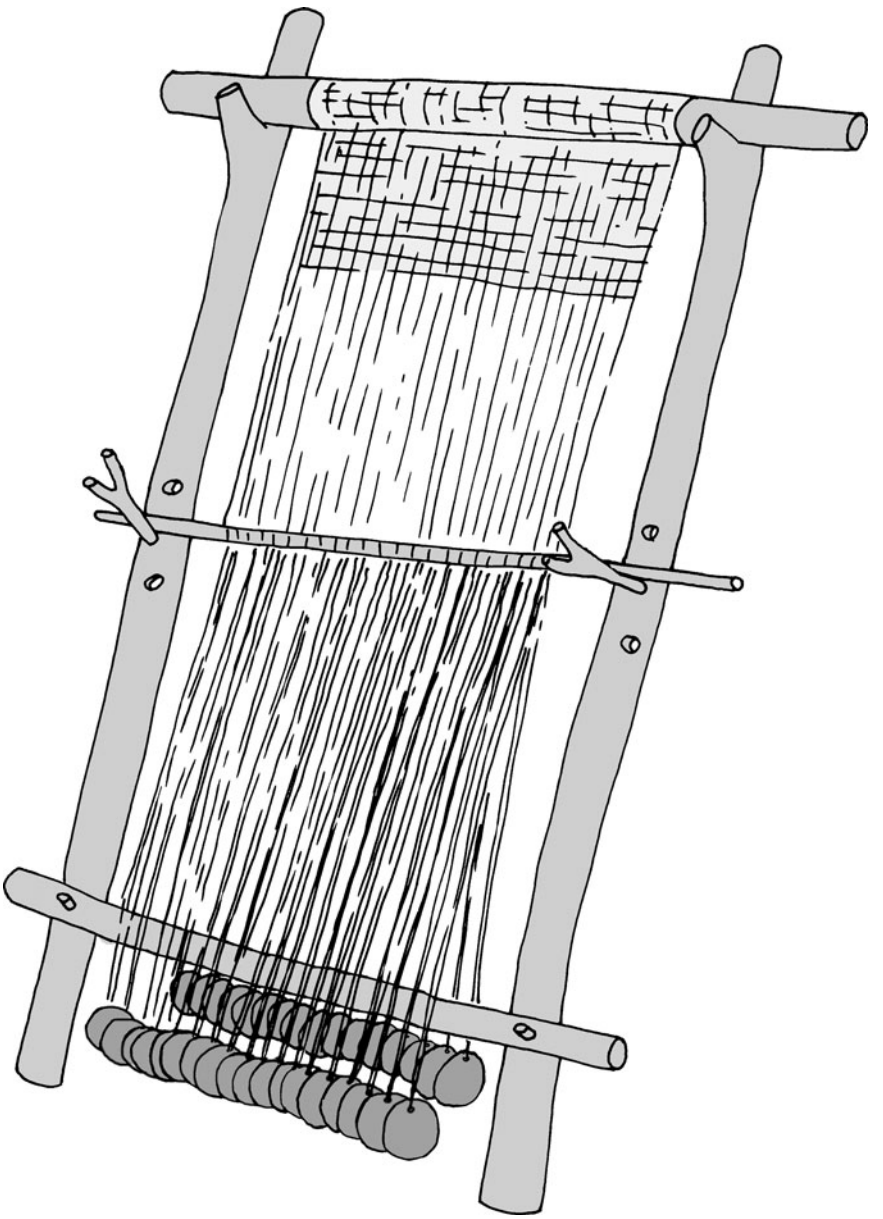

Fig. 1. The warp-weighted loom. Drawing: Annika Jeppsson © Annika Jeppsson and the Centre for Textile Research, University of Copenhagen.

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However, on current evidence, it seems that this loom type went out of use in the southern part of the Greek mainland and the islands at the end of the Early Bronze Age, and did not reappear on the mainland until the Late Bronze Age (Carington Smith 1992, 687–9). Sufficient Middle Bronze Age domestic deposits have been excavated in this region to indicate this absence is not simply due to non-recovery of relevant evidence. On Crete, the warp-weighted loom continued to be used throughout the Bronze Age.

THE APPEARANCE OF DISCOID LOOM WEIGHTS AT SOUTHERN AEGEAN SETTLEMENTS

A number of different loom weight types have been recovered from Bronze Age settlements on Crete, among them a discoid form which often has a flattened or a grooved top (Fig. 2). This type of loom weight was in use on the island from the third millennium BC. For example, discoid loom weights were present in Early Minoan (EM) II contexts (*c.*2650–2200 BC) at the site of Myrtos, Fournou Korifi on the south coast of Crete (Warren 1972). During the first half of the second millennium BC, loom weights of this type also began to appear at a number of sites on the southern Aegean islands and along the south-west Anatolian coast.

In the Cyclades, discoid loom weights have been recovered from Ayia Irini on Kea, Phylakopi on Melos, Akrotiri on Thera and Mikre Vigla on Naxos, as well as Kolonna on Aegina and the islands of Kythera and Antikythera further to the west. In the south-east Aegean, this type of loom weight has been found at Serraglio on Kos, Trianda and other locations on Rhodes, the Vathy Cave on Kalymnos, the Heraion on Samos and Emporio on Chios, and on the island of Karpathos. Along the south-west Anatolian littoral, discoid weights have been recorded at Miletus, Iasos, Teichiussa, Çeşme-Bağlararasi and Liman Tepe, as well as Bakla Tepe on the Cumaovasi plain. They have also been recovered further to the north, at Mikro Vouni on Samothrace and Koukonisi on Lemnos (Fig. 3; Cutler 2012; forthcoming). The first appearance of discoid loom weights at these sites varies markedly, from the start of the Middle Bronze Age to early in the Late Bronze Age, a degree of variation comparable to that for the adoption of different technological and stylistic characteristics of Cretan pottery in the wider southern Aegean (Nikolakopoulou and Knappett 2016; Abell and Hilditch 2016), suggesting that the

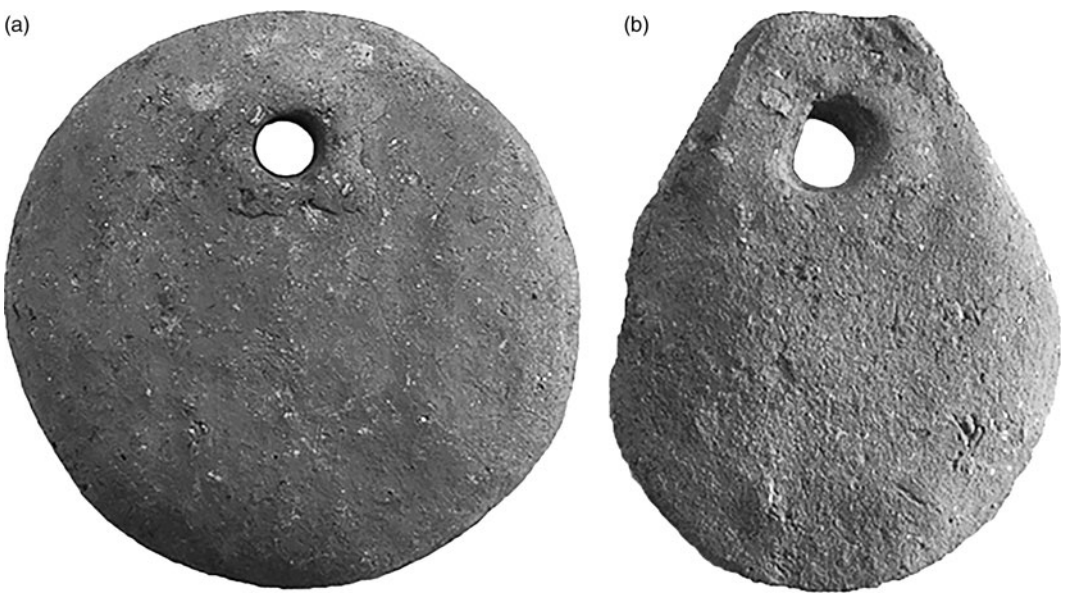

Fig. 2. Examples of discoid loom weights: a) discoid rounded; b) discoid elliptical. Photographs: J. Cutler.

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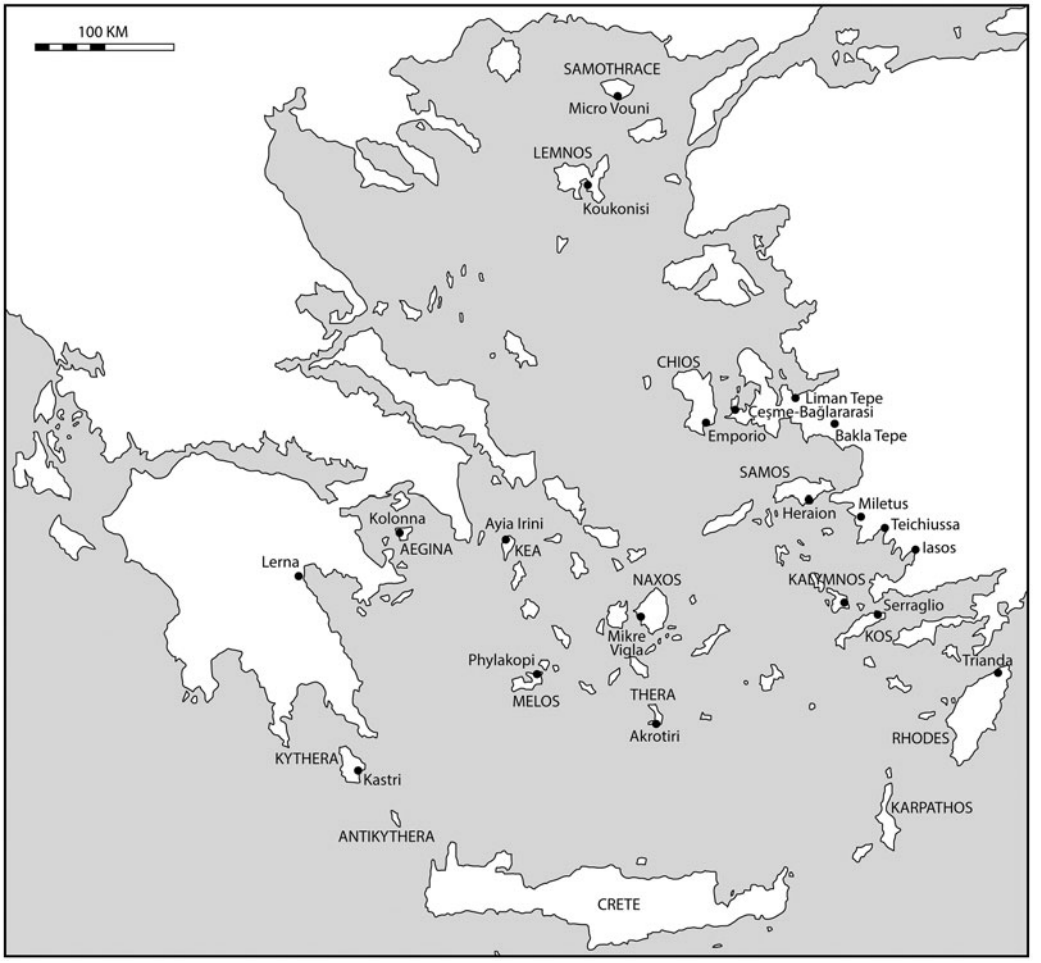

Fig. 3. Map of the Aegean, showing the main locations mentioned in the text. Drawing: J. Cutler, T. Whitelaw.

processes of adoption and adaptation relevant to each craft were determined individually by each community (Cutler 2011; 2012; 2016). However, some differences in the presently documented chronologies of adoption of loom weights also reflect the degree of investigation of Middle Bronze Age strata at each site.

The discoid form of loom weight is the only type present at most of these southern Aegean settlements. The absence of loom weights of any type in earlier levels at the majority of these sites further indicates that, in most cases, the appearance of the discoid weights represents the introduction of the warp-weighted loom, and therefore the adoption of a new weaving technology. Prior to the adoption of the warp-weighted loom, another type of loom is likely to have been used. It has been suggested that longitudinally pierced 'spools' present in Middle Bronze Age contexts at sites on the Greek mainland, as well as at Ayia Irini on Kea and Phylakopi on Melos, may be associated with setting the warp on the horizontal ground loom, although this identification is uncertain (Carington Smith 1975, 404–10; Davis 1984, 63; Pavúk 2012, pl. XXIVa). Experimental research indicates that spools could have been used as loom weights (Olofsson, Andersson Strand and Nosch 2015, 92–5), but the specific shapes and weights of the Cycladic examples have not been analysed for their suitability. If used as loom weights, they were employed alongside discoid loom weights at Ayia Irini and Phylakopi (Cutler 2012), though not at Akrotiri on Thera (Vakirtzi 2019, 500).

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LEARNING TECHNICAL SKILLS: COMMUNITIES OF PRACTICE AND EMBODIED TECHNIQUES

The adoption of a new technology involving new knowledge and practices, such as weaving on the warp-weighted loom, necessitates the acquisition of new technical skills. Contemporary approaches to the transmission of technical practices emphasise that skills are learnt in particular cultural contexts (Dietler and Herbich 1994; Gosselain 1998; Minar and Crown 2001; Stark, Bowser and Horne 2008; Wendrich 2012a). Craft practitioners who share a common body of knowledge and the same technical practices and attendant social relations constitute what social learning theorists Lave and Wenger have called 'communities of practice' (Lave and Wenger 1991; Wenger 2006). Novices gain the knowledge and skills necessary to become a full member of a given community by actively engaging in the practices of the community, developing a sense of identity in relation to the group in the process (Lave and Wenger 1991).

Observation and imitation of an expert craftsperson are not sufficient on their own to enable a learner to master complex skills such as weaving; long-term interaction between the novice and a skilled practitioner is required in order for the novice to achieve competency. The apprentice learns to master increasingly difficult technical elements of the production sequence, with the expert craftsperson assisting as necessary, until the learner can work independently (a process known as scaffolding) (Minar and Crown 2001, 372; Tehrani and Reide 2008). For example, novices learning to weave on the horizontal ground loom in Iranian and Central Asian tribal communities are mainly taught through a combination of demonstration, collaborative weaving and intervention, as they master increasingly complex techniques (Tehrani and Collard 2009, 289; Tehrani and Reide 2008, 320–1). Rug designs in the pile-weaving technique are learnt by 'filling in' part of a design already partly woven by a skilled weaver, with the apprentice working on progressively larger and more complicated design sections (Tehrani and Reide 2008, 321). In Zinacantec Maya communities, the teacher often demonstrates various elements of the process of weaving on the backstrap loom before the novice weaver attempts them and helps with the parts of the process that the learner has not yet fully mastered, providing more assistance with the more difficult elements than for the easier to execute components (Greenfield 1984; Maynard and Greenfield 2005, 85). Greenfield found that when there was a shift to weaving for commercial purposes, learning to weave became more of an independent trial and error process, but novice weavers still needed to ask for help when necessary (Greenfield 2000). Learning to weave in the Sirwa mountains, in southern Morocco, where a type of vertical two-beam loom is used, is similarly scaffolded (Naji 2012, 373).

In non-industrial societies, technical knowledge and skills are usually passed on from parents to children of the same gender, with learning taking place as part of everyday activities (Shennan and Steele 1999; Wendrich 2012b, 11). Children become familiar with the body positions associated with carrying out a particular task at a very young age, through observation and imitation of those around them (Bril 2002). The body postures required are often reinforced by wider cultural practices. For example, when weaving on the backstrap loom (a type of loom consisting of two bars, with one bar attached to a fixed object and the other attached to a strap around the weaver's waist), the body is part of the loom, and the weaver needs good balance, limited motor activity (especially upper-body stillness) and the ability to kneel for long periods (Maynard, Greenfield and Childs 1999, 381–5). Maynard, Greenfield and Childs have observed that, in the case of Zinacantec backstrap loom weavers (who are female), all of these capabilities are fostered through the cultural environment that children grow up in (Maynard, Greenfield and Childs 1999, 381–5). Babies are swaddled and encouraged to nurse at the slightest sign of movement, thus reducing their motor activity; as they get older, girls see their mothers and other women using restricted body movements in their everyday comportment, carrying firewood by balancing it on their heads, and kneeling to perform routine tasks such as cooking and making tortillas – in their turn they learn to do the same (Maynard, Greenfield and Childs 1999, 384–5). Maynard, Greenfield and Childs suggest that the low level of motor activity of the mother is also likely to have a prenatal influence on the unborn child.

Weaving on the horizontal ground loom and the vertical two-beam loom, on the other hand, requires the weaver to sit for prolonged periods of time. Naji (who undertook an apprenticeship as part of field research among Sirwan female carpet weavers) noted that, because Sirwan furniture only consisted of carpets or blankets and low tables, 'people's joints, bones and musculature have been trained over generations to afford the specific body techniques of sitting on the ground' (Naji 2009, 54). In everyday activities, Sirwan female body techniques are much more controlled than those of men, providing a foundation for the constrained posture required when weaving (Naji 2009, 54–5). In contrast to the backstrap loom, horizontal ground loom and vertical two-beam loom, weaving on the warp-weighted loom requires the weaver to stand for long periods, therefore necessitating a different body posture to the kneeling or sitting positions used when weaving on these other loom types.

In the same way that they learn the requisite body techniques through enculturation and socialisation, children in traditional communities that practise weaving become familiar with the loom and the weaving process from infancy, through everyday experience. In Sirwan households, for example, children play around the loom from the time they learn to walk, with toddlers sometimes trying to mimic the action of knotting a thread around a warp thread; as they get older, boys begin to distance themselves from the loom, however (Naji 2009, 52–3). Young children frequently start to learn to weave by play weaving, often on a toy loom. Zinacantec girls begin to weave on miniature backstrap looms at the age of three or four years, and generally start to weave on a full-size loom at the age of eight or nine, although they sometimes begin as young as five (Greenfield 1984, 120; Maynard, Greenfield and Childs 1999, 386–7). The Codex Mendoza indicates that Aztec girls learnt to weave at a similar age (Hendon 2006, 363). Children often learn to spin before they begin to weave on a full-size loom (see for example Hendon 2006, 363; Tehrani and Collard 2009, 289). In Nigeria, Akwete girls begin to play at weaving on upturned stools by the age of three, and may start weaving on the upright two-beam loom as young as five (Aronson 1989, 151). Girls in Iranian tribal communities begin to learn weaving techniques at the ages of nine or ten, sometimes as young as six, initially practicing rug knots on miniature looms (Tehrani and Collard 2009, 289). Today, girls in Sirwan families start to learn to weave between the age of 13 and 17, but previous generations traditionally started earlier, at age 10 or younger (Naji 2012, 373). In the Bronze Age southern Aegean, the Linear B texts dating to the fourteenth–thirteenth centuries BC from Knossos on Crete and Pylos on the southern Greek mainland list children of both sexes in ration lists alongside the large numbers of female textile workers recorded, and it is likely that they assisted in/were learning the women's craft (once they reach a certain age, the boys are no longer recorded with the female workers) (Chadwick 1988; Killen 1984, 52; 2007, 54). Based on Near Eastern parallels, Nosch has estimated that children would begin to work in the work groups at the age of five to six years (Nosch 2003, 16). Females classified as adult who were being taught (di-da-ka-re) are also mentioned in the Knossos tablets (Killen 1984, 55; 2007, 54, 58 n. 11; Nosch 2003, 17).

Because of the physical demands of weaving, children can only become completely independent weavers once they have developed sufficient strength and reach to operate the loom without assistance. On all types of traditional loom, weavers working on their own need sufficient reach to be able to pass the weft thread from one side of the shed to the other unaided, and sufficient strength to beat the weft into place (Foxhall 2012, 187–8). Zinacantec novice weavers need help passing the weft thread through the shed until their arms are long enough to do so unaided (Greenfield 1984; Hendon 2006, 364). On the vertical two-beam loom, where the textile is woven from the bottom upwards, once the weaving reaches the upper part, the weaver has to sit on cushions or a stool to be able to continue (younger children would still not have sufficient height), and needs the stamina to be able to work with arms raised for extended periods (Naji 2009, 57). On the warp-weighted loom, weaving starts at the top, so to work independently the weaver needs to be tall enough to be able to reach the upper part of the loom; the weft is beaten upwards, against gravity, therefore requiring even more strength than beating in the weft on other types of loom (Foxhall 2012, 198). Since the warp threads have weights attached to them, it is also hard work to change the shed, especially when weaving wider textiles that require a larger number of loom weights, and/or when weaving coarser textiles requiring heavier weights.

Girls in Iranian tribal communities generally start to weave independently when they reach adolescence, and Zinacantec girls have usually become accomplished independent weavers by mid-adolescence (Maynard, Greenfield and Childs 1999, 386; Tehrani and Collard 2009, 289). It is likely that children learning to weave on the warp-weighted loom in the past would not have been strong enough to become independent weavers before adolescence (Foxhall 2012, 197–8). Certain weaving tasks, such as setting up the warp on the loom and weaving wider textiles, are easier with two people, encouraging some degree of collaborative work even when the weaver has achieved expertise (Barber 1991, 105; 1994, 86–7). Because setting up the warp is particularly complex, such contexts of collaboration can facilitate support for novices by more experienced weavers.

To become an accomplished weaver requires long-term, repeated practice, and weaving apprenticeships usually last five to ten years (Maynard, Greenfield and Childs 1999, 386; Tehrani and Reide 2008, 321). Warping and complex pattern-weaving (which requires practical mathematical skills) are the hardest techniques to master (Bier 2004a; Dilley 1989, 187; Harris 1987; Hendon 2006, 362; Tehrani and Reide 2008, 321). In learning a craft skill, each individual element in a complex sequence of movements, such as the component actions executed while weaving, initially requires concentration on the part of the novice practitioner. Through constant repetition over an extended period of time, these separate elements are combined into a single, fluent action, becoming an automatic motor behaviour that can be performed quickly, accurately and consistently without having to think about it (Minar and Crown 2001, 373; Schneider and Fisk 1983). Brain imaging studies have indicated that neural changes occur during the different stages of learning a motor behaviour (an initial fast learning phase, a later slow learning phase, and a period of consolidation, automatisation and retention), with the execution of already acquired motor skills being controlled by different brain circuits than those that are active during the learning process (Doyon and Benali 2005; Luft and Buitrago 2005). Once sequences of actions have become fully automatised they are very conservative. Altering such internalised sequences of actions necessitates returning to a conscious, controlled performance, which is both a great deal slower and more prone to mistakes (Minar and Crown 2001, 373; Schneider and Fisk 1983, 120). The internalisation of motor behaviours can cause 'large negative transfer effects', making it more difficult for an individual to modify or change an existing motor habit than it is for a complete novice to learn a motor skill for the first time (Schneider and Fisk 1983, 131–2). Motor behaviours are thus highly resistant to change.

When a new craft technology is adopted, the necessary knowledge and know-how must be acquired from a different community of practice, through horizontal (between individuals of the same generation), rather than vertical (parent to child), transmission (Hosfield 2009, 46). Non-native learners are at a disadvantage, since they do not possess the body techniques and skills that native learners gain through early cultural experience (Maynard, Greenfield and Childs 1999). When the new technology replaces an existing technology, practitioners must also unlearn or modify previously automatised embodied techniques.

THE ADOPTION OF THE WARP-WEIGHTED LOOM IN SOUTHERN AEGEAN COMMUNITIES

With regard to the adoption of the warp-weighted loom in the southern Aegean, learners previously weaving on another type of loom would have needed to change established body movements and techniques. For example, different body postures are required when weaving on the warp-weighted loom than when weaving on either of the other two known Bronze Age eastern Mediterranean loom types, the horizontal ground loom and the vertical two-beam loom. As noted earlier, the weaver stands when working at the warp-weighted loom, whereas weaving on the other two loom types requires a sitting position. With the warp-weighted loom, since weaving starts at the top, the weft is beaten upwards, whereas on the horizontal ground loom and vertical two-beam loom the weft is beaten downwards, towards the lower beam of the loom and the weaver, so the motor sequences used in the weaving process are not the same. The

warp-weighted loom also requires different warping methods to the other two loom types. Additional skills anyone learning to weave on the warp-weighted loom would need to acquire would be the ability to gauge how much tension warp threads of a particular type need on the loom, and the expertise to be able to judge how many threads should be attached to a particular loom weight in order to provide the threads with the correct tension.

If the learner was already adept at weaving on another type of loom, the amount of time needed to achieve proficiency at weaving on the warp-weighted loom is likely to have been reduced, but unlearning or adapting previous automatised practices and acquiring the necessary new knowledge and technical skills would still require prolonged contact between the learner and a skilled practitioner. The adoption of the warp-weighted loom by southern Aegean communities is therefore indicative of the mobility of individuals, with either novices travelling elsewhere to learn the craft or experienced non-local craftspeople spending extended periods of time in the adopting southern Aegean communities. Since weaving in the Aegean Bronze Age was almost certainly a female craft, this therefore suggests that the spread of the new weaving technology was linked to the mobility of women (Cutler 2011, 126–7; 2012, 150).

FEMALE MOBILITY AND THE TRANSMISSION OF TEXTILE CRAFT KNOWLEDGE: ARCHAEOLOGICAL MARKERS AND SOCIAL MECHANISMS

Among the loom weights recovered from southern Aegean settlements are a number that are made of non-local clays. More than 15 percent of the *c.*1200 loom weights, as well as a number of spindle whorls, recovered from the site of Ayia Irini on Kea are manufactured from clays that are not local to the island; the clay fabrics of additional tools may also be non-local (Cutler 2011, 475; 2012, 149–50). A range of non-local fabrics is present; on the basis of visual comparisons, the likely sources for these fabrics include Crete, other Cycladic islands, various locations in the south-east Aegean, as well as other Aegean locales. A similar percentage of the discoid loom weights from Phylakopi on Melos and Miletus are also non-local, with a range of fabrics again being represented, while lower numbers of non-local loom weights have also been identified at other southern Aegean sites (Cutler 2011, 475; 2012, 149–50).

Loom weights and other textile tools are unlikely to have been items of exchange, since they are objects that are not generally regarded as having any intrinsic value and are relatively easy to make, although they can be of considerable value to the craftspeople who use them (Barber 1991, 299). They are therefore unlikely to have been transported from one location to another except as the personal possessions of their users. The non-local loom weights can therefore act as archaeological markers for the networks of connections through which textile craft knowledge and skills are likely to have been transferred. The range of non-local ceramic fabrics, together with differences in the timing of the uptake of the warp-weighted loom at the various southern Aegean sites (Cutler 2011; 2012), suggests that, although the diffusion of warp-weighted loom technology ultimately originated on Crete, some communities may have acquired the necessary skills through weavers from other Aegean centres where the technology had already been introduced and adopted, rather than directly from Cretan craftswomen. At Ayia Irini, non-local loom weights are documented through all phases of the Middle and Late Bronze Age sequence, suggesting that there was continuous mobility of women. Non-local loom weights have also been recovered from all excavated areas of the site, suggesting that this may have been a relatively widespread phenomenon within the community (Cutler 2011, 279). After the initial introduction of the technology, the techniques could then have been passed on to other women within the local community, initially perhaps through horizontal or oblique transmission and subsequently through vertical transmission within families. Weaving on the warp-weighted loom could therefore have become fully local within a generation.

Physical evidence for female mobility in the Bronze Age Aegean has been provided by recent strontium isotope ratio (87Sr/86Sr) analyses of 11 individuals from the sixteenth-century BC Shaft Graves in Grave Circle A at Mycenae, on the southern Greek mainland. Two out of three

individuals identified as being non-local are women; these are the only two among the 11 individuals tested to be securely identified as female (Nafplioti 2009). One of these women, from Shaft Grave III (which also contained two probable male burials, as well as an infant wrapped in gold, found on the female's chest), was accompanied by a large quantity of rich grave goods, and it has been speculated that the women were present at Mycenae as the result of high status exogamous marriage alliances (Dickinson et al. 2012, 181–2; Nafplioti 2009, 289; Papazoglou-Manioudaki et al. 2010, 160–1). Although the case for exogamy (or formal marriage unions more generally) cannot be proven, intermarriage is highly likely to be foremost among the processes that could account for female mobility in the Bronze Age Aegean (Cutler 2011, 476; 2012, 150; Gorogianni, Cutler and Fitzsimons 2015).

It is therefore possible that the presence of non-local loom weights and other textile tools at some of the southern Aegean sites may reflect the practice of women taking loom weights, and perhaps also a loom (as well as spinning equipment), with them when they married, possibly as part of a dowry. Preserved Old Babylonian dowry texts demonstrate that spindles, looms and weaving tools, as well as textiles and wool, were sometimes among dowry items given to women in Mesopotamia in the first quarter of the second millennium BC (Dalley 1980). Since the warp-weighted loom was not used in Mesopotamia during the Old Babylonian period, loom weights would not have constituted part of the weaving equipment. Higher-status women involved in exogamous marriages might also have been accompanied by female servants or slaves, bringing their own weaving equipment and practices with them. Women in the Aegean may have travelled with complete sets of loom weights, or may alternatively have only taken a few loom weights with them, to use as templates for making full sets of weights in local clay once they had moved to their new home.

Other possible processes which may have resulted in the dislocation of women are migration as part of a family group, enforced relocation as captives or slaves, or exchange of textile workers between elites. The large number of female textile workers listed in the later Linear B tablets from Pylos include groups of women referred to by ethnonyms that are interpreted as referring to places of origin beyond the Greek mainland, among which are locations that have been identified with the island of Kythera to the south, the south-west Anatolian coastal settlements of Knidos, Miletus and Halikarnassos, and the east Aegean islands of Lemnos and Chios, as well as 'Asiatic' (a-*64-ja) women (Chadwick 1988; Shelmerdine 1998, 295; Olsen 2014, 95–100). It has alternatively been suggested that the 'Asiatic' workers in the Pylos Linear B archives might originate from the same region as 'Asiatic' (Levantine) workers recorded in Egyptian texts, many of whom were captive female textile workers (Michailidou and Voutsa 2005). The tablets also record ra-wi-ja-ja women, a term that has been interpreted as indicating captives or 'women taken as booty' (Chadwick 1988, 83; Olsen 2014, 111–13). Some of the dependent women workers listed in the Linear B archives from Knossos are described as 'slaves' (do-e-ra) (Michailidou and Voutsa 2005, 18–19; Nosch 2003, 18–20). The term 'slave' may not have had the same meaning in the Late Bronze Age, however; Nosch (2003, 22) has observed that it only seems to be applied to individuals who are privately owned. The capture of craftspeople in the Late Bronze Age Aegean is documented in an early-thirteenth-century BC Hittite text which records a raid on Lazpa (interpreted as the island of Lesbos) by a man called Piyamaradu, in which he kidnapped craftsmen and took them to Millawanda (interpreted as Miletus) (Michailidou and Voutsa 2005, 26–7; Niemeier 1999, 151). Although it cannot be taken as evidence for the Bronze Age, it is also interesting to note that in the Iliad (6.289–95), Alexandros/Paris takes female captives from the Levantine coastal town of Sidon back to Troy to work as skilled weavers (Tzachili 2001, 173).

Captive women working as weavers are also attested in earlier Bronze Age records from Mesopotamia. Foreign women (the majority of whom are associated with weaving and milling), thought to be captives, are recorded in the late-third-millennium BC Ur III texts (Uchitel 1984; Wright 1996), while it is documented that Zimri-Lim (who ruled the kingdom of Mari in the eighteenth century BC) sent more than 100 women from the defeated king's harem back to Mari when he conquered Ashlakka, most of whom were set to work as weavers (Sasson 2008, 99). In terms of the exchange of workers between rulers/elites, archives from Mari show that Zimri-Lim

received 10 women, two boys and two girls from the ruler of Karana, who were set to work in the textile workshop in the palace (Dalley 2002, 153); the Egyptian pharaoh Tuthmosis III also presented 150 Asiatic weavers to one of his chief officials (Hall 1986, 18). The exchange of specialist workers such as masons, sculptors and carpenters between eastern Mediterranean rulers in the Late Bronze Age is well documented in the fourteenth-century BC Amarna correspondence and other texts (Zaccagnini 1983, 249–50). There is also evidence for a textile craft specialist being lent by one merchant to another; an eighteenth-century BC document from the Old Assyrian trading colony of Alishar in Anatolia records that a fuller had been sent on a temporary basis to a trader residing there by a business partner in another town (Dercksen 2001, 43–4, 62). The evidence from the wider eastern Mediterranean and Middle East thus indicates that the mobility of craftspeople in the region, including weavers, was manifest through more than a single mechanism, and this is also likely to have been the case in the Bronze Age southern Aegean.

WEAVING THREADS OF CONNECTION

Cycladic wall paintings contemporary with the Cretan Neopalatial period, notably those from Akrotiri on Thera, show individuals wearing Cretan-style dress (Abramovitz 1980; Doumas 1999; Morgan and Cameron 2007). The adoption of warp-weighted loom technology and the associated discoid loom weights in the southern Aegean may therefore have been at least partially driven by a desire to produce textiles of Cretan type. Many of the costumes depicted in the wall-paintings are elaborately patterned. Textile patterns are more likely than textile techniques to be transferred through horizontal transmission between members of the same generation (Hosfield 2009, 46; Tehrani and Collard 2009, 289). Knowledge of new patterns can also be transferred through the circulation of the textiles themselves, although since pattern-weaving is done during the weaving process – thus being integral to the textile – and can be mechanised through the use of extra sheds, knowledge of the pattern-weaving technique used and skill in pattern-weaving on the same type of loom would be prerequisites for the successful adoption of new designs (Bier 2004a, 181–2; 2004b, 148; Tehrani and Collard 2009, 289).

In considering how pattern-weaving techniques were transmitted, and how widely, it is necessary to take into account how many people are likely to have had the knowledge and skills necessary to weave the Cretan-style patterned textiles seen in the Akrotiri frescoes (which would have required carefully prepared, high-quality raw material, the dyeing of at least some fibres and knowledge of more complex weaving techniques). While both on Crete and in the wider southern Aegean the warp-weighted loom was in use in household contexts, there is of course likely to have been a considerable difference in the nature and, potentially, production processes of the textiles used by the general populace and those used by elites. In addition, through iconography on Crete and in the Akrotiri frescoes, it is clear that some particularly elaborate clothing was ritually significant, for offerings to, or for a robing ceremony involving, a goddess or her human or inanimate proxies (Crowley 2012; Warren 1988). However, while textiles as religious offerings are identified in the later Linear B documents, it is not clear whether any distinct contexts, personnel or procedures were involved in the production of these textiles (Nosch and Perna 2001).

By the beginning of the Late Bronze Age, the warp-weighted loom was widely in use across the southern Aegean. Since mastering a complex craft requires sustained interaction between the novice and a skilled craftsperson, the adoption of the new loom technology would have necessitated the movement of people across the region. The differences in the timing, contexts and associations of the first appearance of loom weights at the various sites suggests that, in some cases, knowledge of Cretan weaving techniques may have been filtered through craftswomen from other, previously 'Minoanised' southern Aegean communities. The identification of non-local textile tools at a number of settlements provides a tangible means of exploring the patterns of mobility that are likely to have fostered the extended female networks

of teaching, learning and craft practice through which the new technology and associated techniques are likely to have spread.

While textile production was almost certainly a female craft (Costin 1996; 2013), use of the potter's wheel cross-culturally is associated with male potters (Kramer 1985, 79–80; Knappett and Nikolakopoulou 2008, 38–9). Wheel-made ceramics are not produced at the domestic level (Roux 1990, 146), though weaving is a craft that can be practised both to meet domestic needs and to produce textiles for exchange. Whereas skill in use of the potter's wheel is likely to have been restricted to a limited number of individuals within a community, warp-weighted loom technology was often more widely employed. Both the introduction and use of these technologies are therefore likely to have involved different processes, and they were not likely to have been adopted together as a 'package' which can be taken to represent a single 'Minoanisation' process. Comparison of the evidence for the two crafts can therefore provide different perspectives on the mechanisms of the adoption, use and development of Cretan technologies in the wider southern Aegean.

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t.whitelaw@ucl.ac.uk

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Ο ιστός της αράχνης: οι γυναίκες, η υφαντική και τα γνωστικά δίκτυα την εποχή του Χαλκού στο Νότιο Αιγαίο

Η εμφάνιση των υφαντικών βαρών σε αρκετά μέρη στο νότιο Αιγαίο την περίοδο της Μέσης και αρχές της Ύστερης εποχής του Χαλκού είναι ενδεικτικό της υιοθέτησης μίας νέας υφαντικής τεχνολογίας: δηλαδή, της χρήσης του όρθιου αργαλειού. Ο συγκεκριμένος τύπος υφαντικού βάρους (δισκοειδής) που ανακαλύφθηκε, είναι Κρητικού τύπου και η ανακάλυψη της Κρητικής επιρροής είναι επίσης εμφανής σε ένα ευρύ φάσμα χαρακτηριστικών των υλικών καταλοίπων στους οικισμούς κατά τη διάρκεια αυτής της περιόδου. Η υφαντική αποτελεί μία πολύπλοκη δεξιοτεχνία και η εκμάθηση της απαιτεί την στενή συνεργασία μεταξύ των αρχάριων και των επαγγελματιών για μεγάλο χρονικό διάστημα. Έτσι, η εισαγωγή μίας νέας υφαντικής τεχνολογίας θέτει το ερώτημα πώς η απαραίτητη τεχνική γνώση και η τεχνογνωσία μεταφερόταν από το ένα άτομο στο άλλο ή από την μία κοινότητα στην άλλη. Οι αρχαιολογικές ενδείξεις αυτής της νέας τεχνολογικής πρακτικής, τα ίδια δηλαδή υφαντικά βάρη, είναι αντικείμενα που σπάνια ταξιδεύουν, εκτός αν τα μεταφέρουν οι ιδιοκτήτες τους. Η ύπαρξη αγνύθων που παράγονται από μη τοπικά κεραμικά υλικά σε ορισμένες από τις περιοχές του νότιου Αιγαίου μπορεί ως εκ τούτου να αποτελούν ένα «παράθυρο» στα πρότυπα της κινητικότητας μέσω της οποίας η νέα τεχνολογία είναι πιθανό να έχει εξαπλωθεί. Τόσο στην Εποχή του Χαλκού όσο και στις επόμενες Αρχαϊκές και Κλασικές περιόδους, η ύφανση συνδέεται στενά με τις γυναίκες. Επομένως, τα υφαντικά βάρη αποτελούν αρχαιολογικά στοιχεία για τις τεχνίτριες που τα χρησιμοποίησαν. Αυτό το άρθρο διερευνά τις γνώσεις που μπορούν να προσφέρουν στα δίκτυα γυναικείας διδασκαλίας, εκμάθησης και χειροτεχνίας στη δεύτερη χιλιετία π.Χ.

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