

The Unwound Yarn

Birth and Development of Textile Tools Between Levant and Egypt

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3 Archaeological Evidence from Ancient Egypt

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3.1 Egyptian Textiles

Textiles played a very important role in Ancient Egypt, as well as in the Near East. First of all, textiles served to dress the body, as tunics, robes, cloaks and other assorted garments; they were also necessary as bed linens, curtains, and to cover home furnishings. Secondly, textiles had a funerary use that gradually intensified during the Pharaonic age, as wrappings or shrouds for the deceased, but they were also left as grave goods within the tombs. Additionally, fabrics were offered to the gods within temples and used as an exchange currency, often paid as part of a worker's wage. Therefore textiles, although mostly lost now, were once present in all contexts: palatial, domestic, temple and funeral, which required that they were produced in huge quantities. Remarkably, the climate of Egypt has allowed a large number of ancient textiles to survive the ages, some of which in an excellent state of preservation, allowing modern researchers to study these usually-lost artefacts. The number of preserved Egyptian textiles is comparatively great, however, to those available from other regions, but it must be remembered that they represent a very small fraction of the output of ancient production. As well, the discovery contexts of ancient textiles are usually limited to the specific air-locked conditions of ancient tombs, which do not provide a comprehensive picture of their actual use in ancient Egypt.

3.1.1 Prehistoric Period

The oldest piece of fabric yet recovered in Egypt is a linen fragment discovered in a pit inside Silo 16 at 'Upper K', a Neolithic site in the Fayum (Caton-Thompson, Gardner 1934, 46, pl. XXVIII); recent microscopic analysis confirmed its identification as *L. usitatissimum* (Jones 2008, 105, figs. 1-2). The fibres within this fragment were prepared with great care, but its threads are coarse (with a diameter of 0.7 mm) and it was rather loosely spun; it is quite difficult to recognize the points at which it was twisted together, however it is recognizable as "S, 2z," that is, of a single z-twist yarn and S-plied. In total, this piece of fabric is rather rough and irregular, with 18x16 threads per square cm (Jones 2008, 107). Despite the appearance of flax at the beginning of ancient Egyptian textile history, other fibres were in use alongside it (Tata 1986, 25), and flax cultivation was limited until its implementation by the early Egyptian state.

The only other remains of Neolithic era textiles belong to the Badarian culture of Upper Egypt, after a considerable chronological hiatus from the remains at the Fayum site. The fabrics of the Badarian culture show a selvage preserved in several cases, which indicates that at this stage fabric was produced on a loom via the continuous passage of the weft through the shed from side to side, and then backwards. The weft typically remained 'open' and was not beaten tightly against the previous row. Many of the Badarian threads were twisted with a very tight s-twist and only occasionally did a single thread show a z-twist (Midgley 1928, 64-7). All fabrics were woven in some variation of a 'tabby weave': some are 'open-weave', some are densely woven and some show a combination of the two practices. Many fabrics of the Badarian period and some of the Predynastic period show a peculiarity already noticed at the time of discovery: the weft and the warp are not arranged perpendicularly, but often show significant discrepancies. For example, fabrics from Gerzeh (Wainwright 1912, 6) show angles in the weft that reach up to 20-40 degrees in relation to the warp (Brunton 1948, 23). According to Midgley (1927, 70) this is a precaution taken to prevent the edges from fraying. Whether it was purposely done or not, Predynastic fabrics from the Naqada III period onward show a perpendicular slant and a change in the ratio of weft and warp threads (from 1:1 to a ratio of 1:2 or even higher). It seems possible that between these two periods certain technical alterations might have occurred thus leading to these changes (Jones 2008, 113).

3.1.2 Predynastic Period

The practice of spinning of single threads in both s- and z-twist continued into the early stages of the Predynastic Period. Fabric remnants from the

tombs of Abydos show that z-twist spinning was also practiced throughout the Naqada I A-C periods. However, some textiles showing z-spun yarns may have been older or somewhat worn-out fabrics re-purposed for funerary use. The Naqada II period fabrics from Hierakonpolis show a combination of s- and z-threads within the same fabric (Jones 2001, 14). On the basis of other cloth finds from the tombs at this site, it appears that a transitional phase existed, which saw the practice of z-spinning give way entirely to the s-spinning, which remained typical of the rest of Egyptian history. This transitional phase should be located between the end of Naqada I and the beginning of Naqada II.

The fragment known as the 'Gebelein Fabric' painted with boats and 'dancers' and housed in the Museo Egizio (S. 17138) is difficult to date because its provenance is uncertain (Donadoni Roveri 1987, 198; Borla, Oliva 2015, 237). Based on its decoration, it is possible to attribute it to the Naqada IC-IIA period, as it exhibits s-spun threads and a fringe. At Adāima, fabrics from the necropolis of the Predynastic period (starting from Naqada IC) are all of s-twist manufacture (Jones 2008, 110). It therefore seems possible that by the beginning of the Naqada II phase the s-twist had become the dominant spinning technique, suggesting that the Egyptians already understood the advantages of following the natural direction of the flax fibre at this time (Jones 2008, 111). During the Predynastic period an increase in textile production seems to have occurred; likewise, a slight improvement in quality can be noticed. All the fabrics that remain from this period come from tombs and therefore give evidence for their marked use in funereal contexts; textiles were not only being used to wrap the corpse but also were clearly deposited as grave goods. Several of the known examples seem to have been specially produced for funerary use, with a decrease in the deposition of re-used textiles in burials (Tata 1986, 31).

The Predynastic textiles recovered from the sites of Qau and Badari are very similar to the older fabric remnants from the same sites (Midgley 1928, 64-7). The weft is open, not beaten, and often the threads do not lie exactly perpendicular to the warp. Most of the textiles from the site of Mostagedda are of tabby weave, and the appearance of these vary depending on the use of single or plied threads. In some cases, despite the same 'open' structure weave seen at other sites, some textiles from Mostagedda include quite thin threads (Brunton 1937, 92-3). In contrast, fabrics from Gerzeh and Mazguneh have a 'plain' weave structure but a warp/weft yarn ratio that is almost double these (Wainwright 1912, 6). At Armant, the textiles have an open structure and an unbeaten weft (Tata 1986, 33). It is only at this time that the first dual-coloured textiles appear, as evidenced by a fragment of white and brown wool fabric recovered from Deir el-Ballas (Petrie, Quibell 1896, 24, T26).

The important site of Tarkhan/Kafr Ammar, which dates to the Naqada III phase, or the end of the Predynastic period, has returned a large quan-

tity of fabrics, many of which are of the finest linen. The first true 'dress' (a complete, long garment) comes from this site, has sleeves, is made of linen, and still bears clear signs of pleated detail. The fabric from which it is made contains 22-23 threads per centimetre in the warp and 13-14 per centimetre in the weft (Tata 1986, 45). Mastaba 2050, although it had been plundered, still contained seventeen linen textile samples of various quality, the finest of these were composed of 80×20 threads per centimetre (Midgley 1915, 48-51). Midgley's analysis of 22 fabrics recovered from three mastabas in this necropolis demonstrated that 17 of these samples contained warp threads that had been plied, while in 12 examples the weft threads had also been plied. In three of the textile samples the weaver had used two threads coupled in the same shed (known as a 'basket weave') instead of using cabled threads. The direction of the twist for all the threads evidenced within the textile corpus from these three tombs was S twist.

The Predynastic period was therefore very important for the development of the spinning and weaving technologies of ancient Egypt, as it can be seen that during this period differing directions of yarn-twist were tried, in order to obtain at the most efficient result. Due to the results of these experiments, the quality of early Egyptian yarns and fabrics improved dramatically and, by the last phases of the Predynastic, fabrics as fine as those of Pharaonic-period production were being woven. Although the Naqada I-III periods are usually considered as 'precursors' to the later centralised regime, the technologies and textile-working ability that are known in the following periods can be seen to have been available during the formative phases of the ancient Egyptian state.

3.1.3 Protodynastic and Old Kingdom

Fabrics from the Protodynastic period are in evidence from the sites of Qau and Badari; they are made of simple tabby weave linen and are very similar to earlier Predynastic fabrics known from the same sites (Midgley 1927, 70-1). The peculiar technique of angular weft insertion (in relation to the warp) continues (Tata 1986, 46). From the Protodynastic period comes a unique woolen find: a piece of tabby weave fabric that had been wrapped around a male individual interred in a grave of the first dynasty of Helwan (Tata 1986, 49). The fabrics from Tarkhan (Midgley 1915, 48-51) and Saqqara are all of flax, while sites at the border of the Nile Valley continue to produce fabrics with vegetable fibres other than linen (Tata 1986, 49). The so-called 'Tomba di Ignoti' at Gebelein dates to the 5th Dynasty and has provided many fabrics used both to wrap mummies and for funeral offerings, as well as, remarkably, an inventory text written in hieratic, where textiles are also listed (Donadoni-Roveri 1987, 199; Borla, Oliva 2015, 237, fig. 302). The Gebelein textile corpus also included pleated and fringed

tunics with long sleeves formed from several specifically-cut pieces that demonstrate the high standards achieved in tailoring techniques by this time. In some cases, the tunics show traces of wear, while others seem to have been created specifically for funerary use.

3.1.4 Middle Kingdom

Fabrics dating to the 11th and 12th Dynasties seem to indicate a great homogeneity in the textile production of the Middle Kingdom (Tata 1986, 153). Individual fabrics do not show great differences, except for the distinction between the finest ones produced for the elite (with a very high sett of weft and warp threads) and those produced for the rest of the population. The type of weave created, however, remained substantially the same at all social levels, and there are no complicated techniques (such as additional weft threads) that would distinguish more expensive fabrics; the only factors that can be considered are the fibre quality and the set. Many fabrics have fringed edges, both those for the elite and for middle class people.

Many mummy cloths found in Thebes which date to the 11th Dynasty have been analysed and have confirmed this homogeneity (Braulik 1900, 40): they show a tabby weave with threads that vary from very regular to quite irregular. Only one of these cloths is weft-faced, with a larger number of weft threads as compared to the warp (21 warp × 46 weft per centimetre). The textiles of the Middle Kingdom are almost all without decorative motifs, except for an example that comes from a tomb of the 12th Dynasty at Deir el-Bahari. It has thin stripes and zig-zag motifs made by additional loops inserted into the weave. The decorative pattern is overall quite simple, but loop-weaving requires considerable skill, and it is interesting to notice that the first known example is so well-crafted (Tata 1986, 154). A second fabric with loop decoration comes from the same context and was entirely made by the technique of loop-weaving (Winlock 1932, 34-5). There are a few other examples of this technique preserved from the Middle Kingdom, such as a fabric found in the Warriors' Tomb of the reign of Mentuhotep and some fragments from Kerma, Sudan (Tata 1986, 155; Vogelsang-Eastwood 2000, 276).

3.1.5 New Kingdom

In the New Kingdom period, more elaborate fabrics began to appear, perhaps in direct relation to the introduction of the vertical loom in Egypt. Fabrics preserved from this period are decorated with different motifs and their yarn was dyed with a wide range of colours.

At the Workers Village at Amarna, however, only wool¹ and linen textiles with a tabby weave are present, although there are some that show slight variation from these, such as a few examples of 'basket weave'² technique (Vogelsang-Eastwood 2001, 94). Generally, woolen fabrics are made of thick threads and open weft, although there are also certain examples of finer work; woolen threads are always plied and are characterised by a single s-spun and a z-plyed (Vogelsang-Eastwood 2000, 145). Fringes are not present on any of the preserved woolen fabrics from the Workers Village, but certain fragments of linen cloth from this area do exhibit 'loop weaving', a method that seems to continue until the Late Period. As for thread sett, most of the Amarna fabrics have a higher ratio of warp than weft, and in many cases the ratio is 40 to 20. Sett can vary a lot between different fabrics some with up to 60 threads per centimetre and others with only 5 threads/cm.

An innovation of the New Kingdom is the 'tapestry weave', which uses the same setup as that of a normal fabric, the difference being that in normal weaving practice the weft thread runs from side to side (from one selvedge to the other), adding one row at a time, whereas in tapestry weaving the weft is passed only in a narrow part that produces only a small portion of fabric. The weft yarn is beaten until it completely covers the warp, which is no longer visible in the finished work. This type of weaving appears in ancient Egypt from the XVIII Dynasty onward, although preserved examples are rather rare. Most of them come from tombs, as do almost all fabric samples, in particular from royal tombs, such as that of Thutmose IV wherein was found a cloth with the cartouche of Amenhotep II woven into it (Vogelsang-Eastwood 2000, 275; Carter, Newberry 1904, 143-4).³ This remarkable piece is made with a z-plyed thread for the warp, while the weft is s-plyed. The thread sett is very high with 29 threads for the warp and 88 for the weft per square cm. Two other examples of tapestry weaving are stored at the Museo Egizio and come from the tomb of Kha at Deir el-Medina. These consist of two seat covers with floral decoration in brown, red, green and unbleached linen fibres; both have fringed edges.⁴ In addition to the tapestry technique, these two fabrics exhibit loop weaving on the reverse.

The richest collection of New Kingdom tapestry fabrics comes from the tomb of Tutankhamun, which contained several tunics that show this

1 Three textile samples from Amarna show a mixture of sheep and goat fibres (Kemp, Vogelsang-Eastwood 2001, 35-8).

2 Two threads of weft per two threads of warp.

3 The fabric may therefore be older and the technique used at least from the reign of Amenhotep II.

4 S. 08528, S. 08529. Schiaparelli 2007, fig. 114; Donadoni Roveri 1987, 204, 213.

technique, of which one was entirely created by tapestry weaving. Two other fragments of tapestry fabrics have been found in the King's Valley (Daressy 1902, 302-3); their precise provenance is unfortunately unknown. For this reason, their designation as New Kingdom period materials is in doubt, although their decorative motifs are quite similar to the other examples of this era.

An unique example of a 'double weave' is the famous Ramses III garland,⁵ the warp-faced ornamental motifs of which seem to be similar to the warp-faced ribbons with geometric patterns found in Tutankhamun's tomb (Tata 1986, 215).⁶

The techniques of embroidered decoration seem to begin with the New Kingdom. The first preserved example of this method is one of four textile fragments found in the tomb of Thutmose IV; it consists of a tabby weave fabric decorated with simple embroidery. The most well-known example comes again from Tutankhamun's tomb, where embroidered decoration is seen on the side-panels and cross-bands of a tunic. Barber (1982, 442-4)⁷ disagrees with the identification of these decorations as embroidery proper, and sees them rather as the result of a different method of weaving. Other small examples of embroidered elements⁸ appear on fabrics of the already mentioned tomb of Kha.

As well, the technique of dyeing fabric was known and had been employed sporadically since the Predynastic period, but in textile remains from the New Kingdom it appears more regularly and with a high degree of proficiency (Tata 1986, 221). Fabrics, which would otherwise remain pure white, were further elaborated in this period with beads, sequins, ribbons, fringes or even painted decoration.

3.1.6 Third Intermediate Period and Late Period

With the end of the New Kingdom, some of the innovations that characterised the weaving technology of this period seem to disappear, such as the decorated fabrics. The fabrics recovered from contexts of the Third Intermediate Period show a return to bleached linen, even if their quality

5 About which much has been written, including Johl (1924), Crowfoot, Roth (1923, 7-20), Barber (1991, 120-1) and Vogelsang-Eastwood (2001, 276) among others.

6 Many discussions have been held regarding the techniques used in their creation, but it seems clear that no tablet weaving technique had been used. See also Vogelsang-Eastwood 2000, 391.

7 Tata (1986, 219), in contrast, supports their identification as embroideries.

8 It is not a decoration, rather a property mark, which is embroidered in some of Kha textiles.

remained rather elevated. The few decorated fabrics, among which a linen scarf with blue motif may be seen, are all datable to the 22nd Dynasty (Tata 1986, 236).

To the period between the New Kingdom and the Third Intermediate Period belong the textiles from the Deir el-Bahari cache, which are today stored in the Museo Egizio (Borla, Oliva 2014, 85). These textiles are not associated with any inscriptions that would suggest a more precise date, although we can recognise two groups within them: the original cloths that were deposited with the mummified bodies in their first internments, and textiles used by priests of the 21st Dynasty to re-wrap the bodies when they moved them into the *cachette* at Deir el-Bahari. All of these fabrics are made of linen in tabby weave and many of them exhibit fringed edges. The thread used within them has an s-twist and appears in many cases with two or three plies, contrary to those stored at Leiden and coming from the same *cachette*, which have cabled threads only to strengthen the selvages (Van Rooji, Vogelsang-Eastwood 1994, 14). In many cases, these textiles show clear signs of having been cut from shrouds, as they are too large to be considered purpose-made bandages. Some fabrics show tailoring elements such as overlock stitching, embroideries, evidence of darnings and other marks that testify to their not having been produced for funerary use. Certain fragments are made of extremely fine linen dyed red; these are generally only seen in tombs of high-ranking persons. A fabric of double-weave, which has been dated between the 20th and 21st Dynasty, bears painted decoration consisting of a vertical strip of red-brown colour (Borla, Oliva 2014, 88:4).⁹

An embroidered textile was recovered from within the fourteen tunics wrapped around the body of a priestess of the 23rd Dynasty. The embroidery itself is seen around the neck and on the sleeves of one tunic; it was worked in blocks of red, purple (or blue) on natural linen (Vogelsang-Eastwood 2000, 280).

In the Late Period, the evidence for and studies of Egyptian fabric are more sporadic, but it seems that textile production continued as in the previous periods, although lacking the wealth and variety that had characterised the New Kingdom. With the end of the Late Period and the conquests of Alexander the Great, the advent of Greek and then Roman domination, new weaving production techniques and new materials arrived in Egypt, altering the system of textile production at a deep level. A major example of this change was the strong support given by the Ptolemaic (and later Roman) state for wool production, to the disadvantage of the native linen weaving industry (Mayer Thurman, Williams 1979, 36).

9 S. 1678.

3.2 Objects Connected with Textile Production

3.2.1 Hanks of Flax and Balls of Yarns

At many Egyptian sites, yarn gathered in hanks or wound into balls has been recovered. These are part of the extraordinary finds preserved in Egypt, where we are uniquely able to connect archaeological materials with all the phases of textile production. These unutilized pieces of yarn indicate that at least part of the yarn spun was not immediately used for weaving, but deposited and used later as needed. This yarn, which was put-by for use at another time, could have been used for sewing or darning, not just for weaving, or perhaps something else entirely, such as the knotting of fishing nets.

Small quantities of yarn were also found at Kahun/Lahun, dating to the end of the Middle Kingdom, c. 1850-1750 BC (Quirke 2003). In total, four hanks of flax and thirteen balls of linen yarn come from the site; the balls of yarn are slightly s-twisted and each wrapped around a core of waste fibres (Allgrove McDowell 1986, 221). Most of the yarn is of medium-fine quality, but there are also coarse threads in evidence, which, according to Petrie (1890, 28) would be thread for making nets. In at least one case this might be true (UC 7511): yarn wrapped around a pottery sherd is s-spun and z-plied, like the threads of the nets of the same site (Cartwright 1999, 101); however, sewing thread generally has the same structure. Fine linen has also been found at Kahun, as well as a net fragment made with very fine yarn. Threads were used both singly and two- or three-plied; occasionally one yarn can consist of up to 6 strands (Petrie 1890, 28). In two linen balls of yarn the splicing points have been recognised (Quirke 2003): they are about 5 cm long and approximately 35 cm apart from each other. Additionally, four other balls of yarns (UC 7510) show traces of splicing, as does another yarn wrapped around a sherd (UC 7421). UC 7510 is an example that shows a peculiar direction of splicing and plying, since in UC7510a threads are s-spliced and z-plied, while these directions are inverted in the other balls of yarn (Quirke 2003). All the wool samples found in Kahun have been confirmed as medieval and intrusive and therefore will not be discussed here (Cartwright 1999, 101).

From Gurob come seven balls of yarn that can be dated to the New Kingdom, with differing thicknesses of threads (0.1 mm to 0.5-1 mm). They were recovered from one or more houses of the town (UC 27882 i-iv) and are probably wrapped around tow (Thomas 1981, 39 nos. 85-8). In one case the thread is wound around a broken cane (UC 27883 iv) and another around a triangular pottery sherd (Kemp, Vogelsang-Eastwood 2001, 83). Two more hanks of fibres, probably also from houses, were found (UC 27883 i-ii) (Thomas 1981, 39 nos. 89-90).

From the Workers Village at Amarna no balls of yarn have yet been found, but 24 hanks of yarn have been identified (Kemp, Vogelsang-Eastwood 2001, 84-6). Not all of them are in good condition and only in some cases was it possible to determine the presence of plying, while in other cases the threads remain single.

From Lisht there are two balls of yarn that date to between the end of the New Kingdom and the onset of the Third Intermediate Period. The thread sizes vary remarkably within each ball of yarn, however both are s-twisted, thin and suitable for weaving (Kemp, Vogelsang-Eastwood 2001, 84-6).

3.2.2 Spindles and Spindle Whorls

With the discovery of two (a discoidal and a conical-with-convex-sides) limestone spindle whorls at the site of Kôm W in the Fayum (Caton-Thompson, Gardner 1934, 33, pl. XII), the production of spindle whorls is attested in the Egyptian Neolithic. Several further examples come from Badarian contexts (Brunton, Caton-Thompson 1928, 34). At the site of Naqada, globular, conical and spherical spindle whorls have been found (Petrie, Quibell 1896, 2, 26, 35), as well as certain objects similar to spindle whorls set along a rod with a dotted surface that may have been used as toys tomb-models (Petrie, Quibell 1896, 35). Other limestone spindle whorls and bone spatulae are attested from the town site at Naqada (Petrie, Quibell 1896, 54). A dozen clay spindle whorls have been found in a house of Naqada Phase IIA date at Hierakonpolis (HK11), meanwhile in Maadi were found 17 limestone spindle whorls dating to Naqada Phase II B (Jones 2008, 112).

From the worker's village of Fourth Dynasty Giza (Heit el-Ghurab) comes no great evidence of spinning and weaving activity, which is unsurprising since organic materials have rarely been preserved at this site. A dome-shaped spindle whorl of ceramic was recovered from there however, which suggests that spinning-related activities did take place at the site (Tavares 2004, 10).

Spindles of the Middle Kingdom and New Kingdom from the sites of Kahun and Gurob exhibit typological differences from each other, as Petrie noticed (Quirke 2003). The older form of spindle takes a large cylindrical spindle whorl (UC 7306ii), while the later examples from Gurob (UC 7809) consist of longer rods with smaller spindle whorls, the tip of which point to the top of the spindle. Both have grooves for fastening fibres towards the top of the spindle; while the groove attested on the Middle Kingdom example has a spiral shape, later versions bear simple incisions.

At Kahun, spindles are quite commonly recovered with dimensions ranging from 17.8 to 38.1 cm. They are characterised by very thick, nearly cylindrical wooden spindle whorls and a long spiral engraving for fasten-

ing the thread (Petrie 1890; Petrie 1917, 53 no. 140). From Kahun come also other types of spindle whorls, such as dome-shaped or conical spindle whorls made of limestone, bone or pottery (Petrie 1917, 53; Allgrove McDowell 1986, 214). Many spindle whorls show traces of mud or plaster, on which there may have been painted decoration (Allgrove McDowell 1986, 215).

Three spindles with spindle whorls still attached, 4 rods and 37 spindle whorls are known from the site of Gurob and are dated to the New Kingdom. The spindles are all made of wood and measure respectively: 24.8 cm in length and 0.3-0.4 cm in diameter (UC 7809), 24.5 cm in length and 1.0 cm in diameter (UC 7810), and 13.5 cm in length (UC 7814 i). At least two spindles still exhibit the groove that hooked the fibre, while it is not clear from the report if the third spindle is broken or complete. The spindle whorls inserted on the spindles are located near one end; the other end was formed to a point. In two cases the spindle whorls are dome shaped,¹⁰ one example is discoidal and all are made of wood. Four other wooden spindle rods from Gurob measure between 9 and 16.8 cm in length (not all are intact); one of them (UC 7812) is decorated with a herringbone pattern that might rather place it in the category of 'pins' (Thomas 1981, 38 no. 82). The first reported group of spindle whorls are 21 in number, they are dome-shaped and some of them show traces of painting. From a second group come 16 other spindle whorls (UC 7814), among these are 13 wooden spindle whorls of different sizes, 3 with part of the spindle still inserted through them and one spindle whorl consisting of two overlapping circular pieces where the spindle itself is still preserved for 4 cm in length. On the second piece basis there are some threads signs (Thomas 1981, 39 no. 84).

The Amarna New Kingdom spindles are made of wood, with one sharp end, and the other end engraved with a spiral, which follows the direction of the s-twist (Kemp, Vogelsang-Eastwood 2001, 266-7). There are no fully preserved examples. Until the New Kingdom, Egyptian spindle whorls mainly took cylindrical shapes and were placed at the top of the spindle. Some examples with domed or conical shape were found in Kahun, but it is only with the onset of the New Kingdom that dome-shaped or truncated-conical spindle whorls became frequent. At Amarna, the discoidal spindle whorls were generally made of wood, while other shapes were made of materials such as stone and terracotta.¹¹ The preservation conditions of the Workers Village are more favourable than those of the Main town (wood is

¹⁰ One of these spindle whorls is rather small, measuring only 2 cm in diameter and 1.5 cm in height (Thomas 1981, 38 nos. 80, 81, 83).

¹¹ Among the terracotta spindle whorls, those made from perforated pottery sherds should be included in the counts of objects, as seen in the previous chapter, but unfortunately, no further elements are provided in the publication.

often preserved in the Workers Village but rarely in the Main Town), which skews the data regarding wooden and stone spindle whorl distribution.

In the Workers' Village, where organic materials are better preserved, wooden spindle whorls are in a ratio of 30:1 as compared to those of other materials, and 100:1 if the spindle whorls made from ceramic fragments are excluded. The main shapes of wooden spindle whorls are cylindrical, more rarely dome shaped, and have an average hole diameter of 0.7-0.9 cm. Some have engraved marks on the surface. Data analysis concludes that spindles and spindle whorls were very common in the village of Amarna both inside and in proximity to the houses, although there is no regular distribution per house (Kemp, Vogelsang-Eastwood 2001, 278).

In the main city the situation appears to have been different, as most of the organic materials were lost. The diameter of individual spindle whorls varies from 18 mm to 81 mm, which is not surprising given the wide range of textiles that must have been produced, from ultra-fine linen yarns to wool and cordage (Kemp, Vogelsang-Eastwood 2001, 280). Some of the stone spindle whorls are made of alabaster and were originally recognised as loom weights. The study sample from the town, as considered by Kemp and Vogelsang-Eastwood, consists of 218 spindle whorls, excluding most of the perforated pottery sherds. It shows that the stone and wooden spindle whorls are almost equal in number, while far fewer examples are made of clay and pottery. A spindle whorl made of ivory was also present in the assemblage from the town. Most spindle whorls have a diameter between 4.5 cm and 5.5 cm, although wooden spindle whorls are, on the whole, larger than the stone examples. Interestingly, spindle whorls from the Workers Village are substantially smaller and lighter than those found in the city (Kemp, Vogelsang-Eastwood 2001, 289). Some spindle whorls bear elaborate surface decoration while others have only simple engravings of crossed lines on the upper side; however, none of them show the marks attested on examples from the Workers' Village.

At the site of Matmar, certain spinning-related objects have been recovered from houses in the area of the temple. This area dates to the Second Intermediate Period but saw its peak of occupation in the 19th dynasty. Amongst the objects recovered are spindle whorls made of stone (particularly limestone), some of which have the spindle rod still inserted through the hole. These spindle whorls are of cylindrical shape with a rather thick profile (Brunton 1948, 71 pl. LII). A conical spindle whorl with engraved floral motif and a lenticular whorl, both made of limestone, are also attested. Some fragments of wooden sticks found in this area may have been part of spindles, especially one example of a long rod with a rounded end (Brunton 1948, pl. LII: 68). From Kôm Rabi'a come 23 perforated

pottery sherds, most with a rounded shape and a central hole.¹² To these must be added a clay weight of discoidal shape (Giddy 1999, 200, pl. 42). These objects were recovered from various occupation levels of this site.

3.2.3 Parts of Looms

It was Petrie who first suggested the use of 'heddle jacks', items that served as the supports for the heddle-rod. They were placed near the warp in order to support the shed bar and open up the shed and could have been removed easily to close it (Winlock 1922, 71).¹³ Seven of these wooden objects have been found at Kahun: they are shaped to fit the heddle; four are relatively light while one example is made of heavy and hard wood. Although no ¹⁴C analysis has been performed on them, it is most likely that they date to the Middle Kingdom, the period of maximum growth for the settlement of Kahun (Cartwright 1999, 92). There are no known heddle jacks from New Kingdom settlements, such as Amarna, Deir el-Medina and Gurob, but four examples have been found at the site of Lisht (Hayes 1959, 218).¹⁴

Heddle supports are other loom-related objects, which take a flat shovel-shape and are pierced in the middle with a short pole which protrudes. They can be more rounded and nearly oval-shaped, and also their inner hole can vary between squared or rounded. Four of these objects have been discovered in Amarna, with quite standard dimensions: from 34 to 37 cm in length with a width from 13 to 16.5 cm. At the moment of discovery, some examples exhibited skin wrapped around their upper parts, and some had ropes carefully knotted around the ring and around the small pole (Kemp, Vogelsang-Eastwood 2001, 348-51). A wooden object similar to these has been recovered from Gurob and dates to New Kingdom (object UC 7926). It consists of a circular ring from which a wooden portion protrudes. According to Thomas it was likely fixed to the wall in order to support part of a loom (Thomas 1981, 39 no. 95).

Another type of object occasionally recovered from Egyptian sites are wooden bars. Three of these was recovered from Middle Kingdom-period Kahun, one of which might have served as one of the beams for a loom. It measures 157 cm in length and is 5.7 cm wide, with rounded ends near which there are deep grooves, probably for fastening the beam to the rest

12 Three examples from this group actually have two holes and should not be recognised as spindle-whorls.

13 The use of heddle jacks has been deduced from the wooden models, like those of Meket-Ra, where they are represented on the ground next to the heddles.

14 Their presence in New Kingdom levels might be a good clue that the horizontal ground loom continued to be used in this period and, thus, contemporaneously with the vertical two-beam loom.

of the loom (Griffith 1910, 11).¹⁵ Another long wooden bar that is variously thought to have been used as beam for a loom, or as a spacer for the production of mats, was found at Kahun and dates to the Middle Kingdom (Allgrove McDowell 1986, 228). It is 97.8 cm long and 8.2 cm wide (Petrie 1890, 28; Griffith 1910, 11; Johl 1924, 33). It exhibits 28 holes drilled through it, which are separated from each other by approximately 4 cm. The holes were originally of a round shape, but were altered over time through use. From the same context is also attested a long, flat wooden bar probably used to keep the reeds or fibres being woven in position, and which is 91.7 cm long and 6.5 cm wide.

Another long bar (1.063 m) recovered in five pieces from Gurob is triangular in cross-section and bears traces of wear from the friction of thread passing over it. It has been interpreted as a weaver's 'slay' or beater-in (tool used to beat the weft threads) and dates to the New Kingdom. A second object from Gurob (UC 7824) with grooves similar to the one just described, but only partially preserved, may have performed the same function (Quirke 2003). Another use for wooden bars could have been as 'shed sticks,' which were rather wide wooden bars used to open the shed on horizontal ground looms. An example with a triangular section is stored in the Cairo Museum and measures 66 cm in length. It shows clear signs of wear on its edges. It has one sharp end and the other shaped as a handle (Kemp, Vogelsang-Eastwood 2001, 351).

Weaving swords were used to pack the weft tightly together after a weft thread passed through the shed. However, the function of these objects is not entirely certain, as all the surviving examples are very short and seem different from those represented in the tomb models and paintings (Griffith 1910, 11)¹⁶. A possible example, which is complete except for its handle, comes from New Kingdom period Kahun (Quirke 2003, Petrie 1890, 28).¹⁷ Twelve other examples of possible weaving swords come from the Workers Village of Amarna and have (preserved) lengths from 18.5 cm to 32 cm. The distribution analysis that can be carried out at Amarna is interesting; however, as it shows how none of these supposed weaving swords come from a room where a loom was posited to have been located; this situation is opposite to that of spindle whorls, which are usually recovered from the same contexts as other textile tools (Kemp, Vogelsang-Eastwood 2001, 354).

A 'warp spacer' is another tool used in weaving, which has several grooves where a group of threads (not single threads) were inserted and carefully arranged. Warp spacers serve to keep warp threads at equal distances from each other; this is especially important when the whole

15 Manchester Museum 34.

16 Manchester Museum 36.

17 UC63630.

warp set is transferred onto the loom. After the transfer, the warp spacer can then be removed or left attached to the warp beam during weaving (Kemp, Vogelsang-Eastwood 2001, 346-7). A wooden warp spacer (UC 7807) dating to the new Kingdom was found at Gurob (Thomas 1981, 39-40). It has a flat base, curved sides and a rounded top. The rounded top part has been incised at an approximate depth of 1.5 millimetres at regular intervals of 6-8 millimetres. Unfortunately, it is not intact and the handle is broken away.¹⁸ Two other smaller spacers from Gurob were mentioned as photographed by Petrie (1917, 53, pl. XLVI), along with 3 additional fragmentary examples from the same site.¹⁹

Furthermore, few more examples of warp spacers are reported. A spacer is housed in the Cairo Museum, it still has its pointed end preserved and shows a triangular section. It is 21.4 cm long, 2.3 cm high and exhibits 44 incisions. A single spacer comes from Amarna, from the Workers Village. It preserves a flattened edge and a triangular section and it is 20.9 cm long, 2.4 cm high and 2.4 cm thick. It bears 33 incisions but there are no signs of wear from the friction of the thread (Kemp, Vogelsang-Eastwood 2001, 341). A spacer of rounded shape with a preserved edge was found at Lisht,²⁰ and an additional example was found within the remains of a Third Intermediate Period settlement built on the ruins of the pyramid of Neusera at Abusir (Johl 1924, 40). Two spacers are housed at the Neues Museum of Berlin, one of which preserves a tapering end (Johl 1924, 40, pl. III). All known warp spacers come from New Kingdom contexts and there is no evidence of their use during the Middle Kingdom, even if they can be employed in both vertical and horizontal looms.

In the category of loom supports, comes evidence from several houses in the Workmen's Village of Amarna. This evidence consists of many stone blocks, generally found in pairs, which were probably meant to support vertical looms.²¹ The blocks are made of limestone, and are squared and carved to hold horizontal poles. The carvings appear either about half-way along one side of the block, or as 'channels' that run from one side of the block to the other (Kemp, Vogelsang-Eastwood 2001, 374). Most of these loom supports were recovered from the front rooms of houses, but

18 The total length of this spacer is 57.8 cm, the width 2.4-2.7 cm, the depth 3-3.1 cm.

19 The other pieces are: 1) 17.5 cm long, 1.3 of high, with 26 incisions; 2) 37.7 cm long, 1.9 cm high, 1.4 cm thick with 92 incisions; 3) 33.9 cm long, 1.8 cm of high, 1.3 cm thick with 37 incisions; 4) a preserved edge with flat shape, 22.7 cm long, 2.9 cm of high, 2.8 cm wide with 24 incisions (Kemp, Vogelsang-Eastwood 2001, 341.6). These all remain uncatalogued at UCL (under the reference numbers 339.2, 339.3)

20 It measures 47.9 cm in length, 3.2 cm high, with a thickness of 2.5 cm; it preserves 40 incisions (Kemp, Vogelsang-Eastwood 2001, 344.8).

21 This is the theory followed by Kemp and Vogelsang-Eastwood, but rejected by Barber (1991, 88-9).

others come from other areas, such as rooms thought to be bedrooms or other lateral rooms. It seems that the front rooms of houses often hosted a variety of home-based activities, particularly textile creation, as many spinning and weaving tools come from these spaces. The identification of these stone blocks as loom supports is still doubted by some scholars, despite the fortunate *in situ* recovery of many such sets, alongside the wealth of information that Amarna provides.

Currently, it is not possible to reconstruct any evidence of weaving cards from ancient Egypt during the historical phases here examined. The only potential 'weaving card' of the Pharaonic age comes from Tell el-Amarna and it is really too large and thick to be considered as one of these tools (Kemp, Vogelsang-Eastwood 2001, 391). Furthermore, no textiles produced by the weaving card method seem to have survived from ancient Egypt, making the use of this tool highly uncertain before the Coptic period.

3.2.4 Needles

Despite the fact that tailoring and embroidery were not practiced at high levels in ancient Egypt, good quality needles made of different materials are commonly attested in the archaeological record. Copper needles were known since the Predynastic period, with certain examples coming from a burial context at Naqada (Petrie 1917, 53, 66-9, pl. LXV). Certain of these are pointed at both ends, which is a feature that did change over time. 18 copper needles have been recovered from the Worker's Village at Giza, which dates to the 4th Dynasty; they prove that darning and fabric finishing were widely practiced at this site.

Copper and bone netting needles are attested at Kahun but bronze sewing needles are also present, varying in size from 10 to 15 cm (Petrie 1917, 53).²² Wooden bodkins are also known, which have larger holes than needles and were used to insert ribbons or tapes (Petrie 1890, 28, pl. IX: 27). A bone needle case was also found at this site, which still contained a copper needle and a wooden pin or bodkin.²³ The needle case was wrapped in reeds and fabric and the copper needle still had the linen thread inserted through its eye. Two wooden netting needles were also found at Kahun, one of which (UC28273) still had the thread wound around it. It is however, probably an artifact of later date, perhaps from the Coptic or Islamic eras (Cartwright 1999, 101).

22 31 examples of needles in total from Kahun.

23 Manchester Museum 97; Griffith 1910, 18; Allgrove McDowell 1986, 221; Petrie 1917, 53, pl. LXV.

The site of Gurob brought forth 10 complete bronze needles (as well as 56 needle fragments) and two bodkins, one made of bone and one made of wood (Petrie 1890, 34; 1917, 53, nos. 81-4, pl. LXV). There is also a netting needle (UC 7806)²⁴ and several wooden bodkins attested from Gurob, however, these are not associated with any datable material (Petrie 1917, 53, nos. 118-22, pl. XLVI). Bone spatulae are sometimes confused with netting needles, but these will be discussed in the section dedicated to them below.

A very large number of objects that should probably be identified as needles come from the Amarna excavations of the '20s and '30s. A total of 80 such objects have been reported, with lengths ranging from 4.8 cm to 12.3 cm, but most measure between 8.5 and 11.8 mm. Another 31 bronze needles were analysed by Kemp, who showed that they were different types of tools (Kemp, Vogelsang-Eastwood 2001, 182-3). Only a few examples of these needles are complete and have the eye preserved. One of them has the square top and a small eye, while the others have a flat top that allows for a larger eye. All intact needles are circular in section, which suggests that those with a square section may have been other tools, such as borers (180).²⁵ Amarna also brought forth a wooden netting needle, cylindrical in shape with two deep carvings that run the length of its shaft, with sharp ends. According to the authors (183) this example is too short to have been used for weaving; therefore, they agree with its identification as a netting needle, while not excluding that such tools in larger sizes may have been fixed to the edges of wooden bars and used as weaving bobbins.

Three large metal needles or bodkins, their 'eyes' created by folding over the metal, come from Kôm Rabi'a (Giddy 1999, 178, pl. 38). Six smaller needles were preserved (two of these could be considered bodkins) as well as twelve fragmentary objects that cannot be identified with certainty as needles or pins. These are all made of copper alloy, now highly corroded. Fishing hooks are also attested from this site, giving evidence that both industries, textile production and fishing, were present at this site, as will be discussed later.

3.2.5 Bone Spatulae and Other Tools

The spatulae discussed in this section are flat bone objects with a pointed end and a polished surface. Some wooden spatulae of similar shape (and perhaps function) have also survived, as three examples kept at the Neues Museum of Berlin show (Kemp, Vogelsang-Eastwood 2001, 358). Bone

²⁴ Petrie 1890, 34; 1917, 53 with examples from Kahun and Gurob. See also Quirke 2003.

²⁵ For example, borers for leather-working.

spatulae are generally recognized as textile production tools, such as pin-beaters for example, but other interpretations such as netting needles or cosmetic tools have been suggested. Almost all spatulae come from domestic contexts that can be dated to the New Kingdom, but the first examples are attested from the Predynastic Period (Petrie, Quibell 1896, 54). The continuity of their manufacture is proven by the publication of some examples from the Worker's Village of Giza, which consist of bone spatulae with rounded or flat edges as well as some pointed tools with traces of wear that should perhaps be categorized as pin-beaters (Tavares 2004, 10).

Thomas defines the Gurob spatulae as "netting needles" (Thomas 1981, 41-3, nos. 123-65, pl. 7),²⁶ but for the sake of consistency with other similar materials coming from other contexts they will be discussed here. These are 43 bone spatulae (only some of them are illustrated in the site report), in many cases they show wear traces at their pointed end due to the threads moving over them. The shapes are quite varied, but several examples of each type are attested, usually with one sharp end and the other left wide, but rounded. None of these objects has been pierced through. One example from Gurob is made of wood (UC 7713) and it is highly polished.

Twenty bone spatulae of different shapes (although usually flat with one pointed end and the other rounded) come from Kôm Rabi'a (Giddy 1999, 162-3, pls. 35, 87). Their profile can be straight, but it is usually rounded, and often the shape depends on the bone from which it is obtained. In the report, they are called spatulae for weaving or net production. The size varies from 6 to 16 cm in length. Most of the examples from Kôm Rabi'a come from layers attributable to the second half of the 18th Dynasty and the early Ramesside period. A single spatula comes from the previous New Kingdom level, but its particular context contains intrusive materials from later periods (Giddy 1999, 163). The wear and signs of smoothing on the surface of these bone spatulae are highly compatible with the production of woven textiles such as nets or fabric. Signs of wear are located along both the edges and along the narrower part of the spatula, near the rounded end.

Bone spatulae from Amarna are understood by Vogelsang-Eastwood (Kemp, Vogelsang-Eastwood 2001, 358) rather as 'pin-beaters', a category of sharp objects that served to fix small knots or weaving errors. It can be difficult to ascertain for certain which objects were indeed used as pin-beaters, because theoretically any sharply-tipped object would have been usable as such. It is therefore possible that bone spatulae associated with textile (or net) remains or production contexts were used as pin-beaters. A total of 156 objects were catalogued as matching this description, many of which are unfortunately broken. In most cases, they were taken from

26 As well as Petrie (1917, 53, nos. 128-9).

the ribs of animals, which gave them a curved appearance with the inner trabecular structure visible. Most of the intact samples measure between 6.5 and 13.1 cm in length, (the smallest example is 4.8 cm long and the longest example is 18.2 cm) and are highly polished (Kemp, Vogelsang-Eastwood 2001, 368).

The Amarna spatulae/pin-beaters also have a long, flat shape with one sharp end and a flat or rounded end; in one case, an object is attested bearing a tip on both sides. Some have an end which protrudes in a way remarkably similar to a pen-nib. All of the Amarna objects show remarkable signs of wear both on the end which bears the tip, along their sides, and sometimes also on the flat surface; the direction of these wear marks however, is anything but uniform. Using a Scanning Electron Microscope for a deeper analysis of wear signs and superficial smoothing revealed the wear marks to be really deep and thin, more compatible with extended contact with a soft surface than with a one-time effort to smooth the surface (Kemp, Vogelsang-Eastwood 2001, 370). According to Vogelsang-Eastwood the Amarna bone spatulae cannot be considered as netting needles as they are not pierced and are not able to manipulate thread in order to weave nets (Kemp, Vogelsang-Eastwood 2001, 372).

Bone spatulae are known from many other sites. Bone objects with one sharp end, as well as a few other bone implements which were likely related to the weaving process come from Matmar (Brunton 1948, 71, pl. LII). Some beautiful examples of bone spatulae with rounded edges and thin, concave profiles were also found at Buhen (Emery 1979, pl. 42).

3.2.6 Net Weights and Loom Weights

As seen in the previous chapter, loom weights were used to keep the warp in tension on a particular kind of warp-weighted loom, which has never been represented in Egypt and whose absence is supposed until the Ptolemaic Period. The horizontal ground loom and the vertical two-beam loom are, however, very well attested in Egypt. If we did not have access to the iconographic documentation for Egypt, which we do have, would the situation be the same? Would we have interpreted the archaeological evidence for textile work in the same way as it has been up to now or would there have been some differences?

The problem, as it relates to the warp-weighted loom, is that we require confirmation of its existence through material certainly attributable to it, preferably without any possible ambiguities. It would seem that in Egypt, such a loom has never existed, however, the large amount of evidence for the warp-weighted loom across the Near East and the Aegean makes us anything but certain. One of the great ambiguities relates to the fact that a stone or terracotta weight may have functioned as a counterweight and

not as a loom weight. Furthermore, even when groups of weights are found together, which is one of the most convincing contexts for recognising the presence of a loom, one could argue that these weights were originally attached to a net. It is still not possible to assert with certainty that the warp-weighted loom was actually in use in Pharaonic Egypt, but excluding any prejudice, the Egyptian evidence does include many weights similar to those found at Levantine sites. Perhaps it is best to say that nothing prevents these objects from having been used as both net weights and loom weights.

Mace (1922, 75) highlighted this issue early on, supporting the idea that loom weights were not at all rare objects in Egypt, and he actually identified dozens of weights, manufactured in clay or stone, at the site of Lisht. The shapes of the Lisht weights easily recall the classic Levantine forms, with conical, bell and discoidal shapes. One weight made of unbaked clay comes from Kahun, and Hall noted that it come from one house with other 'Aegean' materials, and related its presence to that of foreign people (Mace 1922, 75). The site of Kahun, however, has also preserved many nets and – as the written documents indicate that fishing was a major activity at the site – these weights may relate to the fishing industry instead (Cartwright 1999, 100).

Various weights of two types come from Matmar. The first consists of a long cylinder with some incisions towards the ends, the second one is flat with a rounded profile and two through-holes placed towards the upper part. From the photos in the site report, it is also possible to recognise a bell-shaped weight with a horizontal hole passing through it. Most of these weights are made of terracotta, one is made of limestone and five are of unbaked clay (Brunton 1948, 71, pl. LII).

Three types of weights have been recognised at Elephantine. The first one is a baked-clay weight of semi-circular shape: this weight has in fact been flattened; one side remains rounded while the other is straight. It has two holes passing through the flat end, on which there is also an incision useful for fixing to a net. Of this type, 54 examples have been found, with median dimensions of $6.7 \times 4.8 \times 2.4$ cm and a mean weight of 67.4 g (the lightest is 15 g, the heaviest 293 g) (Von Pilgrim 1996, 275, fig. 120). The second type of weight takes a bell-shape and is pierced on the thinner end. In this case as well there is an incision on the upper rim.²⁷ Eight examples of this second type have been found, 6 of which come from a single context, and they weigh 94.6 g on average (with a min. of 41 g and a max. of 125 g). The third type is represented by cylindrical stone weights with one central incision or two lateral incisions parallel to the base of the cylinder. A single example of this type is attested at Elephantine (Von

²⁷ The discoidal Aegean-type weights also have an upper incision, the function of which has been discussed for a long time. If the incision was only useful to attach fishing nets (it is not useful in the case of a loom), should it be necessary to call into question the use of this Aegean type of weights as well?

Pilgrim 1996, 276, fig. 121). The last identified type shows a rather different morphology (conical or flat) and is characterised by the fact that it can be made from reused ceramic fragments, even those of large dimensions. Although this type varies in shape, almost all examples show some incisions useful for fixing a net (Von Pilgrim 1996, 278, fig. 121). Fishing activity is well-documented at Elephantine, but weaving activity, however, is not. One building (H84) in particular has returned various net weights and other tools related to fishing activity.

From Kôm Rabi'a come 27 weights made of stone and copper alloy and 23 pierced and reused pottery fragments. These re-used sherds have been identified as counterweights by certain scholars, but are discussed in this work as spindle-whorls (Giddy 1999, 193). Most of them are rather rough, especially the pear-shaped horizontally-pierced weights. This category is difficult to recognise as net weights, as they could have been used for many other purposes. Approximately half of the weights are pierced, made of limestone and pear-shaped (Giddy 1999, 195-7, pls. 39-41, 88). Another limestone weight of semi-circular shape with two holes has been identified as net weight. The other weights present at Kôm Rabi'a are considered as weights used in order to weigh goods. The pear-shaped weights are all of Late period. The presence of a spinning bowl and ceramic fragments reused as spindle whorls makes clear that textile production was practiced in this site, but this does not prove that the warp-weighted loom was in use.

From the fortress of Buhen come various objects identifiable as weights. The site has a wide selection of the objects of daily life, generally coming from superficial layers and not from stratified contexts (Emery et al. 1979, 113). The author of the site report interprets these objects as net weights, construction tools (i.e. plumb bobs), or even as weapons. He excludes their usage as loom weights following the idea that the staff of the fortress may have received fabrics and garments as commission.²⁸ The horizontal pierced weights (Emery et al. 1979, 113, pl. 40) are of limestone and are bell-shaped or conical; there is also one bell-shaped weight in clay. There are some unpierced pear-shaped weights with horizontal incisions in their upper parts; these are made of clay, mud and limestone.²⁹ More widespread was the production of a series of objects of various shapes: pear-shaped, ovoid, or trapeze-shaped with deep incisions across their surfaces (Emery 1979, 114-15, pls. 40-41); these are made of sandstone, limestone or baked clay and can probably be recognised as net weights.

²⁸ However, the Deir el-Medina example, discussed in the following chapter, indicates that spinning and weaving activities might be performed also in sites where deliveries of textiles are attested.

²⁹ Two examples of these show excessive dimensions, and are more than 35 cm in length.

Other weights from Buhen, particularly those in unbaked clay, were surely not used for fishing and could have been used as loom weights. No spindles or spindle whorls come from the fortress, however, numerous pierced discs made of clay and terracotta do, some of which were made from reused ceramic fragments and could have been used as spindle whorls (Emery 1979, 109-11, pl. 39). Furthermore, purpose-made ceramic spools (similar to the Levantine spools) and some bone spatulae are attested at the fortress (Emery 1979, pl. 42). These objects, however, are of difficult interpretation and their usage in textile contexts is uncertain, therefore it is not possible to confirm that textile production occurred at the site of Buhen.

At Amarna, a few similar weights have emerged. Two of the weights are naturally perforated pebbles with some thread still wrapped around them, but it is difficult to determine whether these were weights or counterweights. Two other types of weights, one made of clay formed into a cylinder and perforated, the other made of limestone or sandstone with engraved lines crossing the surface, seem difficult to relate to looms due to their quite low weights (Kemp, Vogelsang-Eastwood 2001, 394). The suggestion of Vogelsang-Eastwood, that some weights could have been used with the two-beam vertical loom in order to vary the tension of the free warp threads, remains interesting. Johl (1924, 49, figs. 33, 57) has reported the use of a couple of weights along with the warp-spacer, in his model of vertical two-beam loom, but weights could also be used to control the tension of the warp beam (Kemp, Vogelsang-Eastwood 2001, 393).

A recent article by Jarmuzek (2010, 17-21) returned to this topic by publishing some weights found at the site of Tell el Retaba in the Wadi Tumilat, which date to the 21st-22nd Dynasties. Sixteen weights were reported, of different shapes, sizes and materials; these are divided into 5 types.³⁰ The first 4 types are composed of limestone and identified by the author as net weights; only the last type, consisting of two weights of unbaked clay (which could not have been used in water), is considered loom weights. Type 4, or pyramidal weights (Jarmuzek 2010, 20) are identified as loom weights in other areas of the Middle East, but iconographic evidence from Egypt, for example, a model from the tomb of Meket-Ra, shows similar weights being used in connection with fishing nets.

Another type of weight (Type 3) as defined by Jarmuzek (2010, 20) takes a cylindrical shape and corresponds exactly with a weight kept at the Manchester Museum to which part of a net is still attached. Many weights with an upper incision (Type 2) were found in one place at Tell el Retaba, along with a donut-shaped clay weight (Type 5) (Jarmuzek 2010, 18); such weights are attested across the Near East, especially in the prehistoric

30 These weights vary from 35 g to 450 g, but the weight is not provided for all objects.

periods and are not typically associated with the warp-weighted loom. In this case the author considers them as net weights, but their association with a clay weight raises some questions. Is it possible that the weights from Tell el Retaba were part of a single batch and they were actually being used on a loom? It could be that most were net-weights and that the presence of a clay weight is a coincidence. A similar batch of weights in an archaeological context outside Egypt would have been interpreted as a certain proof that textile activities were performed with the aid of a warp-weighted loom. That should always remind us to be very cautious when interpreting the evidence given by such tools, which could have been used for different purposes.

At the current moment, many questions cannot be answered definitively, but a deeper study of the textile-related finds from Egypt might be able to better highlight contexts, associations, distribution, quantities and other elements that indicate the presence (or clarify the absence) of the warp-weighted loom in Egypt. A thorough study of the styles and functional types of net-weights is desirable; to clarify exactly which aspects of their design made them more functional for fishing than for weaving, although it seems possible that certain types of weights could have been used for both activities. Even if the evidence is rather scant, perhaps due to choices made during publication, it is possible that the Egyptians knew of and used the warp-weighted loom in a minor way.

3.3 Iconographic Evidence

One advantage of studying the textile production of Ancient Egypt is the preservation of paintings and funerary models that reproduce almost all stages of textile production, from flax harvesting to actual weaving. Despite the schematic methods of representation and artistic conventions, these objects represent a unique and invaluable source of information. The first depiction of a loom appears in the Neolithic on a bowl discovered in a tomb at el-Badari in Middle Egypt. The loom is located at the bottom of the bowl and it seems to be horizontal, with part of the fabric or mat already produced and horizontal bars that could be interpreted as heddles. On the side of the bowl, vertical poles and two standing figures are represented, usually interpreted as figures preparing the warp for the loom (Cortes 2011, 94). The earliest representations of flax harvest began to appear from the Old Kingdom onwards and remained common throughout the Middle and New Kingdoms.³¹ During the Middle Kingdom, painted scenes of fibre preparation, spinning and weaving occur on tombs' walls, as well

31 For a wider examination of flax harvest scenes and their social value see Tata (1986, 55-96).

as wooden models, for which a comprehensive bibliography is available: therefore these will be here only briefly described.³²

3.3.1 Middle Kingdom Tomb Paintings

- Tomb of Khety from Beni Hasan, 11th Dynasty: various spinning activities, nets and fabric preparation are represented. Starting from the top, in the second register, six male figures appear, of which three are spinning, each one in a different way. The figure on the left is standing and spins from a ball of yarn on the floor, holding the fibres with his left hand. The figure in the middle is sitting and spins using a bowl, also holding the fibres in his left hand. The third figure sits and spins from a bowl, but this time the thread is suspended on a vertical rod with forked edge. The fourth figure on the right is probably weaving a net, helped by a fifth figure placed in front of him. Behind them, a man weaves a mat. In the inferior register, starting from the left side, there are figures engaged in an unclear activity, but it is likely, that they are preparing the fibres as in the tomb of Daga. The first figure on the left is a woman, crouched down, supplying a bowl with yarn; three spinners stand beside her, one man and two women, each with a couple of spindles and two yarns emerging from a bowl placed on the floor. On the right, three women are probably working on a horizontal loom, which is not preserved but can be speculated on the basis of the similarity with other groups of four women who work on horizontal looms (Newberry, Fraser 1893b, pl. XIII).
- Tomb of Baqt from Beni Hasan, 11th Dynasty: contains a representation similar to that on the tomb of Khety at the same site. Three spinners who use the same techniques seen previously are depicted, as well as a fourth man weaving a net. On the other side of the tomb, two men are preparing balls of yarn. In the inferior register (better preserved than in the tomb of Khety) there is a woman passing fibres between two wooden rods and three figures that seem to be splicing using a trapeze-shaped support or their thighs. Next to these women, a child and two women are spinning, each one with two spindles and a thread, which runs through two bowls on the floor in front of them. Other three women are visible working on a horizontal loom on which some bands are painted. The last four women work on a unique large and smooth loom with a pointed end end (Newberry 1893b, pl. IV).
- Tomb of Khnumhotep (tomb no. 2) from Beni Hasan, 12th Dynasty: in the penultimate register is shown a spinner with a spindle and two

32 Tata 1986; Barber 1991; Vogelsang-Eastwood 2001.

threads coming out from two different bowls placed in front of him; he was once probably helped by a woman crouched down. Other two women, crouched down, work on a horizontal loom (Newberry 1893b, pl. XI).

- Tomb of Djehutyhotep from el-Bersheh, 12th Dynasty: various stages of fibre preparation, spinning and weaving are here represented. In the register on the left, two crouched female figures are engaged in producing thread from which the large ball of yarn opposite them was composed. One of them seems to carry the thread to her mouth and this can be interpreted as an attestation of using saliva to aid in the splicing. In front of each of these figures is placed a bowl from which a thread comes out and is spun by two nearby spinners, one of which stands on a platform. The figures on the right could also be engaged in preparing fibres for spinning, as once again a figure is crouched down in front of a bowl with a spinner standing behind. A woman comes after this and is engaged in stretching out the threads on a three-poled warper fixed to the wall. The last figure, unfortunately incomplete, is crouched down towards an indefinable structure. In the inferior register, on the left, two crouched figures are engaged in pulling threads out from what it seems a case containing various organised balls of yarn. On the right two figures are transferring the warp from the warper fixed on the wall (Newberry 1894, 34-8, pls. XXIV, XXVI).
- Tomb of Daga from Thebes, 11th Dynasty: the painting is in bad condition, but it shows the entire process of fibre production. The description goes from left to right and from the bottom to the top. Down on the left a crouched female figure is passing the fibres through a small rod, likely to remove the residual bark, while on the right another crouched female figure seems to be splicing on her thigh. A third figure is manipulating fibres with her arms stretched in front of her, perhaps using a different system of splicing, while a fourth provides the right quantity of fibre to the bowl for spinning. The spinner on the right is represented with two spindles; the first spindle is rolled on her thigh, while the second one is held in her left hand. The thread comes out from a spinning bowl that is placed behind the spinner. On the upper register appears a warper made of two sets of vertical poles with a standing figure working on it. On the right, a horizontal loom is represented, with two crouched women weaving on it (Davies 1913, 34-5, pl. XXXVII).
- Tomb of Sarenput I from Elephantine, 12th Dynasty: on the left, a crouching female figure prepares the yarn, probably by splicing. Next to her, two spinners appear, unfortunately now incomplete, each one engaged in spinning from two bowls, from which a thread comes out. In the lower register, two women are working on a large horizontal loom (Müller 1940, 47-8, fig. 24).

3.3.2 Middle Kingdom Funerary Models

- Meket-Ra (H) from Thebes, 11th Dynasty: a painted and intact funerary model of a spinning and weaving workshop of the Middle Kingdom. Within the workshop, eleven female figures performing all activities related to weaving are represented. Three women appear crouched down on the floor while preparing, on semi-domed supports, the thread for the spinners.³³ The spinners, again three, each have two spindles and pull the thread from bowls, closed on the top except for a hole to let the thread pass through. Once the spindles are full they are given to the two women who prepare the warp on three poles fixed to the wall. In the workshop, there are two horizontal looms, a larger one on which two women work and a smaller one used by a single woman (Winlock 1955, 29-33, pls. 26, 27, 66, 67).
- Gemniemhet from Saqqara, 11th Dynasty: eleven workers are engaged in this model. Two crouched women prepare rough fibres for three women standing and spinning, very similar to those of Meket-Ra's model. Two other women are placed at the opposite angle and are engaged in preparing and spinning fibres. The two horizontal looms are placed to the two extremities of the room, each one used by two women (Firth, Battiscombe 1926, 53, pl. 31c).
- Model from Girgeh, 12th Dynasty: much smaller than the previous model, it shows a woman preparing the warp on two pairs of vertical poles. The model is rather fragmentary and shows four other female figures and two bowls. This artefact has been subject to restorative measures, which have restored part of the original layout but have also compromised its interpretation (Vogelsang-Eastwood 2000, 319-22).
- Usernekhbet from Saqqara, 11th Dynasty: the model shows five female figures. When it was discovered, the weaving tools were scattered across the workshop floor. There are, however, two women engaged in the preparation of fibres in front of a bowl, a woman with two spindles assigned to the task of spinning, and two other female figures crouched down around what remains of a horizontal loom (Quibell, Hayter 1927, 42-3, pl. XXVI; Vogelsang-Eastwood 2001, 325).
- No. 575 from Beni Hasan, 11-12th Dynasties: unlike in other models, the building is not represented here, but only the human figures and their tools have been carved. Close to the edge, there is a spinner with two spindles and a spinning bowl at her back. The spinner is modelled larger than the other two weavers behind her, crouched down around a horizontal ground loom (Garstang 1907, 132-3; Tata 1986, 136-8).

³³ According to the interpretation of Kemp and Vogelsang-Eastwood (Kemp, Vogelsang-Eastwood 2001, 72) who see them like fibres to be prepared.

3.3.3 New Kingdom Tomb Paintings

- Tomb of Djehutinefer from Thebes, 18th Dynasty: in the upper left two figures are represented; they are scutching the fibres by making them pass through two wooden rods. Lower, two other figures are preparing a bowl of yarn. The larger figure in the middle is engaged in spinning from two spindles hung from two rings, with the threads coming out of a bowl. On the right two vertical two-beam looms are represented. Beside the first one on the left, which is larger than the other, two male figures are sitting and weaving from the bottom to the top, while at the other loom on the right, only one male figure works (Davies 1929, fig. 1a)
- Tomb of Neferhotep from Thebes, 18th Dynasty: from the tomb of Neferhotep, unfortunately badly preserved, there are two vertical two-beam looms on which two male figures (one on each loom) are working. The looms are rather similar to those of the tomb of Djehutinefer, except for the loom supports, which seem to be on fixed platforms, while in the previous one were made of truncated conical elements (Davies 1933, 1: 38, pls. XLIX, LX).
- Tomb of Neferrenpet from Thebes, 19th Dynasty: from this tomb comes the representation of two vertical V warpers with two standing figures working on each. Furthermore, four aligned vertical two-beam looms are represented. On three of these one worker is engaged, while on the other one two workers are engaged. Four of these are men, while one is a woman (Davies 1948, 49-51, pl. LI).
- The last spinning scene is represented on a limestone ostrakon from Deir el-Medina, where there are two spindles suspended by rings and two hands engaged in twisting the spindle. The threads seem to come out of a bowl situated in front of the spinner (Vandier d'Abbadie 1937, 93/94/EEC LXIV).

