

## CHAPTER 9

## PRELIMINARY REPORT ON THE AMARNA BASKETRY AND CORDAGE

by

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**9.1 Introduction**

Conditions at the Workmen's Village were particularly favourable for the preservation of organic remains, with the result that the expedition's magazine at Amarna now houses important collections of several categories, amongst them basketry and cordage. The 1987 season saw the beginning of a detailed study of the basketry and cordage, of which this is a preliminary account, based on approximately one third of the stored material.

The investigation of this particular branch of archaeology has not hitherto been extensive, with the result that the small amount of literature on the subject of basketry shows no consistency in terminology, whilst the even smaller amount of literature on cordage lacks definitions and descriptions of methods altogether. Thus it seemed sensible to start this preliminary report with a section on methods, which includes a corpus of definitions. The definitions and explanations associated with basketry and cordage are returned to in the third section, in order to prevent unnecessary turning of pages. The second section is basically an account of the recording, identification, cleaning, first aid conservation, and storage of the objects; the third section offers a quantitative view of the material and a survey of types of basketry and cordage found at Amarna. In addition, this section highlights a number of special objects and techniques.

**9.2.0 Definitions and methods**

An attempt has been made to develop a classification and a set of definitions which does not try to include the whole area of cordage and basketry techniques, but which is workable and convenient for application in the field.

**9.2.1.1 Definition of cordage:** all vegetable fibres which are worked into long cylindrical strands by all possible techniques as well as products obtained by knotting such strands. This definition includes techniques such as plaiting, lucet-knitting, and cylindrical weaving. It also includes all forms of netting, needle binding, and objects in which knots play an important role (hobbles for animals, etc.).

**9.2.1.2 Definition of basketry:** all objects made out of worked vegetable fibre, with the exception of textiles. This definition of "basketry" is much more general than a definition of "baskets" as it includes baskets, bags, mats, sandals, rings, brushes, and all other objects made out of vegetable fibres, regardless of the technique. Basketry, in fact, is an area of study which complements that of the textile archaeologist. It is, therefore, of the utmost importance to draw the line between textiles and basketry. This element of classification can be enhanced by utilising a basketry terminology that is linked to modern basket makers' terms whenever possible and is clearly distinct from the textile terminology.

In order to make the distinction between textiles and basketry it is necessary to take into account material, technique, and use. The material from which textiles have been made is in general more flexible and softer than the material used in the production of basketry. This is probably the only clear difference between textiles and basketry as far as the material is concerned. There is no such thing as a "typical textile plant", as can be seen from the fact that *Linum usitatissimum*, which is used for textiles, is also used for strings and bags and also from the fact that the retting procedure to obtain a supple structure in which ideally only the

*sklerenchyma* of the plant remains is not only applied to flax, but also to grass and the shaft-fibres of the date palm (*Phoenix dactylifera*), both of which are only used in basketry.

As far as technique is concerned, the weaving patterns of textiles are often quite complicated, but a simple tabby or twill weave occurs both in textiles and in baskets or mats. Some mats have very complicated weaving patterns indeed, yet they are not considered to be textiles because of the type of material used. Technique alone, therefore, cannot be considered to be the discriminating factor. A third important criterion is the use to which an object was put. Basketry and textiles have their specific uses, but again it is not always easy to draw a line between them. A jute bag, for example, is usually considered to be a textile, but a bag made out of woven rope belongs to the basketry department. Clothes are made of textiles; sandals, rope belts, and reed hats are normally classed as basketry, yet are also considered as part of costume. In short, one can say that the difference between basketry and textiles is determined by a combination of material, technique, and use which is still somewhat arbitrary and which requires development towards greater precision.

Three main types of basketry are to be distinguished in the ancient Egyptian basketry corpus: coiled, twined, and plaited.

*Coiling* is the technique in which a passive coiled horizontal member, called the *bundle*, is tied or sewn by an active vertical member, called the *winder*. In general the bundle is made out of grass; the winders often consist of palm leaf.

*Twining* is the technique in which a vertical passive member, called the *stake*, is interwoven by a horizontal active member, called the *weaver*. The terms “stake” and “weaver” are also applicable to flexible passive vertical members or rigid active horizontal members. This definition of twined basketry includes the technique, classed separately by Crowfoot and Forbes, as “matting” (Crowfoot 1956: 417; Forbes 1964: 181).

*Plaiting* is the technique in which two or more equally active members have the same importance in the process of working up. The result is either an object of any size or long ribbon-like shapes which can be sewn together.

In the definitions above the terms “horizontal” and “vertical” as well as the terms “active” and “passive” are used as seen from the point of view of the person producing the objects.

#### 9.2.2.1 Recording

The material was recorded on several different forms, each adapted to a specific type of material, according to differences in technique. Thus six types of forms have been used to record: cordage, netting, twined basketry, coiled basketry, plaited basketry and other objects. The basketry forms have been based mainly on those Adovasio proposes, but with considerable changes (Adovasio 1977: 21–24, 54–57, 100–103). The most essential information from the individual forms was subsequently transferred to a computer form.

The information on the object forms consists of general information (object number, short description, site number, date, photographic record, state), followed by nine divisions of specific information. Special attention has been paid to the following aspects:

*Dimension/appearance*, which includes careful measuring, drawing of shape, notes on the flexibility, specific measurements such as Cord-Index (see paragraph 9.3.2.0), angle of plait, number of horizontal/vertical members, etc.

*Technique*, by means of description and drawing.

*Special features*, such as: colour, stain, wear, mends, handles, lids, sheen, decoration, irregularities, strengthening, shifts in pattern, knots, loops and secondary elements.

*Material*, a division simply into the categories “grass”, “flax”, “palm leaf”, “rush”, “sedge”, if possible with an indication of the specific family and species (e.g. *Desmostachya bipinnata*). Further work on the fibre identification needs to be done at a later date (see paragraph 9.2.5).

*Condition* is judged by general view and microscopic examination of the fibres.

*Use* is deduced from the object itself, by examining the material, quality, and dimensions; from secondary elements found with the object; the archaeological context in which it was found; parallels from other sites or museum collections.

*Treatment*: see paragraph 9.2.2.3 and 9.2.2.4.

*Storage:* see paragraph 9.2.2.4.

*General remarks:* limited space for cross-references and other remarks.

### 9.2.2.2 Cleaning and re-shaping

Cleaning baskets and mats is a delicate task. The best results are achieved by cleaning with brushes of different sizes and a low-power vacuum cleaner, using metal and wooden points (such as surgical needles) for the hard encrustations. In a few cases it was necessary to clean an object using sticks tipped with blotting paper soaked in 90% ethanol, although this treatment tended to deepen slightly the colour of the object. The use of blotting paper is preferable to cotton wool or tissue paper, as it does not catch the surface of the objects. When the object was in poor condition, i.e. in the sense of lying in contorted shapes, attempts were made to re-shape the object back to its original form (e.g. mat no. 0003, mat no. 0301, 16 fragments of no. 0342, and 98 fragments of no. 0343). To achieve this the objects were very slowly humidified in a bell chamber containing cold water.

### 9.2.2.3 Consolidation

Problems with the condition of an object arise at two levels, when:

- (a) The condition of the fibre itself is poor, which results in a very brittle object. Material which has deteriorated in this way sometimes simply falls to dust when handled.
- (b) The condition of the fibre is good, but the coherence of the object is bad. This results in the object dropping apart in single strands which remain individually strong.

A combination of "first aid" conservation and packing can provide a solution for different problematic objects (see also paragraph 9.2.2.4). Several resins have been used at Amarna of which three proved to be especially useful:<sup>1</sup>

Paraloid B72: dissolved in acetone to a percentage of 3–15. This resin is suitable for fibres which have deteriorated. It does not ameliorate the coherence of the object itself to a great extent, unless a solution of 10% or more is used. The aim was to use as weak a solution as possible (3–10%). The treated object tends to darken slightly; the higher the percentage, the deeper the darkening. No gloss appears. This resin is reversible by the use of acetone.

Archeo-Derm: a ready-to-hand resin, based on a PVC (polyvinyl-chloride) solution in xylene and methyl-isobutylcetone. Archeo-Derm can be thinned with a special solvent or with xylene. It is reversible by the same solvent or xylene. The resin proved especially useful when applied to cordage with poor coherence and fibre condition. It darkens the material slightly, but no gloss or other traces appear.

PEG 1500: an adaption of the resin Dowman<sup>2</sup> suggested for consolidating wood appeared to be suitable for basketry, prepared as follows:

10 parts Poly Ethylene Glycol (PEG) 1500  
1 part formaline  
69 parts ethanol 95%  
20 parts distilled water.

This resin has been applied, for instance, to grass mat no. 0006, in which traces of insects have been found. The treatment is reversible in an ethanol/water mixture.

It was decided to apply no consolidating resins on objects that tended to fall apart from lack of coherence and not through the poor condition of the fibres. Although the resins would supply sufficient consolidation when applied in large quantities and high-percentage solutions, the object would be "plastified". Instead, objects in a condition of this kind were vacuum-sealed in

<sup>1</sup> With courtesy to Mr and Mrs Jaeschke; Rijksinstituut voor Oudheidkundig Bodemonderzoek (Mr C. Dieleman); Laboratorium voor onderzoek van voorwerpen van kunst en wetenschap (Mr T. Stambolov); Rijksdienst voor de IJsselmeerpolders (Mr A.J.M. Wevers).

<sup>2</sup> Dowman 1970: 137, as follows:

PEG 4000	10 parts by weight
Dowicide	1 part by weight
Ethanol IMS	69 parts by weight
Water	20 parts by weight

polythene foil. In this way the polythene takes on the shape of the object and supports it on all sides. The object can then be studied from all sides and is easily handled and stored. The risk of creating a micro-environment inside the bag is always present, but the dry surroundings at Amarna diminish this risk, and the process is simply reversible by using scissors.

#### 9.2.2.4 Protection, packing and storage

Because the excavated material comprises a wide range of objects such as cordage (mainly small strings, with some larger pieces of rope, including knots of different types), large twined mats, brushes, and baskets, several specific methods of packing are needed. In considering a packing method attention must be given to the effect of a given packing material on the object, and a clinging material should always be avoided. In all cases acid-free tissue paper appeared to be the most suitable basic packing material, except for those objects that had been vacuum sealed.

The objects in the Amarna magazine have been packed as follows:

*strings*: storage in "booklets" of acid-free tissue paper, held in place by cello tape which has been lined with acid-free tissue paper. The booklets are then inserted into a self-sealing polythene bag;

*ropes/knots*: storage in hard plastic specimen-boxes on small trays of acid-free tissue paper;

*nets*: storage on polystyrene beds, held in place by paper-lined cello tape. The polystyrene is put into self-sealing polythene bags;

*mats*: storage on flat wooden trays, wrapped in acid-free tissue paper. The trays are then put into flat wooden containers with ventilation holes on all sides, thus providing airy storage;

*baskets*: storage by nesting them in acid-free tissue paper. The "nests" are put into acid-free cardboard boxes. All other objects are supported carefully by acid-free tissue paper and then stored safely, so as to avoid any pressure on the object.

Most of the Amarna material is now stored in the site magazine adjacent to the expedition house. Although the possibility of controlling the moisture and temperature is absent, the desert location results in fairly dry and stable conditions. The magazine is, however, currently prone to termite infestation. Although the termites are primarily attracted to cardboard boxes, some precautions have been made to protect the objects. Strips of blotting paper permeated with locally purchased insecticides were placed near objects that have not been protected by polythene wrappings. The objects and the dry impregnated strips were separated by several layers of acid-free tissue paper. The contents of the insecticide are unfortunately unknown. An impregnation of blotting paper with a 4% boric acid solution was used in a similar way as protection against mould.

#### 9.2.5 Fibre identification

Although the final results of the fibre identification will probably be published later in a monograph on the basketry from the Workmen's Village, it seems desirable to include brief comments on the working methods.<sup>3</sup> Through limitations of time and resources it is not possible to take samples of all objects. This is relevant particularly to the large number of strings, which can not be individually identified. Therefore a grouping into several macroscopical types has been made, from which a number of samples have been taken. The microscopical identification has been based on an examination of epidermis slides and cross-sections stained with Saffranine and Astra blue. Future samples will be scanned under an electron microscope.

### 9.3.0 The Amarna basketry and cordage

#### 9.3.1 Quantity and position on site

A total of 1193 items has been recorded during the 1987 season, amongst which 781 ropes and strings, 211 knots, 6 netting fragments, 175 mats and matting fragments, and 20 miscellaneous objects were noted. The size and significance of these items differ remarkably.

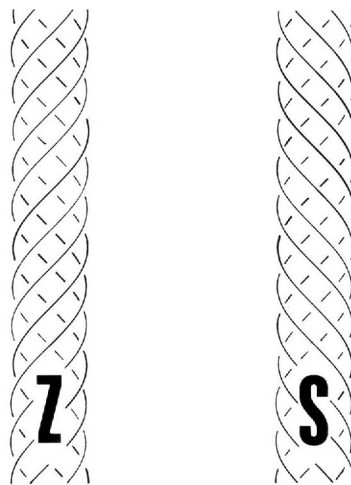
<sup>3</sup> With courtesy to Dr F. Bouman, Drs W.E. Verkerke, Mrs N. Deventer, and other members of the staff of the Vakgroep Byzondere Plantkunde of the Biology Department, University of Amsterdam.



They come from 138 different units in 43 squares/houses. All of the fragments come from the Workmen's Village, and in particular from four houses (West Street 1 and 2/3, Gate Street 8 and 9) and the grid-squares south-east of the Walled Village. Most of the latter appear to be village rubbish, and in some instances this has been disturbed in modern times. Further information on quantity and position will be given in the sections on the different techniques and materials of objects or groups of objects which are of special interest.

### 9.3.2.0 Definitions connected with cordage

*S and Z*: the spin, ply, and cable can head in two directions, simply expressed by "S" and "Z", following the central stroke of each of the letters (Figure 9.1; also AR II: 191–194).



**Figure 9.1.** "S" and "Z" directions in cordage.

*Cord*: collective term for all vegetable fibres, worked into long cylindrical strands, by all possible techniques.

*Yarn*: fibres spun or twisted into a strand, either in an "S" or "Z" direction.

*String*: two or three yarns plied into a long strand, with a diameter of 1 cm or less. The string can be plied in an "S" or "Z" direction.

*Rope*: two or three yarns plied into a long strand, with a diameter of more than 1 cm. The rope can be plied in an "S" or "Z" direction.

*Cable*: two or three strings or ropes cabled into a long strand, regardless of the diameter. The cabling can turn in an "S" or "Z" direction.

*Fibre*: the macroscopically visible fibre bundles. When a microscopical fibre is meant, it will be specified as "fibre cells" or "sclerenchyma/collenchyma".

*To spin*: the turning of a bundle of fibres for the purpose of making a strengthened and elongated yarn.

*Double*: double spin is the plying of more than three yarns in which the individual yarns can no longer be distinguished. This has the effect in production, as well as in appearance, of spinning rather than of plying.

*To twist*: the turning of a part of a plant, stem, leaf etc., for the purpose of gaining suppleness in the process of working up.

*To ply*: the turning of two or three yarns into a string or rope.

*To cable*: the turning of two or three strings or ropes into a cable.

*CI*: the Cord-Index (CI) is the ratio of the number of twists to the length and diameter of a yarn,

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string or rope. This ratio is expressed in a number between 0 and 100. The higher the CI, the tighter the rope has been made. This can give an indication of the quality of a rope.

CI of spin:  $\frac{\text{set of twists} \times \text{diameter of yarn}}{\text{length of the chosen set of turns in mm}} \times 100$

CI of ply:  $\frac{\text{set of turns} \times \text{average diameter of the yarns}}{\text{length of the chosen set of turns in mm}} \times 100$

CI of cable:  $\frac{\text{set of turns} \times \text{average diameter of strings}}{\text{length of the chosen set of turns in mm}} \times 100$

In formula:  $\frac{n \times D}{1 (=l)} \times 100$  (see Figure 9.2)

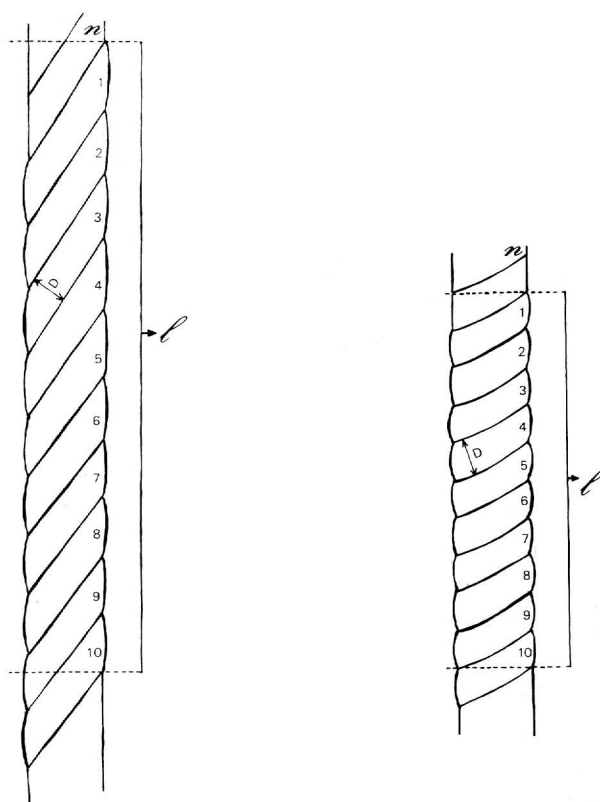


Figure 9.2. Measuring the CI of ply.

### 9.3.2.1 Ropes and strings

As stated above, 781 fragments of string and rope were recorded in 1987, and these have been classified according to material and technique. Tables 9.1 and 9.2 show the relationship between the applied technique and the material for respectively rope/string and rope. The knots have been presented separately in paragraph 9.3.2.2.

The direction of spin has been expressed by a small s or z, the direction of ply by a capital S or Z. An [S] or [Z] between square brackets refers to the direction of cabling. A “double spin” is expressed by two small letters, e.g. ss or sz. The numbers refer to the number of yarns which are plied into a string or rope, or the number of strings or ropes that have been cabled; e.g. zS3

refers to 3 z-spun yarns, plied into one S-ply string, sZ2[S]3 refers to 3 Z-ply strings, each made out of 2 s-spun yarns, which have been [S]-cabled.

technique	zS2	zS3	sZ2	sZ3	ssZ	szS	other	total
material								
grass:	311	38	67	61	–	1	64	539
flax :	16	–	2	–	21	20	40	99
other:	10	7	68	5	–	–	50	143
total:	337	95	137	66	21	20	155	781

**Table 9.1.** The relationship between applied technique and rope and string.

technique	zS2	zS3	sZ2	sZ3	ssZ	szS	other	total
material								
grass:	8	5	27	15	–	–	3	58
flax:	–	–	–	–	2	–	–	2
other:	–	3	–	1	–	–	3	7
total:	8	8	27	16	2	–	6	67

**Table 9.2.** The relationship between applied technique and rope.

By comparing the two tables it becomes clear that grass has been widely used as raw material for cordage in the Amarna Workmen's Village. The majority of items appear to have been made from *Desmostachya bipinnata*, or possibly *Imperata cylindrica*. *Phragmites* species and a straw-like variety (*Triticum* or *Hordeum*) also occur. The fibres from the leaf shafts of the *Phoenix dactylifera* (Date palm) occur rarely. Although flax can make a strong rope of good quality, the fine structure of the fibres makes it more suitable for use on a smaller scale. Just two flax rope fragments, coming from the same rope, have been recorded (no. 0055, diameter: 13.5 mm).<sup>4</sup>

A surprising feature is the relationship between the "standard" technique for the production of string and the technique identified with rope making. A large quantity of string has been produced by plying two z-spun yarns into an S-ply string (zS2). The rope, however, shows a tendency to be in a reverse technique (sZ2 and sZ3). It would appear that the direction of spin and ply may be used to identify a specific producer, either a workshop or a family or a tradition. Thus a certain quantity of a similar kind of rope, such as found at Amarna, may point to a centralisation of the production of the larger ropes. The ropes have been found mainly in the houses.

The majority of the flax strings show a remarkable double spin: a couple of very finely spun yarns have been spun for a second time. Then two or three of these stronger yarns have been plied. The direction of the first spin is in all cases but one s, the direction of the second spin is both s and z, as is expressed in Figure 9.6. Only one flax fragment shows a reverse double spin: zzS2 (no. 0320, from West Street 3). Although this double spin seems to be especially suitable

<sup>4</sup> The numbers used in this chapter are the specific basketry object numbers which refer to the individual object forms.

for flax, nevertheless one grass fragment is S-plied out of two sz-spun yarns (no. 0026). In general, the scheme of spinning, plying, and cabling is an alternate application of directions, e.g. s-spinning is followed by Z-plying and S-cabling. The technique of a double sz-spin follows this habit; the ss and zz spun yarns, however, do not. String no. 0032 and no. 0171 are clear examples of variations of alternating spin-ply direction (0032: szZ2; 0171 even: ssS2). It should be noted that the six netting fragments have all been made out of z-spun yarns, like the "basic" yarn for the zz-spun string (see Section 9.3.2.3). The "other" materials from Tables 9.1 and 9.2 are six different types. The most noteworthy are rushes and palm leaf. As many as 65 fragments were made out of rushes, probably of the *Juncus* species. They form a carefully made, regular type of string, all in the "reverse" technique (sZ2 and sZ3). A total of 49 pieces form part of an amphora sling (see Section 9.3.2.3). Two different palm species, *Phoenix dactylifera* (Date Palm) and *Hyphaene thebaica* (Dôm Palm), have also been used. The occurrence of a third species (*Medemia argun*) has not yet been proved, but it cannot be excluded until the fibre identification has been finished. The 53 palm leaf fragments generally consist of just s-twisted loops, but several strings in both zS2 and sZ2 directions do occur. Palm fibre from the leaf shafts of the *Phoenix dactylifera* has been used for making string and rope (18 fragments). The most common spin and ply direction was the S-plying of two z-spun yarns (zS2 being the most frequent form). Three palm fibre ropes have been found that were cabled. Apart from these, sedge (probably *Cyperus* species), human hair, and an as yet unidentified woody material have also been used as material for cordage.

Most of the "other" techniques from Tables 9.1 and 9.2 hold less interest, for they are just spun or twisted cordage fragments. The most notable are some varieties on plaiting and cabling. The flax has been plaited with three strands on seven occasions, and once with four strands. Only one grass plait with three strands has been found. The flax varieties on double spin have already been mentioned. Object no. 0020 is a collection of very heavy spun yarns in a z-direction, which results in curly and slightly elasticated strands. One flax fragment is a zS2 cord, made out of twisted and plied strands of cloth (no. 0328). In addition to techniques such as grass plaits and grass double-spin (both mentioned above), another important variety is grass cabled rope. In all these cases the grass appears to be *Desmostachya bipinnata*. Three cabled ropes and two cabled strings have been recorded and they show five different techniques. The closest to a "standard" cabling, with alternating spin/ply/cable directions, is no. 0202. It is a string which has been made out of six z-spun yarns, plied into two S-plied strings, which have been Z-cabled (zS3[Z]2). String no. 0295 is a variation of this scheme: eight z-spun yarns have been S-plied into four strings which have been Z-cabled (zS2[Z]4). A "standard" cabling consists of six z-spun yarns, plied into three S-plied strings which are then Z-cabled (zS2[Z]3). The cabling of four strands instead of two or three, is very rare. The ropes have been cabled respectively: zS2[S]2 (no. 0047), sZ2[S]2[Z]2 (no. 0083) and zS3[S]2[S]2 (no. 0223). The last two show a double cabling, no. 0083 in an alternate SZ direction, no. 0223 in an SS direction.

**Specific notes on technique.** The ancient methods of rope making look very similar to those which can currently be observed in Egyptian villages. Owing to the nature of the material it is not possible to carry out the spinning and plying of grass strings in two different actions. Instead, two movements of the hands at the same time are needed in order to make the spin and ply in such a way that they lock with each other to make a firm string. The technique is a combination of rolling movements, in which one hand remains passive, the other active. A bundle of grass is first spun with a rolling movement by the active hand, from wrist to fingertips of the passive hand. The spun part of the bundle is then placed on the wrist of the passive hand, behind a second grass bundle. This second bundle is spun in the same way and placed on the wrist of the passive hand behind the first bundle. Holding the bundle with the right hand and rolling with the left hand results in a z-spin and an S-ply. The same action with the hands reversed (the left hand is the passive one, the right hand rolls and turns) results in an s-spin and a Z-ply. The same reverse spin and ply occurs also when the rolling movement does not take place from the wrist to the fingertips, but the other way round.<sup>5</sup>

<sup>5</sup> This is also the reason why direction of spin and ply does not prove necessarily whether the maker was left- or right-handed.

The start of the rope can be formed by a folded bundle, similar to hieroglyph V28 (Gardiner 1982). The end of a rope is usually held by an overhand knot (see Section 9.3.2.2). Illustrations of the techniques used in cordage production can be found by comparing two grass ropes (nos. 0084 and 0326). No. 0084 is a two-ply rope (sZ<sub>2</sub>) with a start as mentioned above; no. 0326 is a three-ply rope (sZ<sub>3</sub>) with a similar start, which illustrates the fact that 3-ply rope is in fact a strengthened 2-ply rope: the third yarn is spun and plied separately around a ready-made 2-ply string (see Figure 9.3).

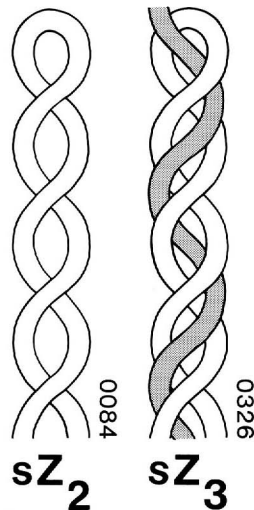


Figure 9.3. Insertion of the 3-ply cord.

The hand-rolling spin technique is useful for strong, stiff, fibrous materials, such as grass and palm shaft fibre. *Juncus* and *Cyperus* need twisting instead of spinning. Flax has a fine structure and can be spun separately without the need of plying at the same time to hold tight the spin. Thus it becomes clear why we so often find a double spin in flax strings and why the second spin appears both in the same and in the alternate direction as the first spin: the flax fibres are probably being spun first and worked up later.<sup>6</sup>

Determination of the use of cordage is extremely difficult. We shall see that it has been used in netting, for an amphora sling (see section 9.3.2.3), pot stands, brushes, several types of twined matting (see sections 9.3.3.1, 9.3.3.3 and 9.3.3.4), and even for a doll and a bracelet (section 9.3.2.2). Not only are we dealing with a multi-purpose substance, but at a later date cordage can often be re-used for totally different purposes.

In order to form an idea of the possible range of use it is important to combine carefully the data on diameter, length, material, quality, and the find spot on site. The presence of knots, loops, and secondary elements may also give further information. In most cases, however, it is only possible to exclude certain forms of usage. Positive clues on use are not very frequent, although they are not totally absent: very fine flax strings with a regular spin and ply and a high Cord Index of spin and ply (i.e. higher than 35) probably will be or will have been part of clothes; strings plied from cloth (no. 0328) were frequently used as lamp wicks. Specific site information, such as that on objects nos. 0144 and 0145, can also provide an answer (both were found in West Street 3 in the front room, around a brick and a mortar emplacement, and thus may have been used as means of strengthening).

<sup>6</sup> The Amarna textile specialist, Gillian M. Vogelsang-Eastwood, has suggested that the flax yarns used for the double-spun strings might be weavers' waste being used up.



### 9.3.2.2 Knots

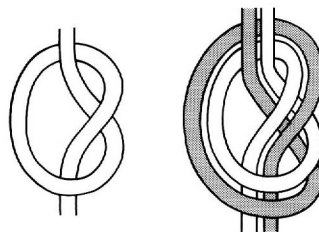
A total of 211 knots has been recorded. Table 9.3 shows the relationship between material and technique.

technique	overhand K/B	reefK	meshK	other	total
material					
grass:	39 / 11	35	1	24	110
flax:	40 / –	6	1	22	69
other:	2 / 20	2	–	8	32
total:	81 / 31	43	2	54	211

**Table 9.3.** Schematic view of knots, from left to right: overhand knot/overhand bend, reef knot, mesh knot (explanation is given in the text below).

It should be noted that a *hitch* ties one rope to another, a *bend* unites two rope ends, and a *knot* in the more specific sense is a knob at the end of a rope/string (Ashley 1985: 9, 18, 84–85, 290–292).

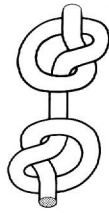
The overhand knot and the overhand bend are essentially the same kind of knot; the bend is simply a coarser variety of the knot, and its function is to connect two strings (see Figure 9.4). The reef knot and the anchor hitch are easily confused when the passive member of the anchor hitch (“p” in Figure 9.6b) is not rigid. Both have been placed, therefore, under the heading “reef knot”, although at least five of them are undoubtedly anchor hitches. The mesh knot is essentially similar to the weaver’s knot and its coarser variation, the sheet bend. The difference between a mesh knot and a weaver’s knot/sheet bend is shown in Figure 9.6a, b. The knots of the six netting fragments have not been counted in Table 9.3.



**Figure 9.4a/b.** Overhand knot (left) and overhand bend (right).

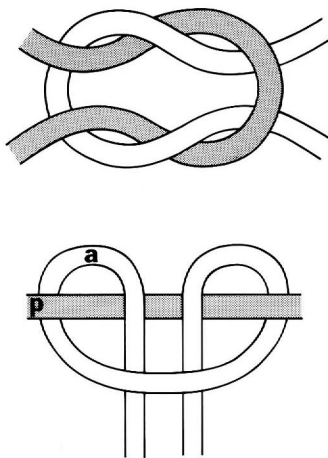
The most obvious task of an overhand knot is to keep a piece of string from unravelling. In the Workmen’s Village collection most of the overhand knots indeed appear to do exactly that. In 26 cases, however, overhand knots have been used to divide one technique from another in the same string (e.g. where a zS2 string changes into a 3-plait: no. 0018 grass; no. 0069 flax). An overhand knot at the end of a string was generally used as a “stopper” to lock a knot connecting two strings (e.g. no. 0037).

Thirteen overhand knots appear totally isolated and their function cannot be determined. An interesting feature is the combination of two overhand knots opposite each other (nos. 0042, 0195, 0234). Two of them might have been attached to a rope; no. 0195, however, seems to have had a function of its own. This cufflink-like feature could have functioned as a connection between two cords, for instance in creating a loop.



**Figure 9.5.** The connecting structure of two overhand knots.

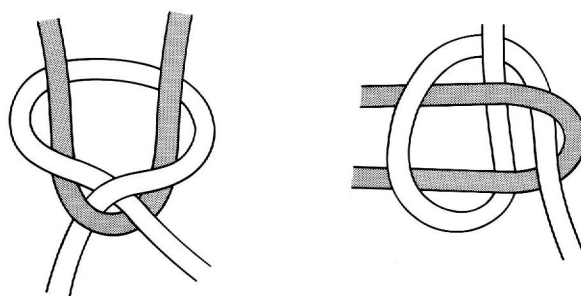
The overhand bend is nothing more than an overhand knot with double members. It is used for connecting two cords. Eighteen of these bends are part of an amphora sling (see section 9.3.2.3).



**Figure 9.6a (above): reefknot; 6b (below): anchor hitch; a = active member, p = passive member.**

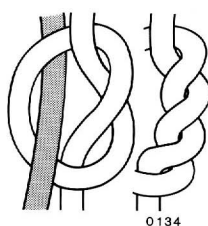
Although the reef knot and the anchor hitch often look very similar, both their function and usage are very different. The anchor hitch is knotted by tying an active member to a passive member (respectively “a” and “p” in Figure 9.6b). Thus a connection can be made between a string and a rigid or “engaged” object (i.e. one lacking loose ends with which to tie it). The reef knot, however, is tied with two active members and is particularly suitable for tying a cord around an object, for example, a bundle. In fact, the reef knot is not suitable for connecting two cords to each other. Nevertheless, this knot has been used at Amarna at least seven times for such a connection (e.g. nos. 0056, 0094). The exact use of the majority of this type of knot cannot always be traced, owing to deterioration, but only one definitely provable “correct” use of the reef knot (according to modern understanding, Ashley 1985: 18, nos. 74, 75) has been spotted (no. 0304). Five anchor hitches have also been identified (nos. 0032 3x, 0077, 0233). Two additional kinds of “stopper” or end knot occur, the “figure eight knot” (no. 0261, grass; no. 0269, palm leaf: see Figure 9.10) and a complicated flax knot which has been stuffed to make it more bulbous (no. 0206, Figure 9.11).

A sheet bend is a connection between two large ropes; a weaver’s knot is tied in exactly the same way. The only difference between the two is that the dimensions of the weaver’s knot in comparison to the sheet bend are far smaller. Both weaver’s knot and sheet bend are also very similar to the mesh knot. The one major difference is that the mesh knot is usually made with the help of a separate tool (a netting needle). Except for its small dimensions, the mesh knot has a different appearance because of the vertical orientation of the knot (see Figure 9.7a/b). Two



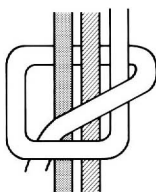
**Figure 9.7a (left):** mesh knot; **7b (right):** weaver's knot/sheet bend.

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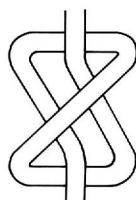
**Figure 9.8.** Two variations on the overhand knot.

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**Figure 9.9.** End knot for a plait with three strands.

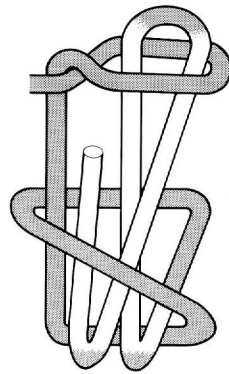
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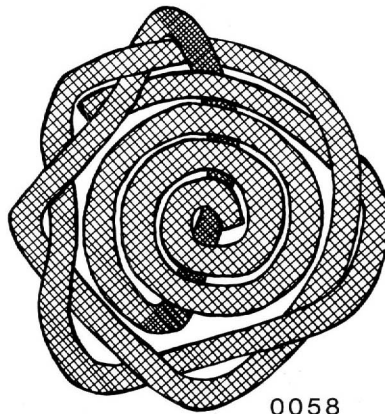
**Figure 9.10.** The "figure eight knot".

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weaver's knots have so far been recorded: no. 0072 is an isolated irregular flax weaver's knot, with green colouring. No. 0114 is an interesting connection of two grass zS2 strings knotted to one grass zS2 string.



**Figure 9.11.** The stuffed knot: the shaded portions are visible on the outside, the unshaded portions are the stuffing.



**Figure 9.12.** No. 0058, a large grass stopper.

The category “other techniques” in Table 9.3 includes several variations on the overhand knot, amongst which are three overhand knots which tie a second string (nos. 0030, 0173, 0193, see Figure 9.8a), one double overhand knot (no. 0134, Figure 9.8b), and an end knot for a 3-plait (no. 0063, Figure 9.9). Two large grass stoppers have been made in different ways, but they have in common that they are of a very coarse composition: the entire grass plant, including the root, has been used (no. 0058, depicted schematically in Figure 9.12; no. 0059, simply coiled and twisted, is not depicted). A comparison between Tables 9.1 and 9.3 shows that flax strings contain relatively more knots than grass strings. The large number of overhand bends made out of other materials than grass or flax are, in the main, parts of an amphora sling (see section 9.3.2.3). A *Cyperus* species has been used as raw material.

Special attention should be paid to two puzzling objects, both made out of flax and with slight colouring. The first is a small doll (no. 0133, see Figure 9.13), found in the house Gate Street 8. It comes from an undisturbed unit (unit no. [1431]) and lay in the rubble from the collapsed roof of Rear Room South (AR III: 20). The object does not have a clear face and legs, consisting only of several bundles of flax yarns. Nevertheless, three observations support its identification as a doll: it is possible to see the winding of two small bundles of yarns at the top of the object as an attempt to shape two arms and a head; the absence of legs can be explained by the lower part of the object, which consists of long vertical yarns, knotted together at the bottom, which could form a kind of dress; a slight pinkish colouring is visible on the “head” of the object, whilst the

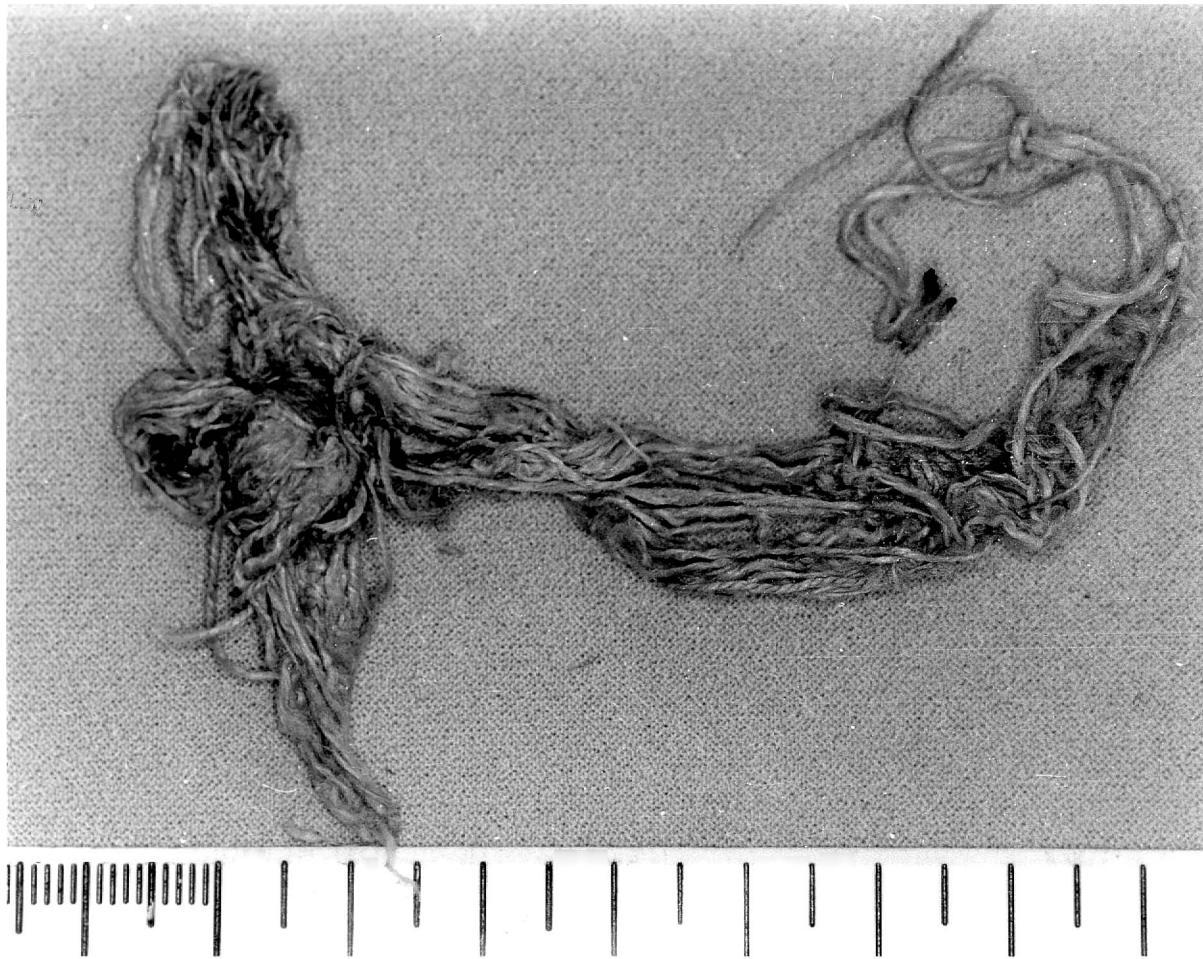


Figure 9.13. Object no. 0133. The scale is in cm.

“dress” contains some greenish tints. The object is 74 x 55 x 5.3 mm, and consists of bundled s-spun yarns with a diameter of 0.5 mm.

The second object is a circular flax string with many different kinds of knots in it (no. 0028).<sup>7</sup> It has been made with obvious care and precision out of some very ordinary flax strings (zS2). The Cord Index of spin is 60, the CI of ply is 47, which are both high values. This small object is not a mere piece of string for practising knots in a quiet moment. It seems to be a bracelet of some kind, or perhaps even an amulet. Its circumference is 185 mm, which would be a suitable size for a woman with small hands, or for a child. Special attention should be paid to the little bundle of green coloured yarns that have been tied in a kind of loop of uncoloured string (see the schematic view in Figure 9.14). The knotting techniques that could not be identified, owing to the poor condition of the knots but definitely did not belong to any of the types that have been mentioned, have also been classified under “Other Techniques” in Table 9.3.

### 9.3.2.3 Netting

Only seven objects occur in this section: six netting fragments (nos. 0339 and 0340 — five fragments) and the remains of an amphora sling (no. 0292). The netting fragments all consist of z-spun yarns, connected with mesh knots. Without exceptions the fragments have been made from flax (*Linum usitatissimum*).

<sup>7</sup> The knots of no. 0028 are not included in Table 9.3.





Figure 9.14. Schematic drawing of bracelet 0028.

No. 0339 is probably part of a carrying net for light goods. The fragment is 230 mm long and 150 mm wide. Since three sides are complete it is clear that the original net could not have been more than 150 mm. wide. The mesh is regularly shaped, with the mesh sides all between 30 and 32 mm long with a mesh diameter of 50 mm. The z-spun yarns have a diameter of 0.5 mm. The colour is light without stains or darkening, and its condition is extremely good. The fragment was found in the house Gate Street 9 in the rubble from the Front Room South, a disturbed area. Because of its very good condition, the antiquity of this object is suspect and it may, therefore, be modern (or at least non-ancient).

No. 0340 consists of five netting fragments from the same net. It is a fine but strong type of netting with a large mesh. It may have been used as a carrying net or to catch small birds. The fragments can be reconstructed into a net with a minimum size of 250 x 300 mm. The diameter of the z-spun yarns is 0.8 mm with a Cord-Index of spin which is 54. The diameter of the yarns and the spin are both irregular, whereas the mesh itself is very regular. The sides of the mesh are 47 mm, while the mesh diameter is 65 mm. The netting fragments are in a reasonable condition, but the net as a whole has been torn into at least five pieces, although these can be handled without risk. The fibres have been coloured reddish by the surrounding soil. All five fragments come from one unit in square M10, from a deposit in the Main Quarry laid down just after the Amarna Period but also dug over in modern times. Nevertheless, the condition of the netting fragments leads to the conclusion that they are ancient.

Object no. 0292 was a collection of 47 pieces of string, all of sZ2 formation, together with 18 overhand bends, 3 different knots, 1 ring of coiled rope, 1 handle piece (made out of sZ2[S]3 rope), and two looped pieces of string. All the fragments are made out of sedges, probably a *Cyperus* species. The quality of the string is very high (CI of spin is 43; CI of ply is 78; CI of cable is 33; spin, ply, and cable all are extremely regular). The fibres are in surprisingly good condition, but the object itself had fallen apart. An attempted reconstruction on paper appeared to be successful in giving an image of the object: the ring of coiled rope has two overhand bends attached to it and is damaged in four places. The two knots and the four damaged spots divide the ring into six equal parts. The division of the remaining 12 overhand bends fits into a netting construction, as shown in Figure 9.16a and b. Thus the ring forms the base, while the handle forms the top. The six netting ends come together at the top as two groups of three ('1' in Figure

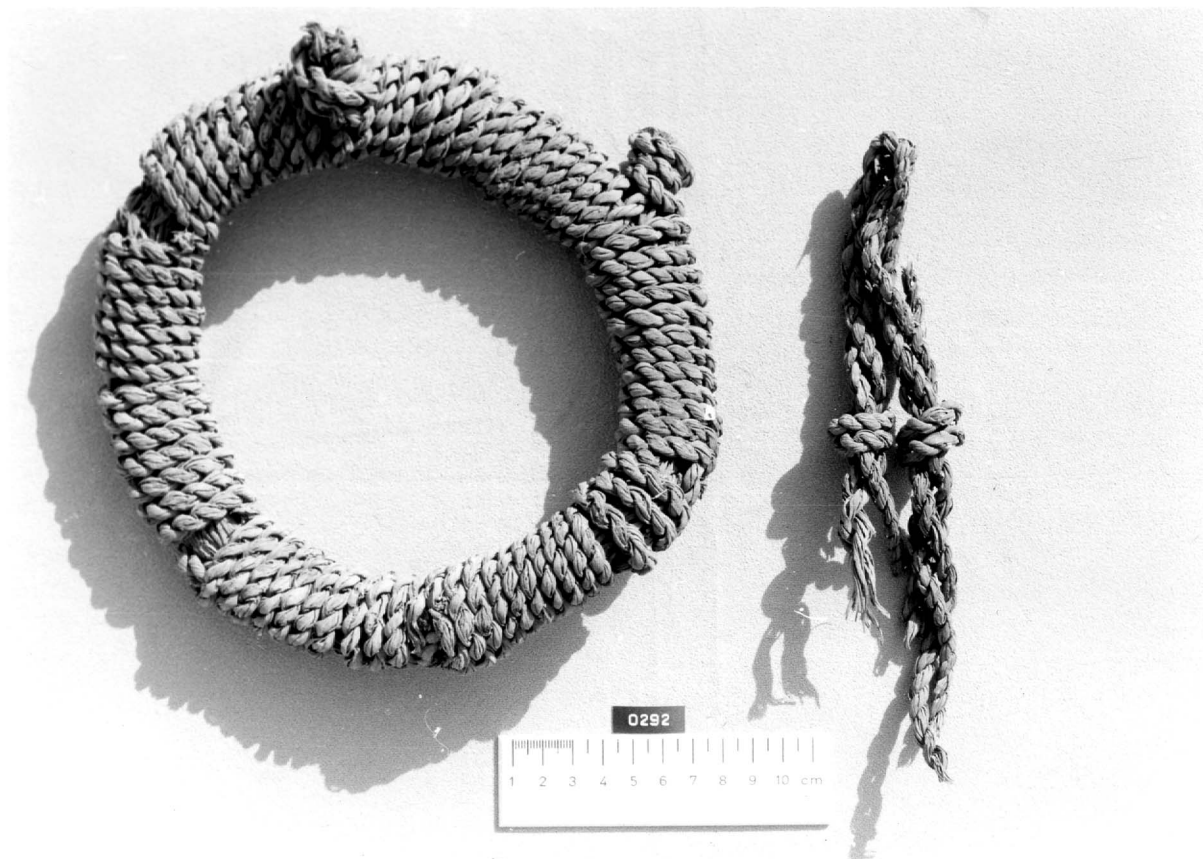


Figure 9.15. Portion of handle and the bottom ring of an amphora sling.

9.16b connected to the left, “r” connected to the right side of the handle). Three additional knots have been found, of which one is similar to the knots in the handle piece. This knot could either have been inserted at the low end of one handle side as anchorage and strengthening, or it might have been part of a second handle. An amphora sling with two handles has been found among objects from the tomb of Meritamun at Thebes (Winlock 1932: 32, Pl. XXXI). If, however, we assume that the amphora sling from Amarna also had two handles, we should have to admit that one knot is missing from an otherwise complete collection of fragments. The amphora sling comes from an undisturbed deposit in the rubble of the Middle Room of Gate Street 8 (unit [1583]; AR III: 22, 23).

#### 9.3.3.0 Basketry, associated terminology

In addition to the definitions on basketry given in section 9.2.1.2, there are several concepts that need a short explanation:

*Pairing* is the turning of two horizontal members (weavers) together around several passive vertical members (stakes), in which the two weavers alternately lie in front of the stakes (see Figure 9.19).

The *side edge* of a twined mat is the edge where the weavers are fastened off (see Figure 9.19). The *transverse edge* of a twined mat is the edge where the stakes are fastened off (see Figure 9.20).

A brush consists of a *core* which has been divided at one end into several *fingers*. The core and fingers have been covered by the *winders*.

As with coiled basketry, pot stands, pads, ring stands etc. consist mostly of a *bundle* around which the *winder* has been wound.

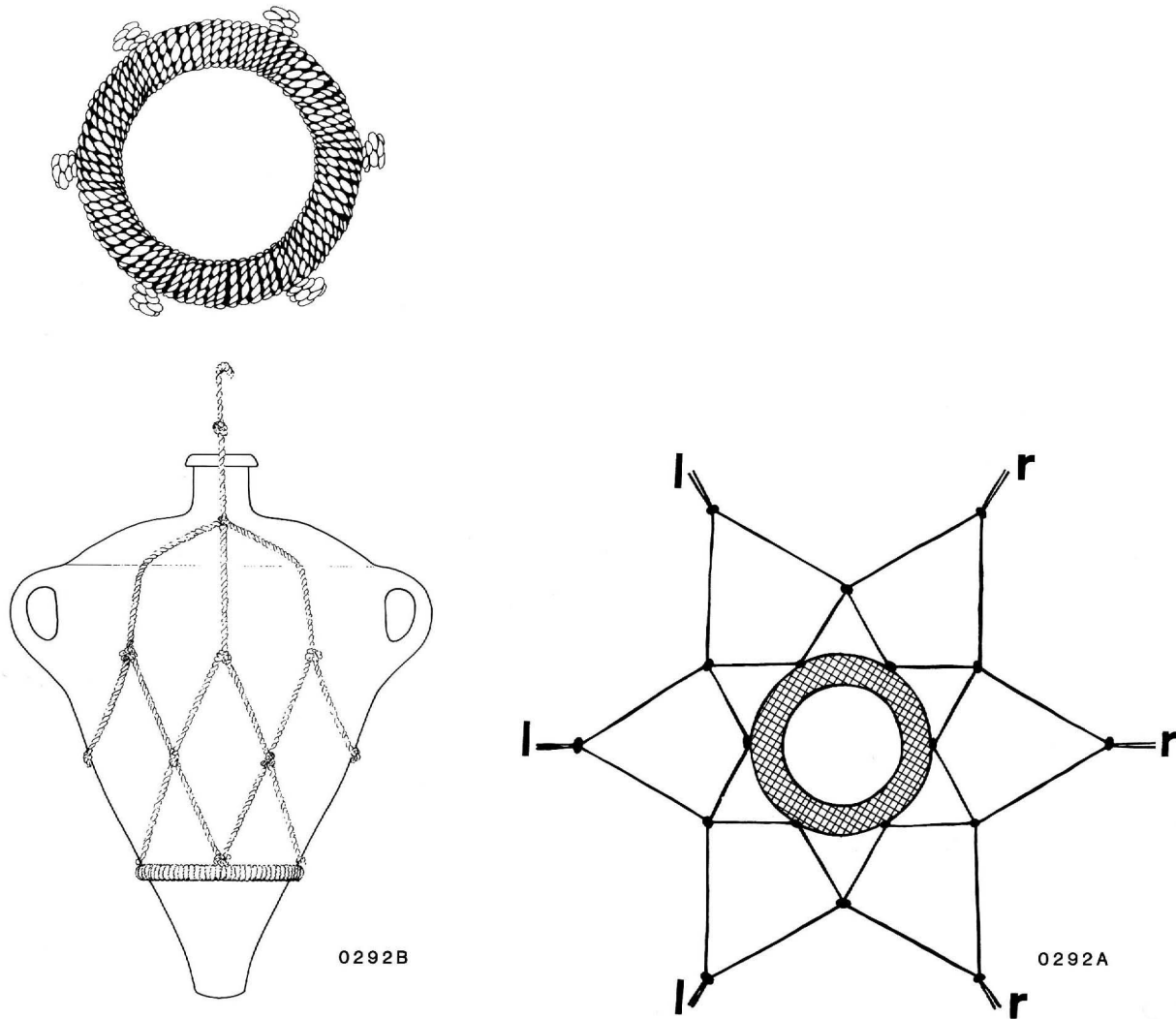


Figure 9.16a and b. Reconstruction of amphora sling.

Because of the wide definition of basketry which I advocate, many different objects have been brought together in this section, although there is not one real basket amongst them. The only “basket-like” object is a coiled circular shape that could be the bottom of a basket, but it could equally be a fragment of a mat. To make it easier to discuss the different techniques, a subdivision has been made, into twined matting and miscellaneous types; brushes, pot stands/pads, and miscellaneous basketry objects. These are described in sections 9.3.3.1–9.3.3.5.

#### 9.3.3.1 Twined matting

A total of 171 twined mats and matting fragments has been recorded during this season. Table 9.4 gives a general view of the typology, in which the objects have been divided into five different types of twined matting. The criteria are the material, the working of the material, and the space between two weavers and two stakes. Figure 9.18 illustrates four of the five matting types. The matting type designated as type 3 is very similar to type 4, and therefore has not been included separately in the drawing.

The first type of twined matting is a variety made entirely from grass. The stakes have been formed from grass strings, and without exception of the zS2 kind. The weavers are plain, untwisted grass, which have been woven into a simple unpaired one-up/one-down form. The mats

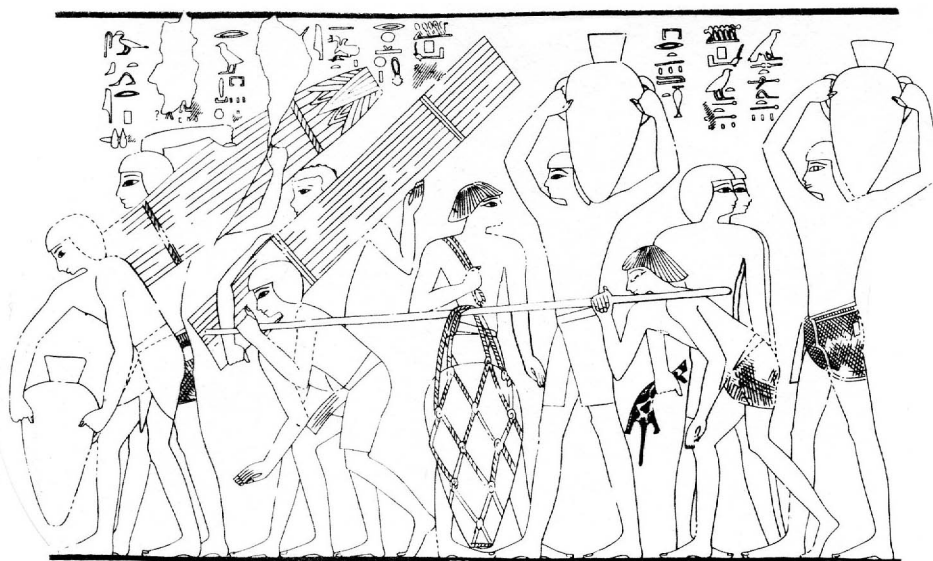


Figure 9.17. Wall painting with a depiction of an amphora sling from the Tomb of Rekhmire at Thebes (after Davies 1943: Pl. L).

type	material stake/strand	space stake/strand	object nos.	total
1	cord/grass	open/close	0001 0002 0004 0005 0007 0008 0009 0010 0012 0353	10
	fragments:		0057(3x)	3
2	grass/cord	close/open	0003 0006	2
	fragments:		0045(5x) 0046 0054 0111(2x) 0216 0278 0281 0286 0287 0342(16x) 0343(98x)	147
3	cord/cord	close/open	—	—
	fragments		0054(5x) 0122	6
4	cord/cord	close/close	0301	1
	fragments		0288	1
5	palm/palm	close/close	—	—
	fragments		0011	1
			total	171

Table 9.4. Types of twined matting recorded at Amarna.

are weaver-faced, i.e. the stakes are invisible, the weavers determining the exterior of the mat. The distance between two stakes has an average of 22 mm, the distance between two weavers varies between 0 and 1 mm. The result is a strong, flexible, closely woven mat, which is also light; flexibility is created by the cord stakes which make the mat easy to roll up (rolling along the weavers, transverse to the stakes). The Cord Index of the spin and ply of the stakes differs slightly in the different mats. In general the CI of spin lies around 40, the CI of ply is mostly about 30. Both spin and ply are fairly regular. These values point to a carefully made type of

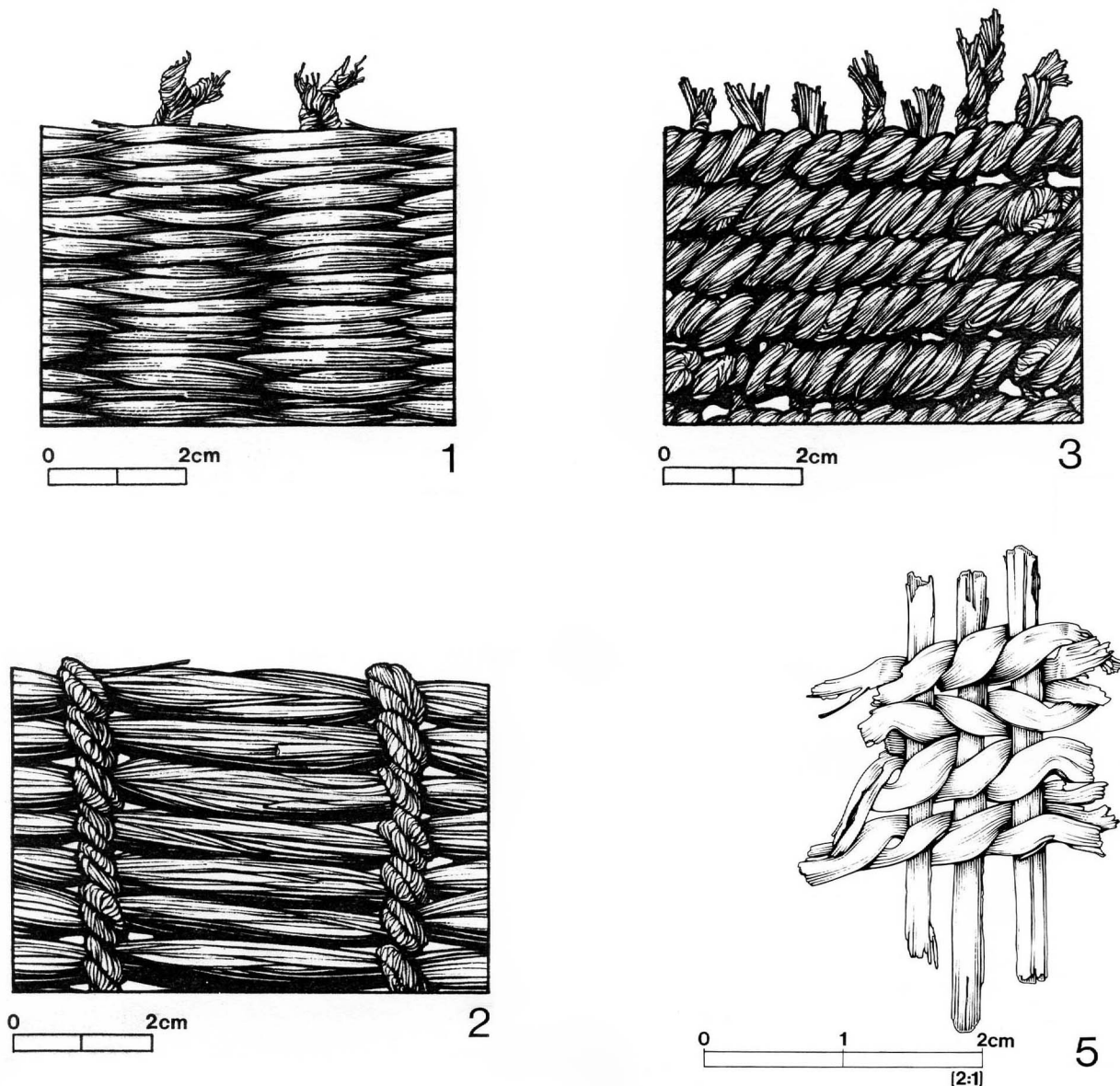


Figure 9.18. Four types of twined matting: types 1, 2, 3, and 5 (illustrations by A. Boyce).

string, which is reflected in the regular appearance of the mats as a whole.

Only one type of side edge appears. The strands have been folded double around a strengthening string; two strings are then paired and thus fix the weavers into small bundles, as if they have been stitched. The pairing is done in an S-direction in all mats (see Figure 9.19). The mats with fragments of side edges are nos. 0001, 0002, 0007 and 0353. The transverse edge shows a considerable amount of variety. The schematic drawings in Figure 9.20 illustrate six different types, labelled A to F. Type A can be found in mat no. 0001; type B in nos. 0002, 0004, and 0008; type C in no. 0057; type D in no. 0007; and type E and F in no. 0353.

The material of the different mats of this kind is the same: the epidermis shows in long and short cells and in the stomata that both stakes and strands are made from leaves of the same kind of grass. In the cross section the fibre bundles appear to be heavily sclerosed, a feature which points to the *Desmostachya bipinnata* species. Only one exception has been found, and that is the



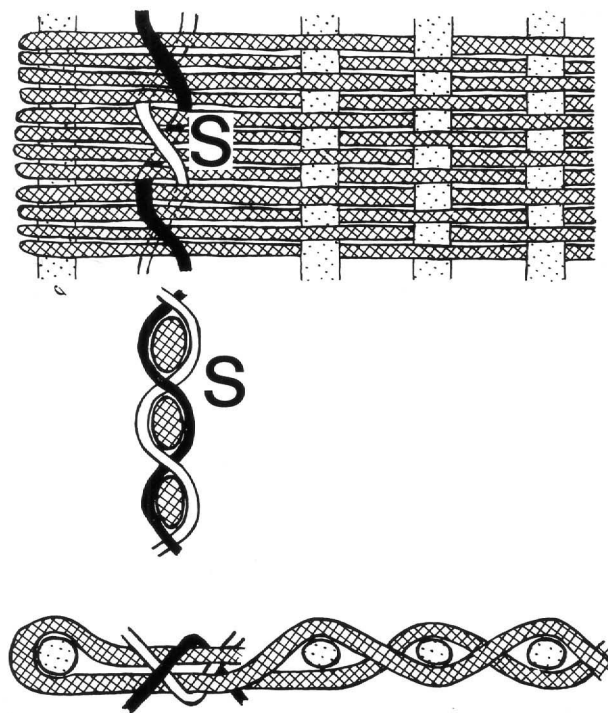


Figure 9.19. Side edge of matting type 1 and illustration of S-pairing.

group of fragments no. 0057, which have grass stakes but palm leaf strands.

Mats nos. 0001, 0002, 0007, 0008, 0009, and 0010 were all found in 1985 and come from the open space between the small enclosures in West Street 1 and the house West Street 2/3 (AR III: 28, 30). The mats lay in two groups on the surface of the organic fill, as if blown in after the abandonment of the buildings. It is possible that they came from the South Annexe to West Street 2 and may originally have been used as a light roof (AR IV: 4). The same can be said for mats 10004 and 0005 which were found in 1986 in West Street 2, in a unit sealed by collapsed rubble (unit [2638]). These two mats were lying on the mud floor of West Street 2, Area ix, and were covered by reeds (AR IV: 5, Figure 1.3, Stage 3). A further three matting fragments (0057) were also found in this area in the disturbed drift sand at the surface above West Street 1.

Although it has been suggested that the mats may have served as awnings or light roofing material, this does not exclude other possible functions. Mats are multi-purpose objects. This type of mat is easy to roll and is thus pre-eminently suitable to serve as a sleeping mat, or as a floor mat. In addition mats such as these are easy to transport. Ways of using this type of matting are illustrated by the *in situ* discovery of two nearly complete mats in square N17 of the main grid excavated during the 1980 season.<sup>8</sup> These mats were found in a folded position, one in Building 350 on a floor, the other close by in a rubbish deposit (Kemp 1981: 7, Fig. 1, 14). It would seem unlikely that awnings would have been left like that. On the other hand, sleeping mats, for instance, could have been.

In this respect, consideration has to be given to the original sizes of the mats, measurable where both side and transverse edges are at least partially preserved. Two specimens are particularly useful, nos. 0007 and 0353. Mat 0007 has remains of three edges: two side and one transverse. The total width is 930 mm, the original length was at least 1010 mm. Mat 0353 has remains of four edges, providing reconstructed original dimensions of 935 mm wide and a minimum length of 1.66 mm. Since no dimensions of other matting fragments exceed these sizes,

<sup>8</sup> One mat is no. 0353, now stored in the Faculty of Oriental Studies, University of Cambridge; the other is in a magazine of the EAO as a result of a division of finds in 1982 and has not yet been catalogued.

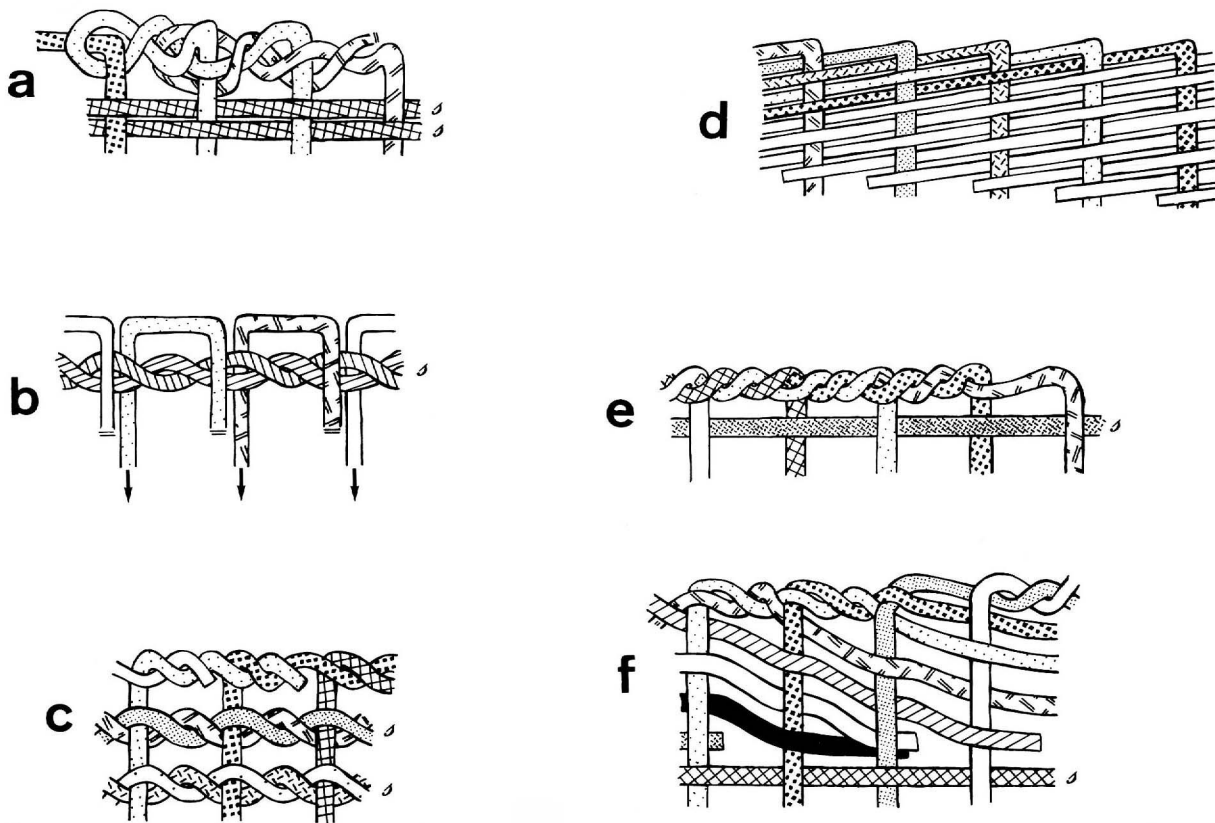


Figure 9.20. Six types of transverse edge, matting type 1 (s = strengthening of the edge).

we can conclude that we are probably dealing with a type of matting of more or less fixed size, i.e. about 93 cm wide and 1.70 m long. This would present a problem if the use of these mats was for awnings. If we assume that matting type 1 came in a standard dimension of 93 x 170 cm., then the width of the South Annexe to West Street 2 would be too large (about 250 cm.). On the other hand, if we argue that this type of matting could have been made on the spot to fit the dimensions of the South Annexe, then we have to explain the different types of transverse edges. If the edge is distinctive as to the producer of the object, it would point to the presence of at least three, and possibly six, different producers (the transverse edge at top and bottom might be different). An alternative explanation as to why this concentration of matting was present will be offered below.

The condition of type 1 mats differs slightly from that of the other mats. In general the condition of the fibres is reasonably good, but the construction of the mat has become considerably weakened. In most cases (nos. 0001, 0004, 0005, 0007, 0008, 0009, 0010) consolidation was with a Paraloid solution of 2–10%. Mat no. 0002 has been consolidated with Archeo-Derm for comparison. Both resins produced good results, although the weakly concentrated Paraloid solutions penetrated more easily into the material than Archeo-Derm did. Both sets of objects were covered with polythene during the application of the resins in order to slow down the rate of evaporation.

The second type of twined matting is distinguished by bundles of soft material, functioning as stakes, which have been tied together by two S-paired grass strings (see Figures 9.21 and 22). The strings are in all cases zS2 strings. The two most important items made in this technique are the nearly complete mats, nos. 0003 and 0006. Although made in the same technique, they differ remarkably in appearance. No. 0003 is a finely made mat with a total width of 370 mm and two strengthened side edges (Figure 9.21). The distance between two weavers is 50.1 mm; the stakes

fit close to each other and are 6.4 mm wide. The spin and ply are tight (CI of spin = 45, CI of ply = 31), but irregular. The side edges have been strengthened by alignment with a separate zS2 string.

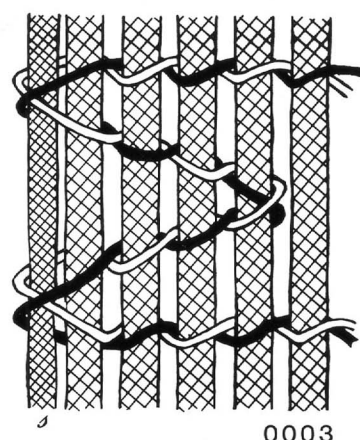


Figure 9.21. Twined matting, type 2 with side edge.

The results of a preliminary identification of the fibres from 0003 are that the bundles consist of grass, probably *Desmostachya bipinnata*, and palm fibre, probably the deteriorated leaves of the *Phoenix dactylifera* (Date Palm). The leaf of the Date Palm can develop into very fine and soft fibres when nothing more than the *sklerenchyma* is left. The identification is based on epidermis slides but needs to be confirmed by further investigations in the laboratory.

Mat no. 0006 is, by contrast, much larger and coarser. Its dimensions are 830 by 760 mm. No edges are present. The distance between two weavers is 85 mm; the stake bundles are 12 mm wide. The zS2 strings that have been S-paired (like those from mat 0003) are coarse in appearance, and the CI of ply is only 25 and irregular. Strengthening has been achieved by inserting a double row of weavers. This coarse type of matting can be made very quickly and in large quantities, the result being a large mat, without real strength, which can be easily undone. Peet and Woolley found much of this kind of coarse matting, classifying it as roofing material (COA I: 57–59). Sometimes the only parts of this type of matting to remain are tiny “bristles” that protrude from the weavers. They are the ends of the stakes and the only parts of the stakes to survive. Usually the pairing has been very tight in these cases.

The large quantity of fragments of this type of matting show a repetition of the technique, similar to that of mat no. 0006. The double row of weavers frequently appears. Only one fragment (0287) gives some additional information on the technique of production. This is a small piece of transverse edge, in which the technique used to fasten off the grass bundles is similar to that of the side edges of twined matting type 1: the strengthening is achieved by alignment with a zS2 string (see Figure 9.22). Fragment 0216 is an example of the application of the same technique in a different material: the stakes have been formed by a stiff material, probably the undeteriorated leaves of the *Phoenix dactylifera*, while the weavers are the usual grass rope.

The condition of the mats is reasonably good, but they have been distorted by long burial in sometimes contorted positions. Reshaping by means of slow humidification has, therefore, been essential for most of them. Mats nos. 0003 and 0006 have been treated with the PEG/formaline solution (see section 9.2.2.3). This has resulted in a slight darkening of the objects. In the case of no. 0006 this was from a grey-brown to a reddish-brown. No gloss appeared. After treatment the mats were temporarily placed outside the magazine in order to dry thoroughly.

Mat no. 0003 was found in the open area between the enclosures in West Street 1 and West Street 2/3; no. 0006 was found in West Street 2, Area ix. In addition to the wood and roofing materials, several interesting objects occurred in West Street 2. At least three clews of soft fibrous material, probably grass or deteriorated palm leaf, were found with pieces of this second type of

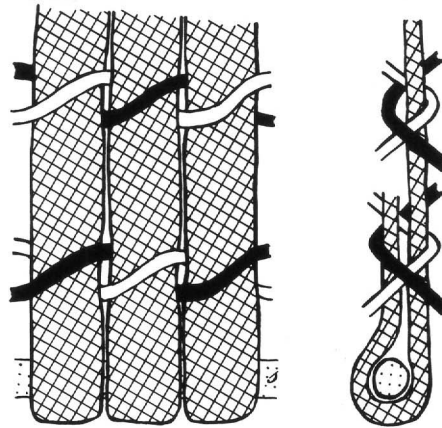


Figure 9.22. Transverse edge with strengthening, twined matting type 2.

twined matting in the middle. It would seem that in the process of mat making, the producer stopped his/her work and then rolled up the material as if to continue later on. This detail would point to the home production of mats in West Street 2. It might even point to an industry making mats for other parts of the village. This would also explain the large quantity of twined matting of type 1 in this area already discussed. That they could have then blown from the roof once the village was abandoned does become less likely, however, for West Street 2/3 did not possess a staircase, so that access to the roof would have been difficult. The corollary to the theory that the mats were being made here is that Area ix in the West Street 2/3 annexe was the place of manufacture, and Area v in the West Street 1/28 area could have been another. The loose mats in Area vi would be the remains of a stack of finished mats against the south wall of the West Street 2/3. The variety of different self-edges could argue for or against this hypothesis. One producer is more likely to make one kind of self-edge than six. On the other hand, we might think of the enlarged house West Street 2 and 3 as a small workshop in which more than one producer worked. To find confirmation or denial of this hypothesis a study needs to be made of the matting that has been found over the whole of the domestic area of the Workmen's Village as well.

The third and fourth types of twined mats occurring at the Workmen's Village use the same kind of cord for both stakes and weavers, in all cases simple grass zS2 string. The difference between the two types is just the space between the weavers. Six fragments have been found which have cordons of double S-paired weavers. In the case of no. 0054 (five fragments) the distance between two cordons is 48 mm. The stakes fit closely. No. 0122 is clearly of the same type of twined matting, but the surviving fragment is too small to contribute additional information. In the case of objects nos. 0288 and 0301, the weavers are very closely fitted, as are the stakes, showing that a strong type of matting had been developed.

The weavers have been S-paired in types 3 and 4, the Cord Indices for spin and ply being quite low (the average spin value is 20, the average ply value lies around 25). It is the steady S-pairing that gives the objects the appearance of high-quality matting. Both of these types of twined matting provide a material that is especially suitable for use as bags, something illustrated by several small bags in the open technique type 3 on display in the Egyptian Museum, Cairo.<sup>9</sup> Modern Egyptian donkey saddles are also made from a matting which is structurally the same as the Amarna fragments 0288 and 0301. Object no. 0301 was re-shaped by humidification. After thorough drying, it was treated with a solution of 10% Paraloid in acetone; blotting paper, impregnated with 4% boric acid was used as a protection against mould.

<sup>9</sup> Egyptian Museum, Cairo, accession no. 49908, on display in Corridor 39.

The fifth type of twined basketry is represented by only one fragment (no. 0011). This piece is of high quality and beauty, for the stakes are only 2.1 mm, while the weavers are only 2.5 mm wide. The weavers have been paired successively S, Z, S, and S, which creates a row of horizontal V-shapes, which was probably meant as decoration. Because of its high quality and small size, no sample was taken so that identification will have to wait until a future date. This small matting fragment was found in the surface sand, east of the village, on top of Building 250. It could have been brought up from ancient deposits as a result of the modern disturbance to which the area has been subjected, but the possibility of its being a modern fragment cannot be excluded.

#### 9.3.3.2 Miscellaneous matting techniques

Five objects represent three different matting techniques but with such small samples as to exclude the possibility of comparing different objects in the same technique. It is known from other sites that more techniques than these three were used in ancient Egypt, and the variety in details of each technique is considerable (Gourlay 1981).

*Coiled matting:* coiling is a basketry technique which has been frequently used for very different types of baskets. Until now only one fragment of coiled basketry has been recorded (no. 0302b), and this is part of a combination of two originally unrelated objects which at the time of excavation in 1986 was classed as a basket, but appears to be a composite object consisting of a coiled mat or bottom of a basket and a ring. The ring has now been re-classed as a pot stand (see Section 9.3.3.4). The coiled object is probably the bottom of a basket, for the outer coils have not been finished, as one would expect for a mat. On the other hand, no transition to a rim is visible either, but, to the author's knowledge, few coiled mats have been found. The ring and the coiled object were found on top of each other, a fact suggesting that the two objects had been re-used and re-combined to make, for example, a temporary container, a stool or an elaborate pot stand. The object comes from West Street 2, from an undisturbed area of rubble deposit (AR IV: 5, Figure 1.3, Stage 1).

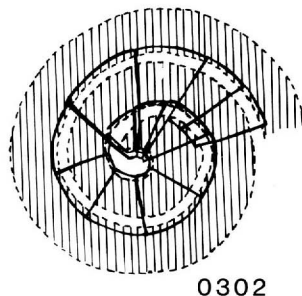
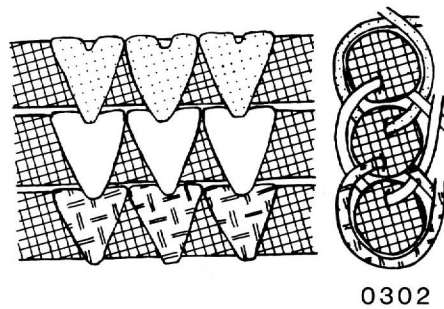


Figure 9.23. The “snail-centre”.

The technique of coiling used is very simple. The coils have been stitched through the last bundle as well as through the last row of coils, the centre being a simple “snail-centre” (see Figure 9.23). The bundle is made out of grass, while the coils consist of strips of palm leaf. Samples of both have been taken and are awaiting fibre identification. The condition of the coiled fragment is poor. It has been attacked by termites, and the coils have disappeared from the bundles in many places. The mat has been cleaned with brushes and with 70% ethanol. Two very small coiled fragments have also been found which should be mentioned here: no. 0220 is a fragment of an elongated coil, which could have been part of the centre of an oval basket or mat; no. 0275 is a half-circle fragment, which may have been part of the centre of a round basket or mat.

*Looped matting:* a technique found at the Workmen's Village in connection with roofing





**Figure 9.24.** Technique of coiling, illustrated by object no. 0302b.

fragments only is a type of very open matting, which consists of loops of palm leaf (objects no. 0303, at the time of excavation in 1983 classed as a jar stopper; and no. 0344). Figure 9.25 is a photograph of both the “jar stopper” and the roofing fragment, whilst Figure 9.27 shows a schematic drawing of the technique.



**Figure 9.25.** Roof matting, objects no. 0344 and no. 0303.

This type of matting has been used as reinforcement to a mud roof. The fragments were found in a dump from the 1922 excavation of Peet and Woolley. Precisely the same matting type has been noted in the Egyptian Museum, Cairo,<sup>10</sup> but this piece has not been covered with mud, a situation which shows that this type of matting, although looking quite fragile, is in fact a sturdy type of

<sup>10</sup> Egyptian Museum, Cairo, accession no. 46874, on display in Room 12.

matting. It owes this degree of strength to the type of material used and the working technique. The material (probably the leaf of the *Phoenix dactylifera*, Date palm) has been s-twisted. This twisting gives the loops a certain stiffness which holds them in place.

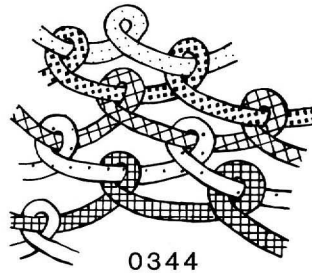


Figure 9.26. Schematic drawing of looped matting.

Several groups of s-twisted palm leaf loops have been found, which fit this type of matting. Group no. 0052 consists of 20 pieces of looped palm leaf; group no. 0260 contains 26 loops of palm leaf which have in some cases the connections typical for the looped matting. Both groups come from West Street 3 and have been found in an undisturbed layer of rubble from the roof. A palm leaf loop, string, and ring have also been found in several disturbed units from West Street 3 (Middle Room and the two rear rooms). Only four palm-leaf loops have been found in Gate Street 8 in the Rear Room North and South. They differ in appearance from the loops coming from West Street 3. If we take the data given above together, it would seem reasonable to suggest that either the roof of West Street 3 had been reinforced by looped matting or that this type of matting had been produced in West Street 3.

*Bound matting*: two fragments from the same unit (no. 0308) appear to represent a type of matting unknown to the author until now. The small fragments have a coarse construction which could be matting, but the size of the fragments and their uniqueness urge extreme caution in identification. This possibly new technique has been named “bound matting” because of the binding at the edge of the fragment (see Figure 9.27). The material has not been determined, but it seems to be a grass. It could, for example, be the straw of *Hordeum* or *Triticum* species. The fragments come from a disturbed deposit from Area viii in West Street 2.

#### 9.3.3.3 Brushes

Four brushes have been recorded, all produced according to the same principle: a core of rough fibres, shaped by means of binding. The sizes differ, as do the methods of production. Brush no. 0290 is quite large (length 300 mm, width 75 mm, and 33 mm thick). The core has probably been made out of the thick fibres from the ribs of the *Phoenix dactylifera* (Date Palm). The object has been shaped into a four-finger brush by weaving S-twisted palm leaf (again probably *Phoenix dactylifera*), around four bundles of fibre. The handle has been made by winding the s-twisted palm leaf around the lower part of the brush. A fibre sample has been taken, but the fibre identification has not been completed. Figure 9.28 shows a schematic reconstruction.

The fibre of the core is in a reasonable condition, but the twisted palm leaf is friable, and the winding is incomplete. Consequently the brush has a tendency to fall apart. It has been cleaned and subsequently vacuum-sealed as a means of support. It was found in an undisturbed area of rubble filling in the Outer Hall of the Main Chapel. It had been made with care, the twisting of the palm leaf and the winding being both regular, but at the same time it is not an elaborate artefact. It would thus seem unlikely to have had any special function and could easily have been used for normal cleaning work, i.e. for quite coarse brushing of floors, etc.

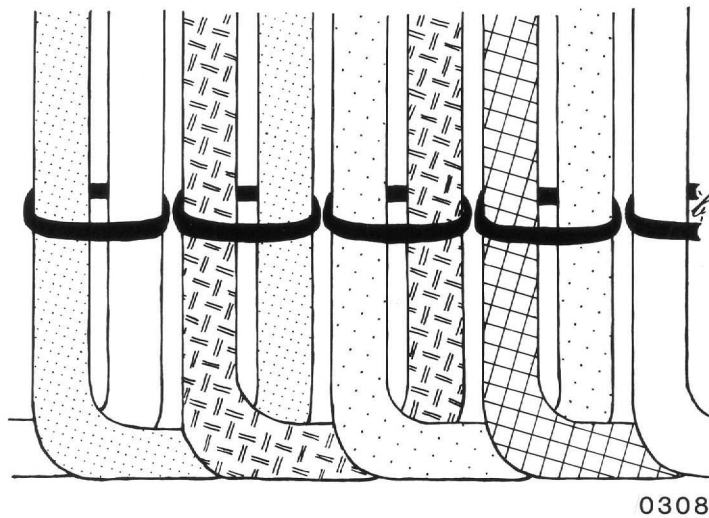


Figure 9.27. Bound matting; b = binding.

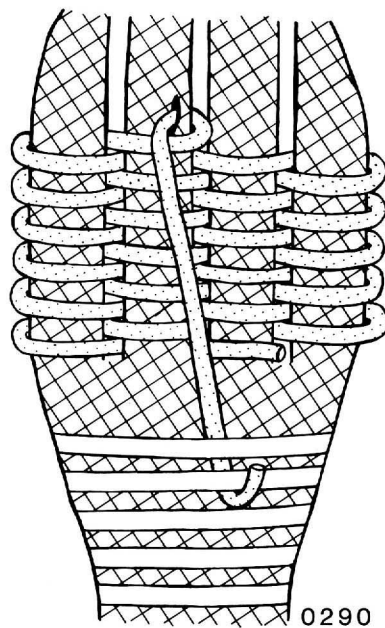


Figure 9.28. Schematic reconstruction of brush no. 0290.

Figure 9.29 shows a drawing of brush no. 0291. It is only 92 mm long and nearly round, with a diameter of 43 mm. It was found in an undisturbed area of rubble in the northern half of the Middle Room of Gate Street 8. The working edge of this little brush is slightly worn. White debris (which is probably gypsum) is visible all over the working edge and between the fibres of the core. This would suggest that it had been used as a paint brush for whitewashing walls. The core of the brush has been made from a bundle of fibres (probably from the ribs of the *Phoenix dactylifera*), tied together in the middle and then folded backwards and fixed by binding with a zS2 string (see Figure 9.30). The condition of this brush is good. Although the fibres are quite brittle, the object itself is in a very sturdy condition.

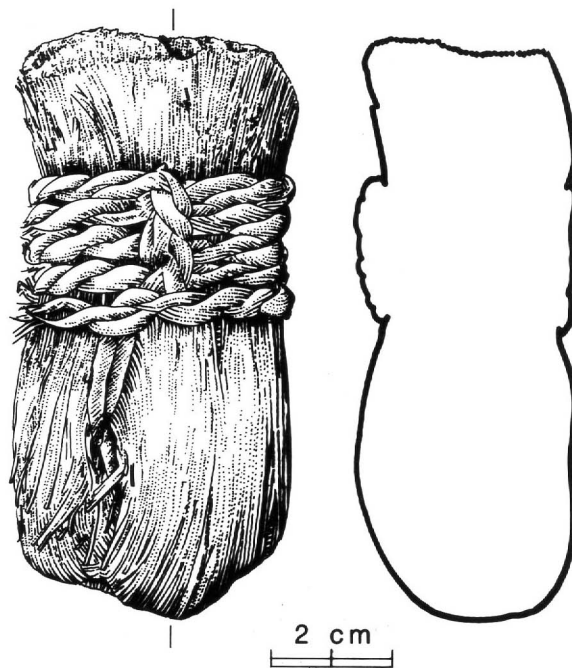


Figure 9.29. Brush no. 0291. Drawing by Barbara Garfi.

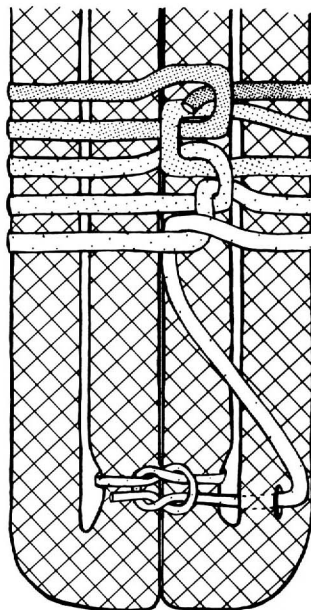


Figure 9.30. Schematic drawing of brush no. 0291.

Brush no. 0300 is very similar to brush no. 0291: a core folded backwards and fixed by zS2 string. However, both the production and the material betray a brush of lesser quality. The elaborate binding of brush no. 0291 has been simplified in brush no. 0300. Its material is grass, probably *Desmostachya bipinnata*. No white substance is visible, although the working edge is also worn. It was found in Gate Street 8 on the floor of the Middle Room in an undisturbed unit. This brush would again appear to be a multi-purpose implement and seems especially suitable for

cleaning smaller surfaces.

Brush no. 0295 was also found in Gate Street 8, in an area of rubble in the Front Room South. It is virtually undamaged although heavily worn and represents a beautiful, elaborate object, made with extreme care. It is still strong and notably superior both to brush no. 0290 and to modern, locally made brushes. The core consists of a wooden pin, 188 mm long, with a diameter that decreases from 25.3 mm to 5.8 mm, snugly fitted into a circle of fibres of palm rib (probably *Phoenix dactylifera*). The three-fingered brush has been moulded into shape with a binding of zS2 string with a diameter of 4.8 mm. The wooden core, noted above, is not the remains of a long handle. It has been clearly finished off at the low end of the brush and is obviously meant for strengthening the fibre handle.<sup>11</sup> Figure 9.31a/b shows both a graphic and a schematic drawing of this object. It seems to be too strong and well made to have served as a simple tool for brushing the floor but would have been more suited to cleaning food vessels.

#### 9.3.3.4 Potstands and pads

Two ring shapes have been found that, although of a different make, seem to have had the same use. Object no. 0289 is a ring with an outside diameter of 170 mm, an inside diameter of 120 mm, and a height of 22 mm. It consists of a bundle of grass, around which a zS2 string has been wound. The string is of a good quality with a regular spin and ply and an average Cord Index (CI spin = 26, CI ply = 33). Both bundle and cord have probably been made out of *Desmostachya bipinnata*. In order to avoid damage no fibre sample has been taken. The ring comes from the Outer Hall of the Main Chapel, from amidst the undisturbed rubble of the collapsed walls. It might have been used as a head ring for carrying pots, but in view of its size it is more plausible that it was used as a pot stand, probably for the support of shallow bowls. This interpretation is strengthened by the finding of a circular depression in the floor of the Outer Hall (unit [884]) containing the impression and some remains of a circular ring of similar kind (AR I: 16, Figure 2.1; 20).

A second pot stand (no. 0302a) was found with the coiled-matting fragment from West Street 2. This one is also ring-shaped and consists of a grass bundle around which s-spun grass with a diameter of 11.6 mm has been wound. Samples of both bundle and winder have been taken. The spin is regular and has a Cord Index of 34. These indications of a well-made object are not matched by its irregular shape. Furthermore, it has been mended with s-twisted palm leaf and at one point a zS2 string has been tied around the bundle. This further strengthens the idea that the combination of objects 0302a and b was a re-use of two objects that originally did not belong together. A very similar ring, also made out of a grass bundle with broad s-twisted grass strands wound around it, is on exhibition in the British Museum.<sup>12</sup> With the objects 0302a and b were the remains of small reddish insects. These have been identified as *Gibbium psylloides*.<sup>13</sup>

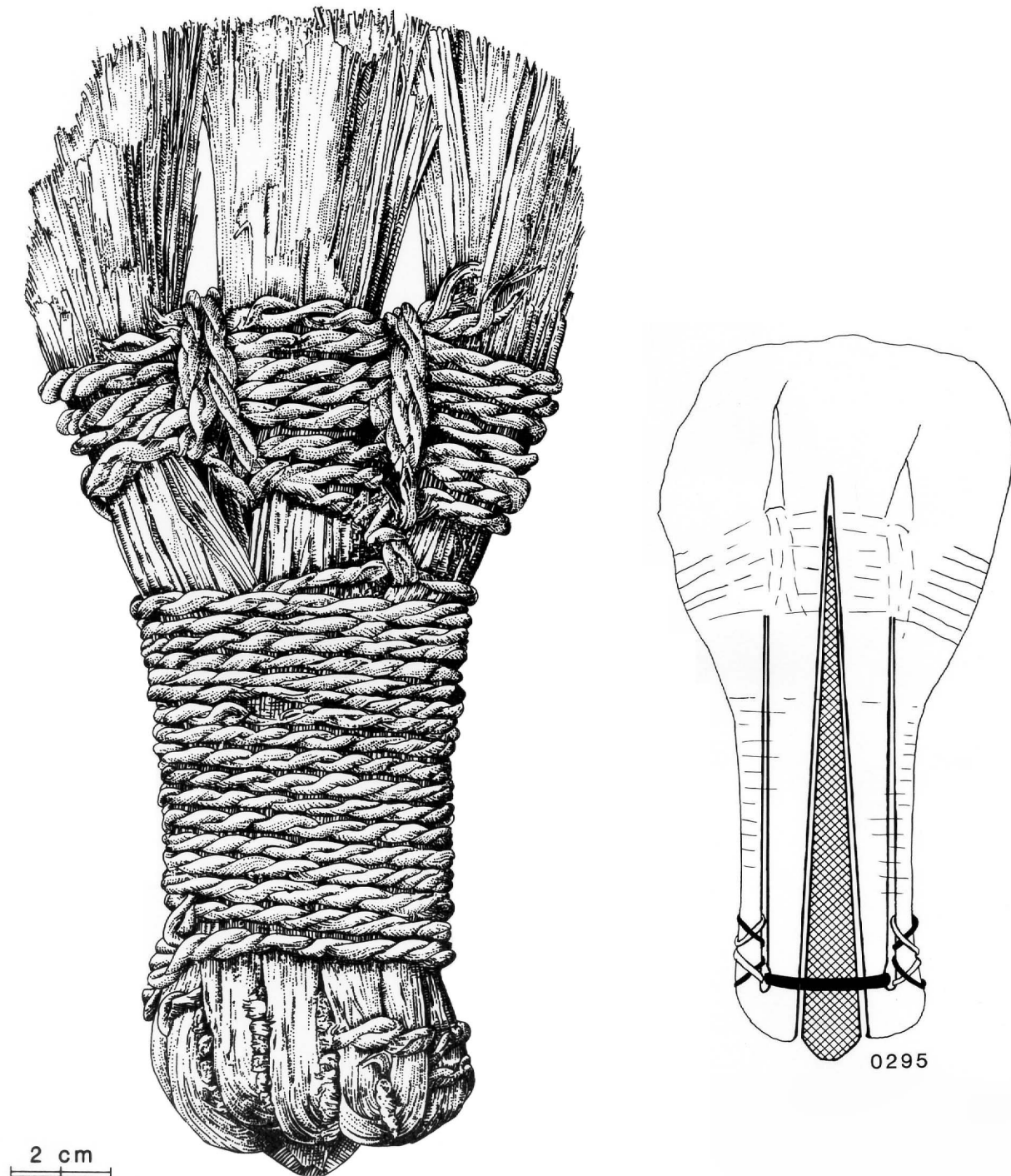
Four pads have been recorded (nos. 0296–0299), each one slightly different. Figure 9.32 shows all four of them, and Figure 9.33 highlights one (no. 0296). They have all been made out of grass (probably *Desmostachya bipinnata*) and in each case consist of a grass bundle with cord wound around it. The winding has been done with coarse strings in reversed technique (sZ2). Obviously we are dealing with multi-purpose objects which seem to have been made quickly whenever needed, without strict attention paid to their appearance. The only approximate uniformity lies in their sizes: with a deviation of approximately 10 mm, the diameter of these

<sup>11</sup> A similar brush with wooden core is on exhibition in the Rijksmuseum van Oudheden (R.M.O.) in Leiden (Egyptian Department, glass case containing weapons, tools and furniture). Although not as elaborate as the Amarna brush no. 0295, it is of interest because of the lesser degree of wear. The handle has a length of 123 mm; the brush part has a length of 467 mm; and the length of the wooden core is 118 mm. It has been made from a grass species (probably *Desmostachya bipinnata*).

<sup>12</sup> British Museum, accession no. 23079, 18th Dynasty, from Thebes. British Museum, accession no. 55133 is a pot stand of a different make, excavated at Amarna, see COA I: Pl. XXI.

<sup>13</sup> Identification kindly made by I.R. Harrison of the Zoology Department, University of Nottingham, through the mediation of Dr Paul Nicholson and D. Quicke (both of the University of Sheffield). Mr Harrison writes: "specimens were *Gibbium psylloides*, stored product beetle, often found in mummies. They feed on vegetable matter and probably seek the bandages as a food source. They are commonly called the hump-spider beetle and do look rather like small ticks."



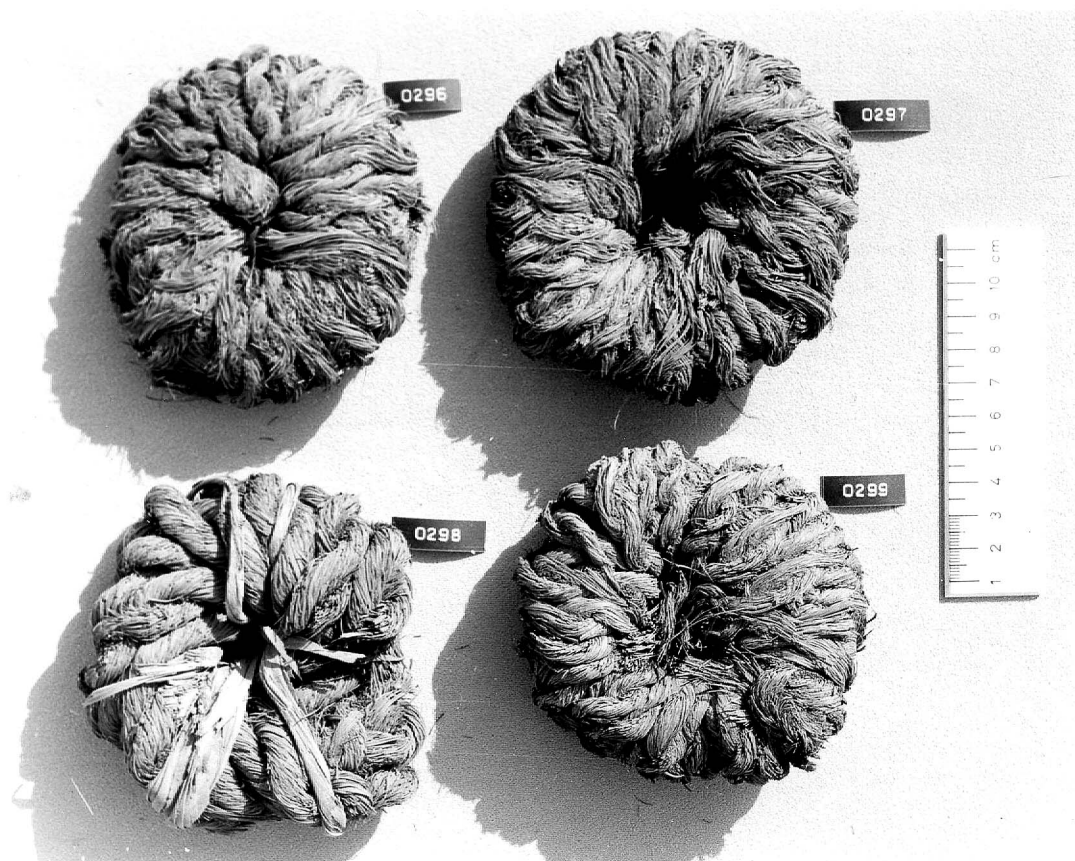


**Figure 9.31.** Brush no. 0295. Drawing (left) is by Barbara Garfi; drawing (right) is a schematic rendering.

pads is 100 mm. Apparently no attempt has been made to achieve perfectly round objects. One of them (0298), however, has either been repaired with palm leaf strips or the grass cord winding was once covered with palm leaf. Both possibilities show a certain care for the object.

As can be seen in Figure 9.32, the holes in the middle are different in size to nos. 0297 and 0298. They have been “stuffed” with the twisted ends of the wound string in the case of no. 0296. The hole of no. 0299 is stuffed with separate fibres, possibly the remains of a very





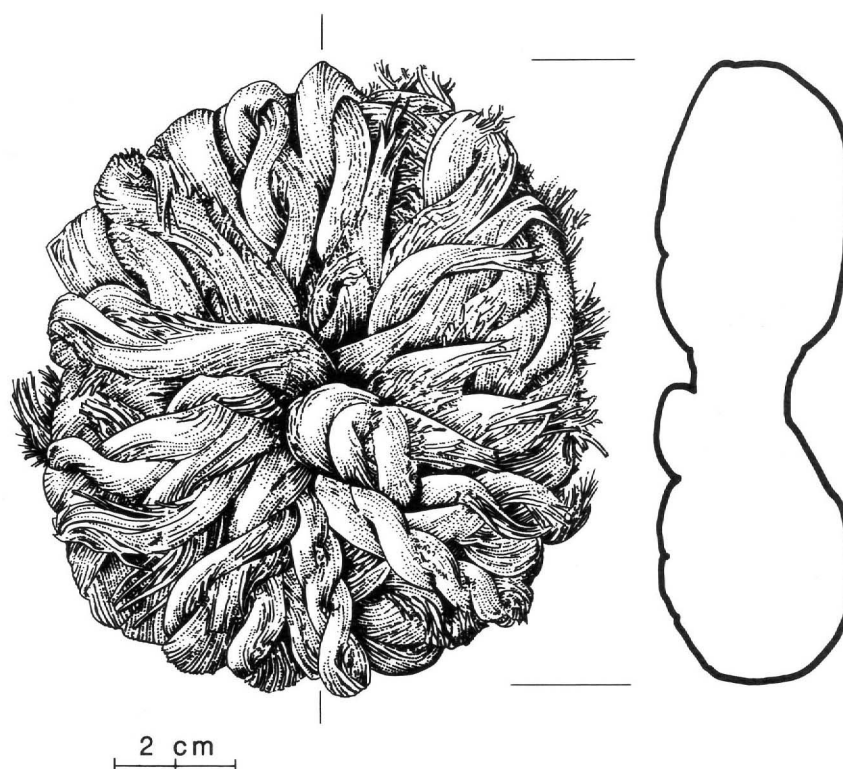
**Figure 9.32.** Pads nos. 0296–0299.

deteriorated rope. The four pads come from two different units in Gate Street 8: 0296 and 0299 come from disturbed surface material over the whole house 0297 and 0298 come from a very disturbed area of rubble in the Front Room. Because of the disturbance it is virtually impossible to reconstruct their original function from the surroundings. From the objects themselves it is possible to conclude that they were used as head stands, i.e. grass cushions under pots, dishes etc., which were carried on the head, for the protection of the head and to retain the balance of the objects. The pads could also have been used to stop pots from bouncing against each other and breaking, or as a stuffing put under or between objects being moved or stored in order to keep them in the desired position. The three pads with the holes in the middle (all except no. 0296) could have functioned as large stoppers in that a cord could have run through the hole and then been fixed by a knot at the end which, if large enough, could have served as a knob.

#### **9.3.3.5 Miscellaneous basketry objects**

Ten objects have been found which cannot be classified within one of the sections above. These are mostly hooped twigs around which palm leaf has been wound. In all cases the function of these objects is obscure. Without exception they were found in Gate Street 8, but this could be coincidence, insofar as a large part of the total collection remains to be studied.

I should like to highlight the most interesting of the ten items: nos. 0066, 0265 and 0267 (2x), all bent twigs with palm-leaf wrapping around them. They might have been used in the strengthening of mud seals, although a brief study of the mud seals found in the Workmen's Village did not reveal any examples of a seal strengthened in this way. Nos. 0266 and 0273 are straight sticks of different sizes (diameters respectively 6 mm and 13 mm, lengths respectively 90 mm and 190 mm). These have been aligned with two strips of palm leaf that run on both sides of



**Figure 9.33.** Drawing of pad no. 0296 by Barbara Garfi.

the sticks and along the full length. The sticks and the palm-leaf strips were then covered by palm leaf which was wound over the whole length. Both were found in disturbed areas, the first in Rear Room North (area around the staircase), the second in Front Room North. They could have been handles from large carrying baskets.

#### 9.3.4 Associated finds

As mentioned above, a brief study of the mud seals has also been made. This resulted in the discovery of the fragment classed as a mud seal (no. 0303) which appeared to be part of a roofing fragment with looped matting (0344, see section 9.3.3.2). A short study was carried out on the roofing fragments, but the results will be published later, together with information on the roofing materials used (i.e. unworked reeds, wood, sedges, etc.).

A third associated field is the study of string impressions on pots and potsherds. These impressions originate from the support that strings gave to the pot during the drying process, a practice which gave rise to the use of string impressions as decoration. In total, 79 string marks have been examined. The strings used for this decoration/support are without exception S-plyed and whenever discernible z-spun. The Cord Index of ply differs remarkably and covers the whole range from 19 to 55. The zS2 strings were of a low or average quality. It is impossible to identify the raw material from mere impressions, but it is possible to say that sedges and palm leaf have never been used. The size, shape, and direction of the fibre impressions suggest that the material used was either a grass or the shaft fibres of the *Phoenix dactylifera*.

#### References

- Adovasio, J.M. (1977). *A basketry technology; a guide to identification and analysis*. Chicago.  
Ashley, C.W. (1985). *The Ashley book of knots*. London.  
Crowfoot, G.M. (1956). "Textiles, basketry and mats", in C. Singer, E.J. Holmyard and A.R. Hall, ed., *A history of technology*, I. Oxford.

- Davies, N. de G. (1943). *The Tomb of Rekh-mi-rē' at Thebes*. Volume II. New York.
- Dowman, E.A. (1970). *Conservation in field archaeology*. London.
- Forbes, R.J. (1964). *Ancient technology*. London.
- Gardiner, A.H. (1982). *Egyptian grammar*. Oxford. 3rd edition.
- Gourlay, Y.J.-L. (1981). *Les sparteries de Deir el-Médineh, 18<sup>e</sup>–20<sup>e</sup> dynasties*. Paris.
- Kemp, B.J. (1981). "Preliminary report on the el-'Amarna Expedition, 1980." *JEA* 67: 5–20.
- Westendorp, A., A.D. Van 't Hoog, and W.D.J. Tuinzing (1985). "Het Vlechten van Ovale Manden met Teen." *Stichting Wilg & Mand*. IJsselstein.
- Winlock, H.E. (1932). *The Tomb of Queen Meryet-Amūn at Thebes*. New York.
- Wright, D. (1983). *The complete book of baskets and basketry*. Devon.

#### Acknowledgements

I should like to thank the following institutions whose financial support made my participation of the 1987 expedition to Amarna possible: The Theological Department of the University of Amsterdam; The Amsterdamse Universiteits Vereniging; The Stichting Dr Hendrik Muller's Vaderlandsch Fonds. Finally I should like to thank Willem Vogelsang, Gillian Vogelsang-Eastwood, and Hans Barnard for their support and for all the work which they have done.