

# The Kahun/el-Lahun sling: Analysis and Pointers for Reconstruction Approaches

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## Abstract

The findings on the analysis of a sling excavated in Kahun/el-Lahun (Manchester Museum Acc. No. 103) are reported. The dimensions of the key components are given. It is found that the pouch of the sling composed of orthogonal warps and wefts, with the warps being at least partially twined. Also, pointers for future reconstruction attempts are given.

## 1 Introduction

Slings, one of histories earlier projectile weapons, have seen widespread and diverse use throughout many cultures. Therefore, different types of slings exist which are manufactured with a broad range of textile techniques. However, knowledge about and/or detailed analysis thereof is somewhat lacking. In this article I will focus on one particular family of slings, the slings from the pharaonic period in Egypt, and within this family on one specific sling, a sling from Kahun/el-Lahun. To the best of my knowledge, there are four slings from the mentioned time period. There is a pair of slings from the tomb of Tutankhamun (Cairo Museum No. 61572 and 61573, Burton Photo. No. P1324, Carter handlist 585y) [1]<sup>1</sup>. A further sling was excavated by W. M. Flinders Petrie in Lahun. It is dated to 800 B.C. (22nd dynasty), currently in the Petrie Museum (UC6921) [2, 3] and previously analysed by E. M. Burgess [4]. Last, there exists a second sling from Lahun. It was also excavated by W. M. Flinders Petrie. It is dated to 1900 B.C. (12th dynasty) and on display in Manchester Museum (Acc. No. 103) [5, 6]. All four slings seem to be of similar construction. The focus in this report will be on the last mentioned and oldest sling. This sling was analyzed and the findings are reported here.

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<sup>1</sup>There is speculation about possibly a further pair of slings visible in Burton Photo. No. P0086 and P0087, described as belt (?), Carter handlist 21kk. If a sling, it would be a sling with at least two pouches, which is highly unlikely.

## 2 Labelings and Measurements

The labeling of the sling as well as the respective measurements can be seen in Figs. 1 and 2. The sling has a retention cord with retention loop. The release cord is also present, although slightly damaged. To point out certain positions in the pouch the terms left/right as well as upper/lower half of the pouch will be used as designated in Fig. 1. Additionally, the corresponding row number as labeled in Fig. 2 will be given when necessary. The measurements were made with a caliper and measuring tape. While measuring, the sling was never pinched. Therefore especially the diameters of the strings as well as given thicknesses must be be regarded as upper limits. Unfortunately, I forgot to measure the exact length of the release and retention cord. I estimate the distance from the end of the pouch to the retention loop to about 55 cm. The threads going in longitudinal direction along the pouch will be referred to as warps, the threads or strings going from left to right across the pouch will be referred to as wefts. I want to stress that by calling these threads warps and wefts I do not intend to make any implications about how and with which technique the pouch was made. Their function may easily have been inversed during manufacturing.



Figure 1: Full view of the specimen with the measured distances. It is possible that the three balls shown together with the sling are not slingstones as they are rather small (Image courtesy of Manchester Museum, University of Manchester, labels added).

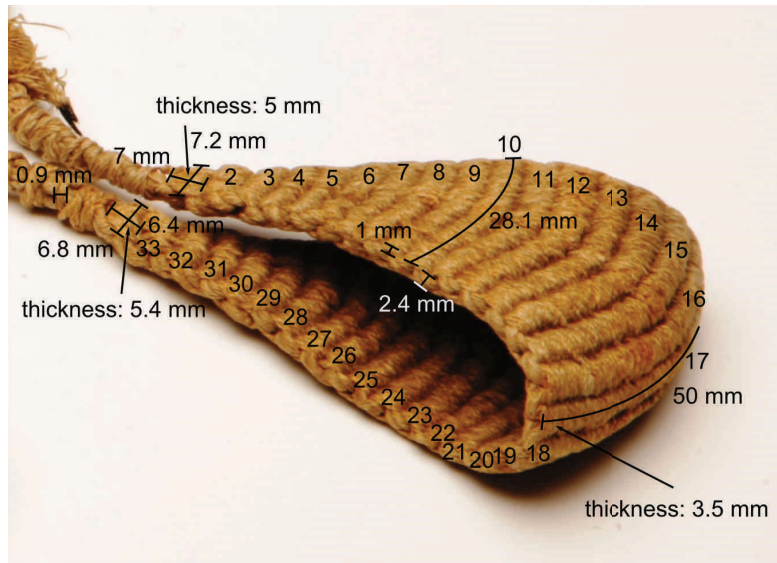


Figure 2: Closeup of the pouch with measured distances. The pouch is divided into rows, which are enumerated from 2 through 33. Row 1 and 34 are not labeled, but the respective widths and thicknesses are indicated (Image courtesy of Manchester Museum, University of Manchester, labels added, cropped).

### 3 General Impressions

The sling looks well and robustly made. Both cords are still easily pliable. However, the pouch itself is stiff and stays in the shape seen in figure 2. Especially on the inside dirt residues can be seen. Despite its old age and being excavated more than 100 years ago it is still in a very good condition. From personal experience, the slings length is on the shorter side for long distance shots, but absolutely fine for target shooting up to several tens of meters. The pouch will hold stones up to a weight of ca. 100 g, possibly even a bit heavier. This should be absolutely sufficient for hunting e.g. birds, waterfowl and other small wildlife.

### 4 Detailed Analysis

#### 4.1 Retention and Release Cord

The retention and release cord consist of a 2 ply Z-twist with an angle of 30-35 degree. Each ply (S-twist) is made out of a number of thinner threads. The thinner threads in the retention cord have a diameter of ca. 0.8 mm, and are Z-twisted with 3 plies (see Fig. 3) at an angle of approx. 40 degrees. In the release cord, the thinner threads are S-twisted and most probably 2 ply. Therefore, the threads of retention and release cord are not of the same type. There seems to have been some repair on the release cord as the end is made out of other material, possibly raw plant fibre (see Fig. 4).



Figure 3: Close-up of the retention loop. On top the frayed end of the release cord is visible. On the bottom of the retention loop a frayed thinner Z-twisted thread is visible, where 3 plies with S twist can be seen.



Figure 4: Close-up of the release cord. A transition to a different material is visible. In the brighter material, possibly raw plant fibre, no thinner threads can be easily identified. The dark material consist of S-twisted thin threads.



The wrappings at the transition pouch-release/retention cord consist of thread with a similar diameter as the thinner thread in the retention/release cord. They are partially made with 2 ply and S-twist threads, partially with Z-twisted threads. It is rather intriguing that the wrappings of the cords are made with threads of the opposing twist than used in the cords themselves.



Figure 5: Close-up of the transition from retention and release cord to the pouch. The top cord is the release cord, which is wrapped with Z-twisted thread, the bottom cord is the retention cord, which is wrapped with S-twisted thread consisting of two Z-twisted plies.

## 4.2 The Pouch

### 4.2.1 Characterization of the Used Threads

The warps of the pouch are mostly Z-twisted threads, similar to the 3 ply thread mentioned above. The thread used is slightly smaller than 1 mm. Due to the condition of the string it is somewhat difficult to tell if S-twisted strings are present. In Figs. 6-8 several such locations are indicated. It was however not possible to follow one of these S-twisted strings over two or more rows in the body of the pouch. There are probably more occasions of S-twisted threads. The weft seems to be a different material. There are two "counterpropagating" 2 ply Z-twisted wefts. Each ply itself is S-twisted. See the damaged row 18 in Fig. 8 or Fig. 9. It is somewhat thicker, with each weft having a diameter of roughly 2.4 mm.



Figure 6: Close-up of the lower side of the pouch. Visible are rows 34 through 26. Marked in red is one occasion of an S-twisted thread in row 34.



Figure 7: Close-up of the lower side of the pouch. Visible are rows 26 through 18 (damaged part). Marked in red is one occasion of an S-twisted thread in row 20.



Figure 8: Close-up of the lower side of the pouch. The focus is on row 18, which is damaged. Marked in red is one occasion of an S-twisted thread in row 17. The weft is visible in row 18.



Figure 9: Close-up of the left side of the pouch. Rows 1 through 7 are on top. The twist of the weft can be most easily seen between row 2 and 3.



#### 4.2.2 Construction of the Pouch



Figure 10: Close-up of the right side of the pouch. The weft is broken around row 25, marked by a red circle. The two outermost threads are 2 ply and S twisted, the individual plies are Z-twisted. It is visible that the two outermost warps twine around each other.

The warps of the pouch seem to be, at least partially, twined. See Fig. 10 where the right side of the pouch is shown. There, a part of the weft is missing and the warps are visible. Clearly, a Z-twining of the warps around each other can be seen. This twining of the warps is most probably also present on the opposing edge of the pouch, but more difficult to identify (see e.g. Fig. 11). Left and right border seem both to be Z-twined. For me it was impossible to tell whether the warps are also twined in the middle of the pouch due to the high density of the warps. For a reconstruction I would assume that the warps are all twined. This assumption is justified as a transition from twining to a plain weave would produce one cross where two warps from the front side would lay adjacent to each other without being separated by a warp from the backside. I could not find such a position. However, I could also simply have overlooked this tiny feature in this very dense piece. The assumption of twined warps is further supported by the observation that the ends of the pouch do not lie on top of each other; the upper end of the pouch is offset to the right. This indicates that the piece has a tendency to twist, which can be caused by the twining of the warps. In several reconstruction attempts I encountered this feature as well, the side depending on whether the warps were S- or Z-twined. Z-twining leads to an offset to the right, fully consistent with what is observed





Figure 11: Close-up of the lower side of the pouch. Rows 34 through 25 are visible. The left side of the pouch, as labeled in Fig. 1, is on the right.

in the investigated piece. It is particularly interesting that at the edge 2 ply S-twisted threads are visible, in contrary to what is observed in the body of the pouch. This is a feature on which one could follow up in further investigations. At the point where the weft is missing at the right side of the pouch around row 25 it is possible to estimate how dense and with what kind of pressure the pouch is made (see Fig. 12). There, the warps bulge outwards while no looseness at all can be seen in the remaining row. Therefore, the weft seems to compress the warps significantly. I tried to estimate the number of warps as I was not able to reliably count them. As mentioned, they are very densely packed, sometimes overlapping as well as disintegrating. For a reconstruction attempt I would settle for the following: For the first and last row 16 warps, counting warps both on front and backside of the pouch, and addition/removal of 8 warps in each row. In the four rows in the middle of the pouch I would leave the numbers of warps constant. This makes a maximum of 144 warps. However, this number can vary depending on the way of estimating (or counting) them. Addition and removal of the warps occurs most probably in the middle. An example of a position where this is possibly visible is shown for the lower side in Fig. 13. For the upper side I was unable to identify such a position. However, a "V-shape" of the rows is visible, which one would expect when adding warps in the middle (see Fig. 14). Overall, it is intriguing that many different types of thread and strings are used, both in the pouch as well as the rest of the sling. Partially, this was certainly done deliberately for functionality as observed in the different thickness of warp and weft. This ratio, given a fixed thread count and working tension, will define the shape of the pouch. Nevertheless, the different kinds of thin threads raises the question if possibly just any available odds and ends were used.



Figure 12: Close-up of the lower side of the pouch. The warps bulge out significantly in the left of the image, which corresponds to the right side of the pouch.

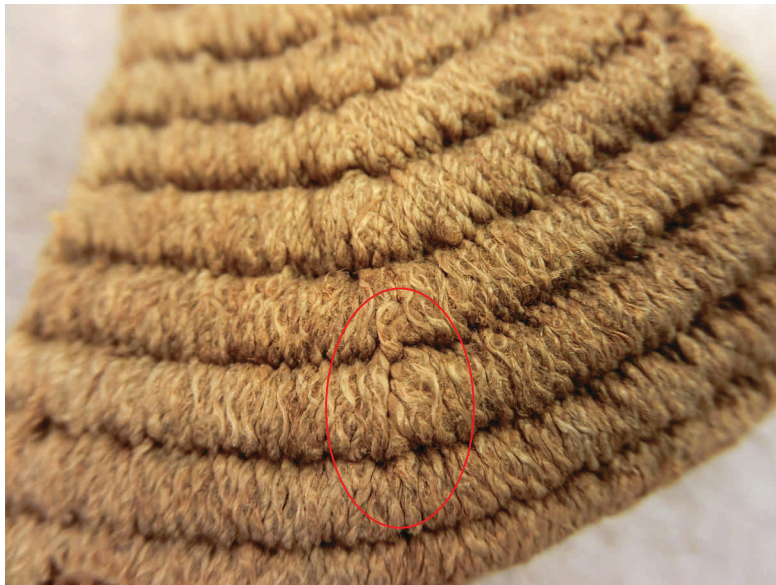


Figure 13: Close-up of the lower side of the pouch. The red circle is centered on row 20 and marks a place of possible addition of warps.



Figure 14: Close-up of the upper side of the pouch. A "V-shape" of the rows is visible.

#### 4.2.3 Connection of Pouch and Release/Retention Cord

The connection of the pouch to the release and retention cord is made by twisting the two counterpropagating wefts into one string. This can be seen in Figs. 15 and 16. Subsequently, there is a wrapping as described above (see Fig. 5). I'm unable to distinguish where the transition from the weft material to the cord material as observed in Figs. 3 and 4 occurs. Unfortunately I'm not in possession of detailed photographs of the region just after the wrapping where also some kind of knot can be seen. Also, I'm unable to identify if warps propagate into the cords. This may be the case especially at the connection to the retention cord. I assume that the wrappings have the function to stabilize the initial twisting of the wefts and therefore prevent any untwisting during use.





Figure 15: Close-up of the transition from retention and release cord to the pouch. The upper cord is the release cord.



Figure 16: Close-up of the transition from retention and release cord to the pouch. The upper cord is the retention cord.





Figure 17: Close-up of the transition from retention and release cord to the pouch. The upper cord is the release cord.

## 5 Classification of the Textile

For the classification the “Basler Systematik” by Annemarie Seiler-Baldinger [7] is followed, which classifies the textiles according to their way of fabrication. For the sake of consistency the german names of the techniques are used. According to this scheme, the pouch of the sling could have been made with a variety of different techniques. Following, a list of the different techniques which produce the same or a similar structure as observed in the piece are given.

- Zwirnbindiges Flechten über ein passives System
- Zwirnbinden des Eintrages oder der Kette
- Aktiv-passives Zwirnflechten
- Zwirnspalten

Please note that this list is most probably not complete. The following discussion of the individual techniques is deliberately rather short as a complete discussion would require detailed practical implementation of the techniques and would therefore exceed the scope of this work.

### 5.1 Zwirnbindiges Flechten über ein passives System

A passive system of threads is fixated by twining. Alternative names are plain or simple twining. See p. 39f in [7] for details. This technique can be executed without any tools. It is possible to manufacture a sling with this technique which resembles the original one in great detail. A description of the process is available online [8] or upon personal request. Therefore, contrary to the claim by Burgess, a reconstruction approach without a frame or other tools is conceivable.

### 5.2 Zwirnbinden des Eintrags oder der Kette

Twining of the warp or the weft is another option. See p. 59 and p. 70 in [7]. These techniques can produce identical structures as ”Zwirnbindiges Flechten”. A possible obstacle is the addition and removal of warps or wefts, which may be hidden inside the pouch. The reconstruction approaches by Burgess [4] and Potter [9], if modified slightly, could both be classified as weft twining. Instead of using weft twining it is also possible to produce functioning slings with warp twining (see [10]). However, adding and removing warps show clear signs on the side of the pouch, which are not observed in the actual specimen. Adding and removing warps could possibly be hidden in a different way, but the process seems rather complicated and less economic than other approaches.

### 5.3 Aktiv-passives Zwirnflechten

It is also called oblique twining. See p. 50 in [7] for details. Pairwise guided elements change their function, i.e. the elements are used both as passive system and active system while twining. They exchange their function at either the side of the piece or in its middle. This method may be ruled out as the point of interchange of active/passive system should be visible. This is not observed at the center nor the border of the pouch. At the border we clearly see that the active and passive system do not interchange their function. In the middle an interchange of the active and passive elements would lead to a visible border. However, none is observed.

### 5.4 Zwirnspalten

Ply-splitting is characterized that twined elements are split by each other as shown on p. 52f in [7]. Here, we would regard the elements along the sling (the "warps" as labeled previously) as the passive threads, which are split by the active ones (the "weft"). They would lay perpendicular to each other. While possibly yielding a comparable structure I do not know how one could implement this approach in practice. The approach by Burgess shows elements of ply-splitting as he mentions splitting up the string. However, he performs a "figure of eight weave"<sup>2</sup> with the individual plies contrary to ply-splitting, where the string would remain intact throughout the working process.

## 6 Conclusions and Outlook

In this report one (Manchester Museum Acc. No. 103) of four preserved slings from pharaonic Egypt is measured and analyzed in detail. As a key feature in the textile forming the pouch twining was identified, which is a similarity it shares with the sling in Petrie Museum (UC6921), despite having twisted instead of braided retention and release cords. The other two preserved slings in Cairo Museum are of similar appearance, which is an indication that sling manufacturing technique may not have significantly changed throughout time. To confirm this conclusion a detailed analysis and a direct comparison of all four slings would be required. Several textile techniques are presented with whose it is possible to create reproductions resembling the original item in great detail. To obtain a perfect reproduction further analysis of certain parts of the sling, e.g. the transition from pouch to retention and release cords, is needed. However, these details should only minimally influence the functionality of the reproduced sling. It is currently not possible to unambiguously identify a certain manufacturing technique. To resolve this question possible courses, beside the mentioned direct comparison of all available slings, are the analysis of other similar textiles, such as a belt (?) from the tomb of Tutankhamun (Carter handlist 21kk), finding depictions of the actual work or the excavation of possibly used implements. Also, there exists the possibility that a similar sling is found in a different historic or ethnographic context, thus connecting the family

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<sup>2</sup>In the terminology of this work it would correspond to twining.

of pharaonic egyptian slings with the vast diversity encountered worldwide. A further avenue for future research would be the context in which the sling was found, which possibly yields information about its former user.

## 7 Supplementary material

A collection of all pictures is available upon personal request.

## 8 Acknowledgements

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## References

- [1] <http://www.griffith.ox.ac.uk/gri/carter/585y.html> (accessed 29.10.2017).
- [2] Flinders Petrie, William Matthew, *Tools and Weapons*, London: British School of Archeology in Egypt (1917).
- [3] <http://www.ucl.ac.uk/museums-static/digitalegypt/textil/other.html> and [http://www.ucl.ac.uk/museums-static/ave/detail/details/index.no\\_login.php?objectid=UC\\_6921\\_&accesscheck=%2Fmuseums-static%2Fave%2Fdetail%2Fdetails%2Findex.php](http://www.ucl.ac.uk/museums-static/ave/detail/details/index.no_login.php?objectid=UC_6921_&accesscheck=%2Fmuseums-static%2Fave%2Fdetail%2Fdetails%2Findex.php) (accessed 29.10.2017).
- [4] Burgess, E. Martin, *An ancient Egyptian sling reconstructed*, J. Arms and Armour Society, **2**(10), 226-230 (1958).
- [5] Flinders Petrie, William Matthew, *Kahun, Gurob and Hawara*, London: Kegan Paul International (1890).
- [6] <http://harbour.man.ac.uk/mmcustom/Display.php?irn=320846&QueryPage=%2Fmmcustom%2FEgyptQuery.php> (accessed 29.10.2017).
- [7] Seiler-Baldinger, Annemarie, *Systematik der Textilen Techniken*, Basler Beiträge zur Ethnologie **32**, Basel: Ethnologisches Seminar der Universität und Museum für Völkerkunde (1991), ISBN 3-85977-185-X.
- [8] Gartmann, Thomas E., *Making Egyptian slings: A "No-tools" approach* <http://slinging.org/forum/YaBB.pl?num=1505851909/0> (accessed 29.10.2017).
- [9] Potter, Timothy J., *Tutankhamun Sling Tutorial* <http://www.seekyee.com/Slings/howtos/tut1.htm> and <http://www.seekyee.com/Slings/howtos/tut2.htm> (accessed 29.10.2017).



- [10] Gartmann, Thomas E., *Kahun (el-Lahun) sling: A Novel Approach*  
<http://slinging.org/forum/YaBB.pl?num=1360291032/0> (accessed 29.10.2017).