



STUDIES OF ANCIENT EGYPTIAN FOOTWEAR. TECHNOLOGICAL ASPECTS. PART XV. LEATHER CURLED-TOE ANKLE SHOES

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ABSTRACT

In ancient Egypt sandals were a common commodity despite the fact that people must have been used to walking on bare feet. Shoes were less common though several types are known from the archaeological record. Despite the many examples of footwear, however, detailed studies are lacking. The present paper presents the closed shoes 'curled-toe ankle shoes', that are made of leather. The focus, as is usual in this series, lies on manufacturing technology; other topics are discussed in passing. A preliminary typology is proposed.

Introduction

Despite the many examples of footwear from ancient Egypt in collections all over the world, detailed studies are lacking. In order to better understand footwear, the Ancient Egyptian Footwear Project (AEFP) studies the specimens housed in museum collections as well as from recent excavations. Iconographic as well as philological aspects will be dealt with too, to be linked with the archaeological record in a later

phase of the project, together with the information obtained by ethnographic studies, experimental archaeology and chemical analyses. These aspects, however, will be discussed here only in passing as the present paper focuses on the technological aspects of leather curled-toe ankle shoes. In discussing footwear, terminology is after Goubitz *et al.* (2001: 317-324) For the use of directions, such as ventral and dorsal, the reader is referred to Veldmeijer (2007/2008: 101). Abbreviations are explained in table 1.

Typology

True shoes are defined by Van Driel-Murray (2000) when they entirely enclose the foot; if they are open dorsally, as seen in BM EA 4391 (Veldmeijer, 2009a) and the shoes of Tutankhamun (Carter & Mace, 1923: 179, pl. xxxvi; Veldmeijer, In press a), Van Driel-Murray does not regard them as true shoes. Thus according to the scholar, true shoes were only introduced into Egypt in post-Amarna times (Van Driel-Murray, 2000: 316). The AEFPP, however, defines a piece of footwear in which an upper encloses the heel as a shoe. This definition therefore applies the term 'shoe' to a greater variety of footwear.

The AEFPP distinguishes between open and closed shoes. The upper in the former category is low and basically only covers the sides of the foot: the shoes are open dorsally. Closed shoes, however, completely cover the foot. The height of the upper differs. Ankle shoes, like the shoes presented here, can be differentiated in those with an upper 'on the ankle' and those with an upper 'over the ankle' (Goubitz *et al.*, 2001: 23-24; figure 1).¹ Shoes with uppers 'below the ankle' are usually referred to as 'low-cut shoes'. Those with an upper higher than the ankle but lower than the calf are referred to as 'high shoes', while 'boots' are all those that are higher than the calf.²

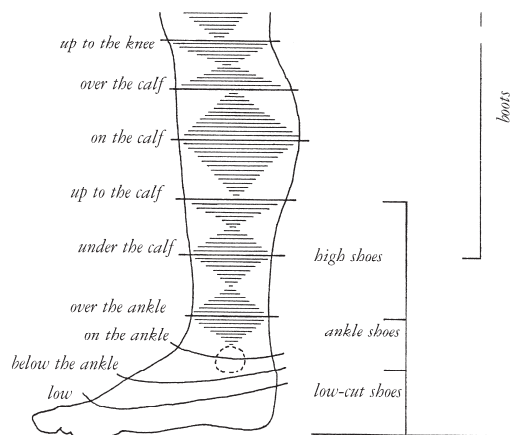


Figure 1. Leg, showing height designations and transitional zones. The figure is adapted after Goubitz *et al.* (2001: 24, figure 7).

Closed shoes can be classified in several types. The curled-toe ankle shoes (Class X, Type C of Montembault, 2000: 74) can be distinguished from other footwear by several technological details as well as recognisability. The

sole/upper construction, albeit with slight differences, are comparable and unique for this type. The shoes have a separate, elongated toe and a triangular flap covers the instep (referred to as 'instep flap'). There are two variants; variant 1 is the most abundant and is represented by 13 examples. These shoes are decorated with applied motifs of leather. Moreover, the shape of the sole is narrow and elongated. The upper in variant 2 is not decorated. The sole is thicker, shorter, wider and less clearly swayed. This variant is represented by only two examples.

Description

Variant 1³

Montembault (2000: 205) reports that the pair of shoes EgCa 5174/5175 (figure 2), which is in excellent condition, was found in the cachette of the Amun priests at Deir el-Bahari and date to the 21st Dynasty (Bruyère, 1937: 64-65). The pair will be used to describe the general construction; additional information will be provided for by several other specimens (table 1).

The sole is swayed, showing a rounded heel, slightly constricted waist and pointed toe. As usual in swayed soles, the lateral edge curves more distinctly towards the toe.

The sole consists of two layers (figure 3A, 4A & B): the edge of the beige insole is covered with a red strip of leather⁴ that is sandwiched between the insole and treadsole. The extent of this strip of leather cannot be determined, hence the dashed line in the figure. Due to the shoe's completeness it cannot be determined if the layout of the treadsole is comparable (*i.e.* the red edge made by means of a strip and thus not covering the dorsal surface), but most probably it is. The two sole layers are stitched along their perimeter with relatively widely spaced running stitches of flax, which also fasten the edging strips. It is difficult to say whether the stitch holes were pre-pricked; the holes are roughly tear-shaped (figure 4A) but this could also have been caused by the eye of the needle. Moreover, the sole layers are rather thin, which does not require pre-pricking.

The upper consists of four pieces (figure 3B), excluding the decoration patches and laces, but always one thickness of thin, red leather. The ventral upper is one piece and stitched at the heel, which is neatly finished with a nearly circular patch obscuring the seam. This patch, as

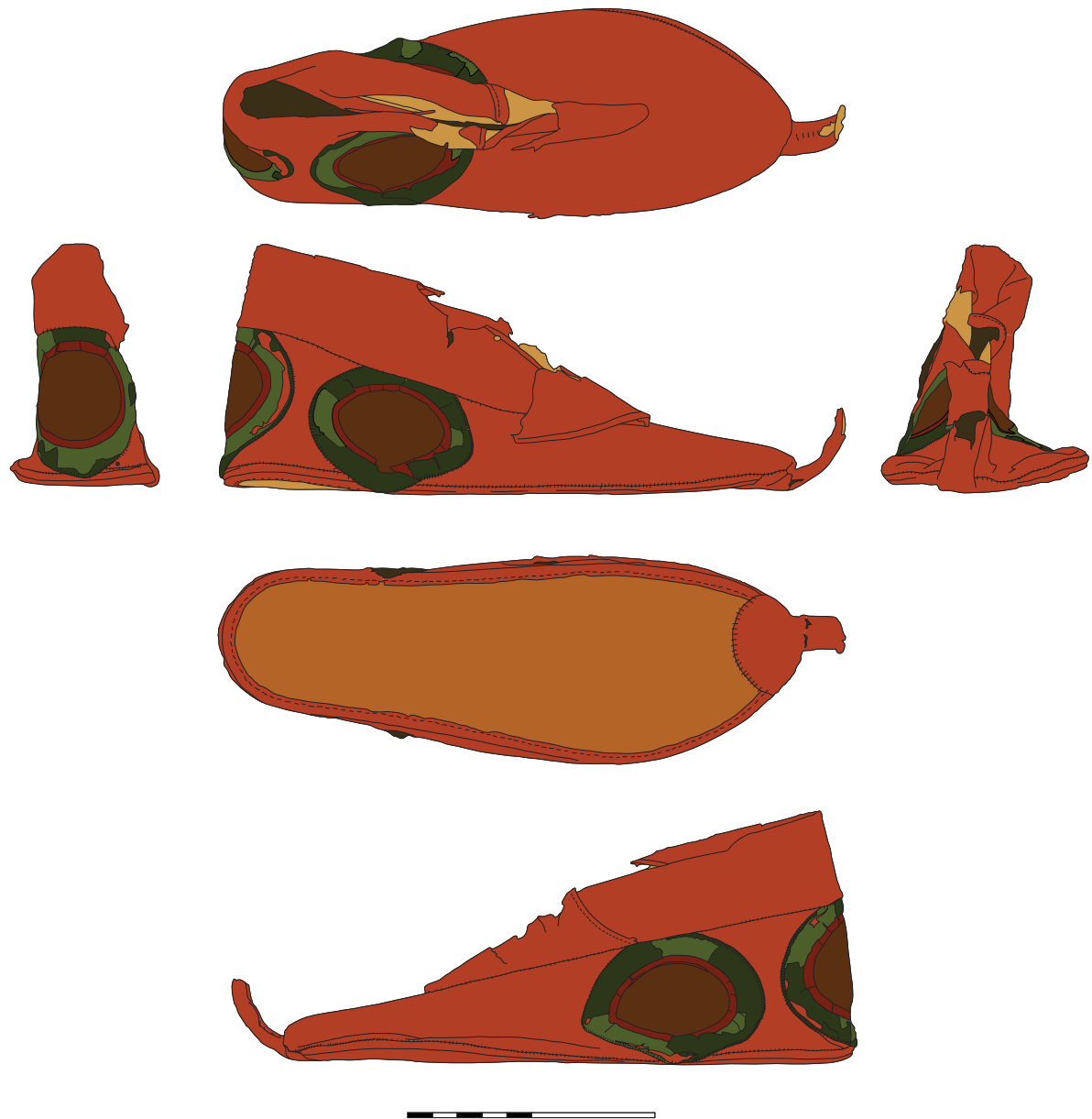
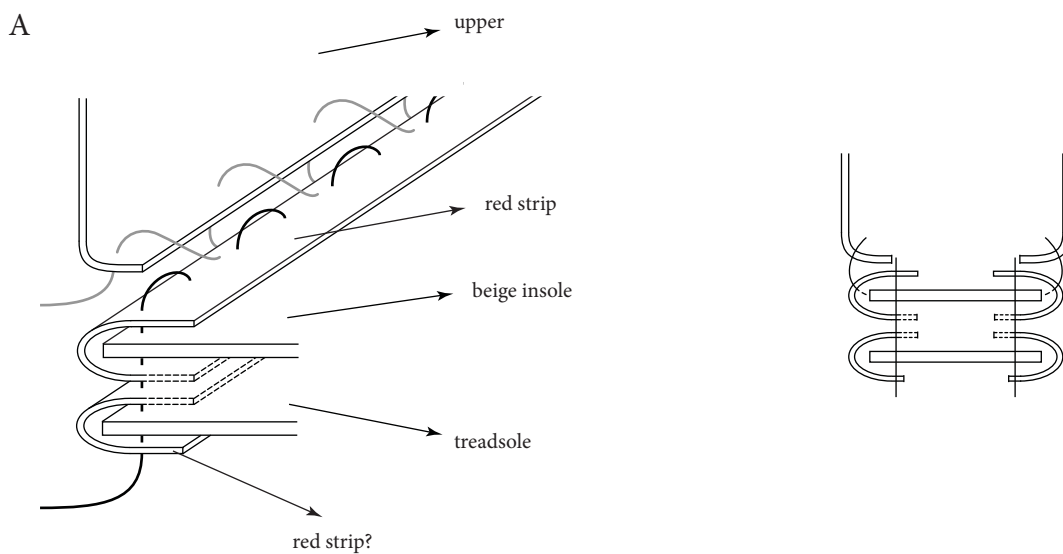
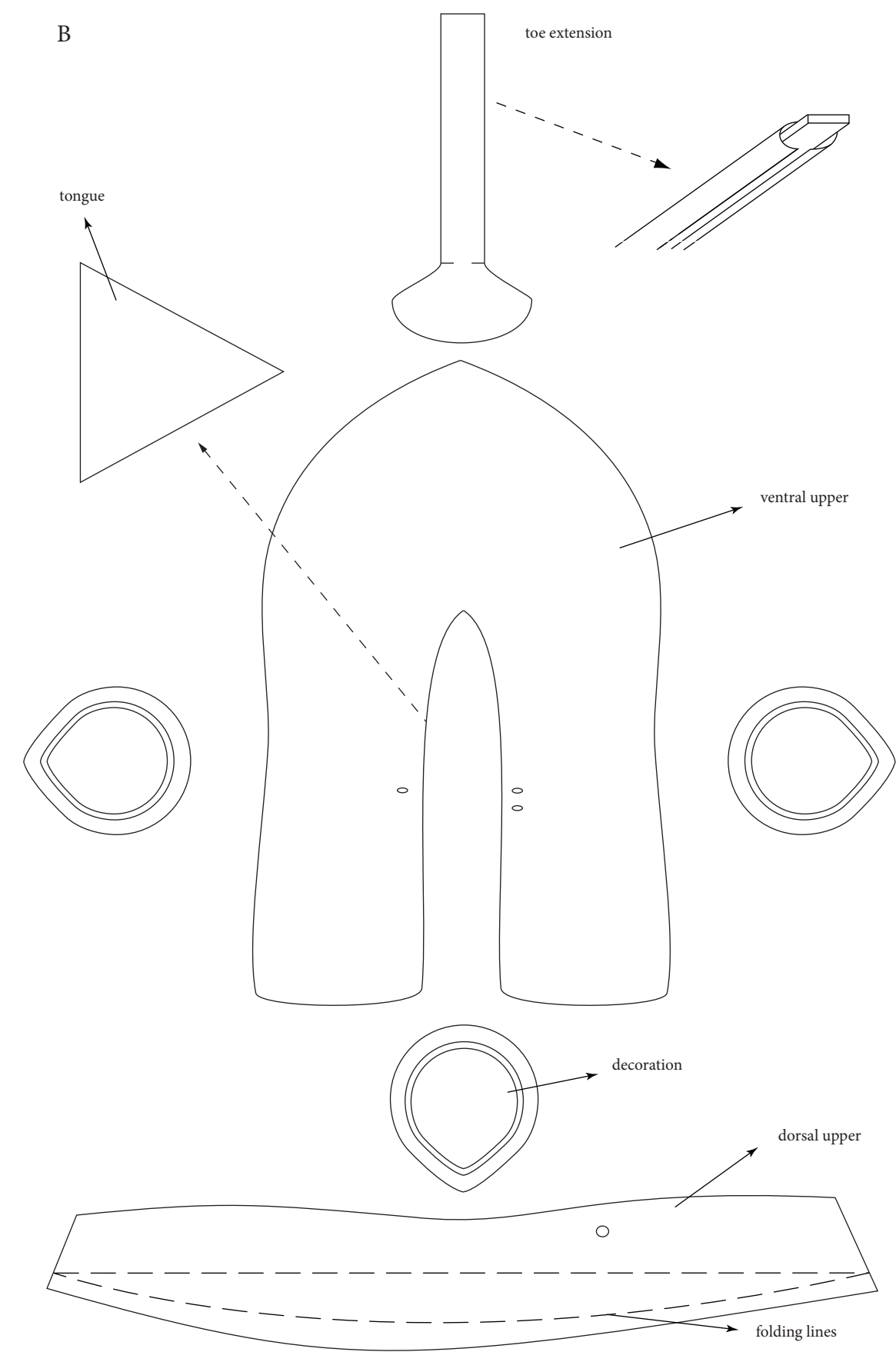


Figure 2. Left shoe of the pair EgCa 5174/5175 in A) Dorsal; B) Medial; C) Ventral; D) Lateral; E) Posterior and F) Anterior views. Scale bar in cm. Drawings by E. Endenburg. See Veldmeijer (In press a) for the photographs.





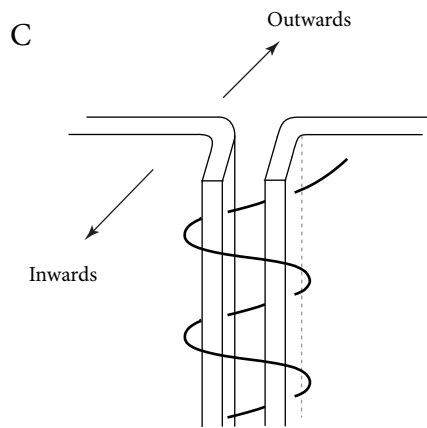
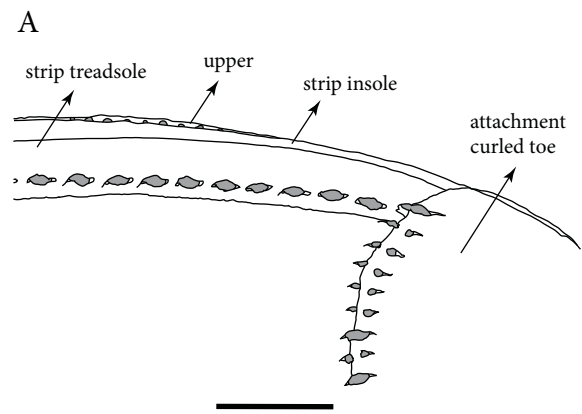
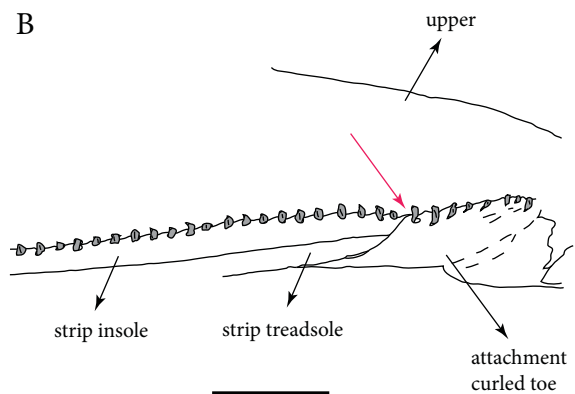
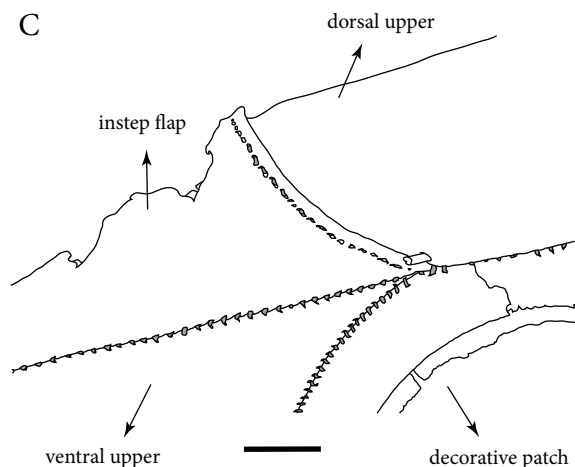
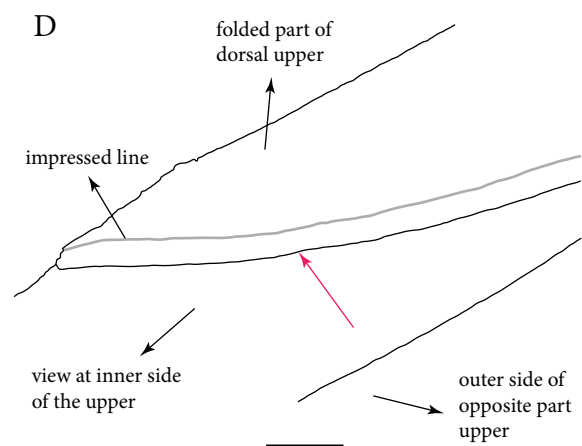


Figure 3. Pair of shoes EgCa 5174/5175. A) Sole/upper construction; B) Cutting pattern. The dashed line indicates the folding line; C) Seam connecting the dorsal and ventral uppers, attached with whip stitches. Not to scale. Drawings by E. Endenburg/A.J. Veldmeijer.

well as the patches at the sides of the shoes, are basically tear-shaped with the point orientated ventrally; they are 65.5 mm high and about 65 mm wide. Although obscured by the patch, we can safely assume, however, that the back seam is stitched with whip stitches, as are all other seams of the upper. The patch, like the ones at the medial and lateral sides, consists of three layers (figure 4C, F & G): the centre is dark brown to black, lined with a narrow circle of gray leather (once probably red) and a slightly wider outermost circle of green. The patches are stitched with tiny whip stitches along their perimeter, which thus fasten all three layers.

The top of the upper runs diagonally from the heel to the lower front part, at the top of which is attached another part (the so-called 'dorsal upper'), thus increasing the height of the shoe to an 'over the ankle' ankle shoe (figure 1, 4D & F). The edges of the two layers are turned inside the shoe (figure 3B) and stitched with whip stitches (figure 3C & 4F). The upper is attached to the insole (figure 3A), the stitches of which possibly only join the red leather strip, or at best, the corner of the thicker insole proper. This latter option, however, seems unlikely as in the much comparable shoe EgCa JE 30607, discussed below, the outer layer of the upper is only stitched to the strip. The decorative patches at the medial and lateral sides are folded over the sole's edge, and consequently a tiny portion of it is visible at the ventral surface of the treadsole (but not extending beyond the red leather strip, see figure 2C & 4G).



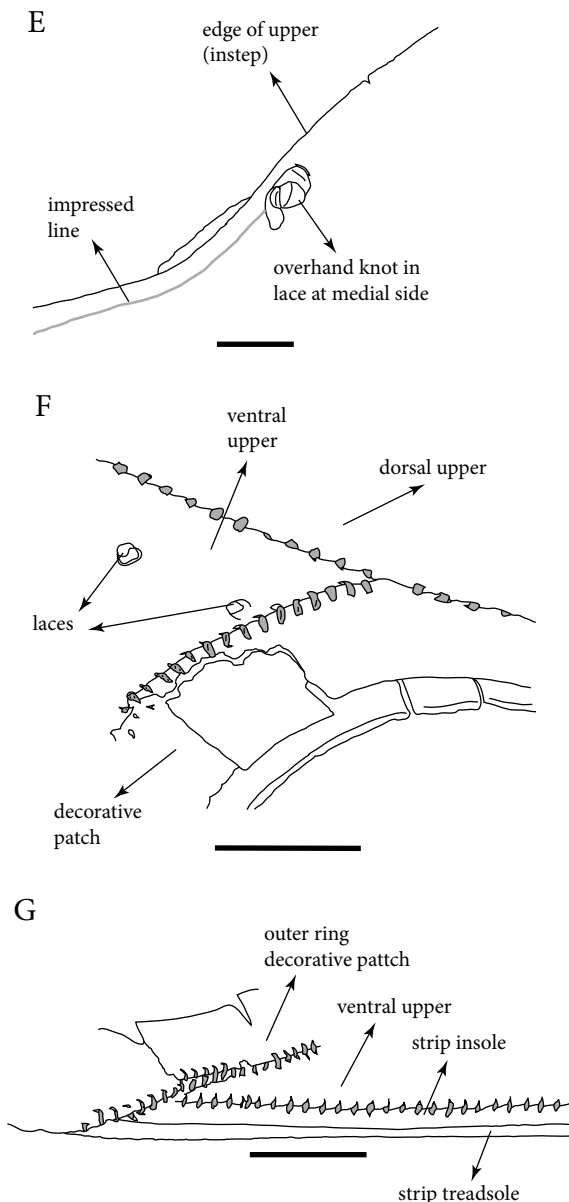


Figure 4A-G. Details of the pair of shoes EgCa 5174/5175. A) Anteromedial view of the ventral surface of the treadsole, showing the sole seam and attachment of the cladding of the toe extension; B) Medial view of the front edge of the left shoe; C) Lateral view of the left shoe, showing the seam between ventral and dorsal upper, including the triangular instep flap. Note that the decoration patch is included in the seam as well; D) The top of the dorsal upper is folded, the edge of which is folded too (red arrow); E) One end of the lace is simply fastened with an overhand stopper knot; F) The lace runs around the heel through holes in the ventral upper; G) The patches are added after the ventral upper was attached to the sole, evidenced by the fact that the patch runs over the seam (and even under the ventral surface of the treadsole). Stitching in gray. Scale bar is 10 mm. Drawings by A.J. Veldmeijer. See Veldmeijer (In press a) for the photographs.

The upper part of the dorsal upper is folded into the instep (dashed line in figure 3B, see also figure 4D), but the height is not equal through-

out: it has its largest size at the heel and the smallest at the front of the instep. The edge of this fold is folded again (red arrow in figure 4D), but this extends only few mm: none of these folded edges are stitched.

At the lateral side, a triangular instep flap is inserted in the seam between the ventral and dorsal upper (figure 3B & 4C). The edge facing the instep is folded and stitched with a running stitch but the edge facing diagonally to the sides is folded without being stitched. The triangular instep is folded over the front of the instep.

The toe has a large extension consisting of a rawhide core, which is clad with a red leather strip (figure 3B). The edges of the cladding are folded towards the surface that is less easily visible. The fact that there are no stitches, except for a small part at the toe of the shoe itself, suggests that the cladding was glued to the core. The excellent condition of the shoes does not allow clear view of the attachment with the shoe proper. Additional information, however, comes from other examples. These show that the core of the extension runs into the shoe through a slit in the seam between the upper and the insole and is inserted through a slit in the insole (figure 5). It is not clear whether it penetrated the treadsole too, as it is not visible at the sole's ventral surface, but if so, it is obscured by the attachment of the toe extension.

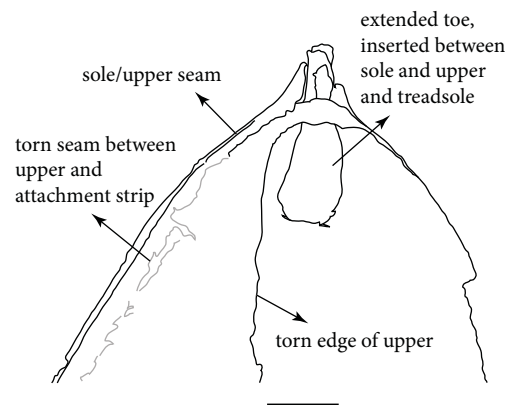


Figure 5. Dorsal view of shoe EgCa 5212. The extended toe is secured by stitching the cladding to the sole but also by inserting the core in the sole/upper seam and stitch it through the insole. The torn seam between upper and attachment strip is sketched, hence the gray colour. See Veldmeijer (Forthcoming) for the photograph. Scale bar is 10 mm. Drawing by A.J. Veldmeijer.

In EgCa 5174/5175 the folded, red layer that covers the core of the extension is spread out to form a quarter-of-a-circle-shaped piece, which

is attached to the ventral surface of the treadsole (figure 2C, 4A & B). In order to do so, the sides have been cut in (figure 3B). The attachment area of the cladding is stitched with whip stitches to the sole and the pointed edges are inserted between the upper and the dorsal surface of the insole (red arrow in figure 4B). The stitch holes in the sole have a roughly triangular shape, the blunt, wider part of which receives the stitches (figure 4A). The holes in the attachment area, however, were caused by a different tool, as these are slits and stand on an estimated 45-degree angle to the stitches. The choice of the tool was dictated by the thickness and hardness of the leather. The extensions in both shoes are broken but the length suggests it extended to the front of the instep, probably running over the instep flap. It is unlikely that the point was attached, judging the fact that they are always broken off without remnants at the instep. Moreover, due to the use of a fairly stiff core, the extension would not need additional fastening.

At both sides of the ventral upper, in between the side patches and the patch at the heel are two⁵ tiny holes for the reception of a narrow lace (figure 4F). The laces are largely lost, but it is clear that they ran behind the heel. A small remnant of lacing is knotted (overhand knot) at the edge (medial side) of the dorsal upper part, posterior to the triangular instep flap (figure 4E). The laces are not likely to have been used to close the shoe as is common nowadays, but held the left and right part of the instep loosely in place.

The pair EgCa JE 30607 (table 1, figure 6) is extremely fragile, due to which it could not be handled before consolidation⁶ and hence prohibited detailed study. The left one is largely incomplete, lacking much of the upper, although enough is preserved to recognise the shoe and its construction. The right one is largely complete but especially the lateral back part is fragmentary. This pair differs at various points from EgCa 5174/5175. The upper consists of two layers: a beige one that was green originally as indicated by green spots and an overall greenish glow, and a red lining. The lining protrudes beyond the outer layer at the sole and is folded around the edges (figure 7A), rather than that a separate strip of leather was folded around the sole's edges as in EgCa 5174/5175 (*cf.* figure 3A). The outer layer is attached with whip



Figure 6. Dorsal view of the right shoe of pair EgCa JE 30607. The small piece of wood, possibly put there to give support, could not be removed before consolidation. Scale bar in cm. Drawing by E. Endenburg. For photograph see Veldmeijer (In press a).

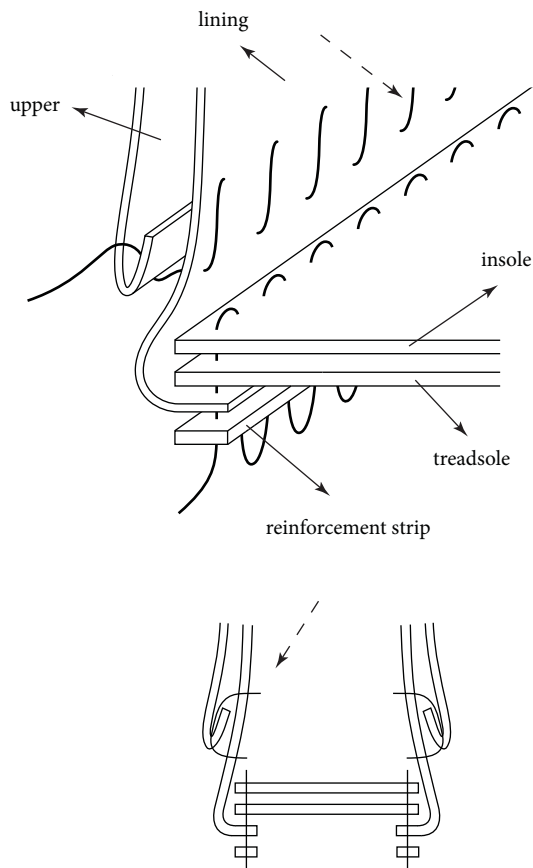
stitches to the lining only. It could not be determined whether the whip stitching, that fasten the two layers, runs over the folded edge of the dorsal upper (as it has been drawn, see dashed arrow in figure 7A, see also figure 8) or entirely through the fold (not drawn). The first option, however, is the most likely, as it is much easier to make and stronger (see below).

The lining is folded around the edge of the sole layers; at the ventral surface of the treadsole it is reinforced with a green strip of leather, thus sandwiching the fold between it and the treadsole. It is the only attachment of the upper to the sole.

The decoration of the upper is comparable to previously discussed examples, *i.e.* roughly tear-shaped patches stitched on the upper, but the colour is different: the outer ring is red, followed by a gray inner ring (most likely not the original colour). The inner part is black.

The triangular instep flap has openwork decoration (figure 7B) but seemingly at the inside: it would not have been visible when the flap would be folded over the instep in times of use. The extent of the decoration could not be ascertained, as the point has broken off (A in figure 7B) and the remaining bit, *in situ*, could not be investigated. The sides of the outer layer (*i.e.* the

A



B

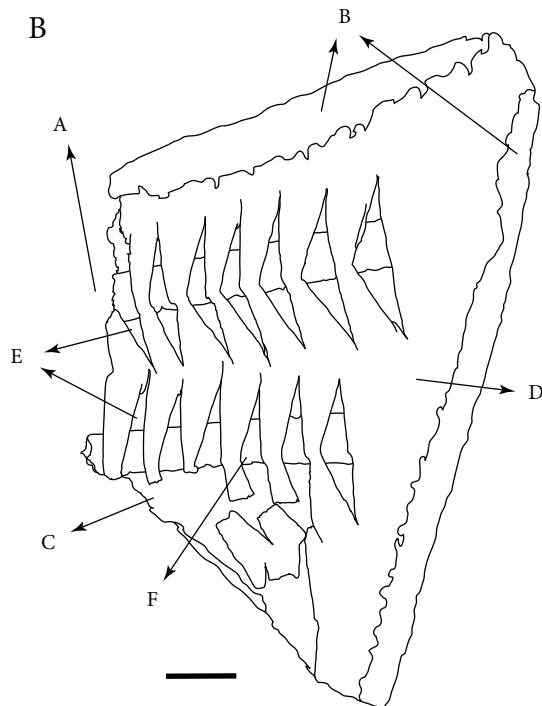


Figure 7. Pair of shoes EgCa JE 30607. A) Sole/upper construction. It could not be determined whether the whip stitching, which fasten the dorsal and ventral upper, ran over the folded edge of the dorsal upper (as it has been drawn, see dashed arrow), or entirely through the fold (not drawn). The first option, however, is the most likely. Not to scale; B) Openwork decoration of the instep flap. The letters are explained in the text. Scale bar is 10 mm. Drawings by E. Endenburg/A.J. Veldmeijer.

dorsal layer which is visible when the triangular element is folded over the instep) are folded and fastened with whip stitches, its width being only a few mm (B in figure 7B). Note that the other side is black but it is not certain whether this is painted or an additional layer of leather (C in figure 7B). The folds fasten a second beige layer (D in figure 7B; in contrast to the rest of the upper, the triangular instep flap has no red lining, which seems due to the decoration). This inserted layer has two rows of cut out triangles (E in figure 7B). Red leather strips are inserted under this layer at right angles to the cut out triangles and running roughly through their middle (F in figure 7B).

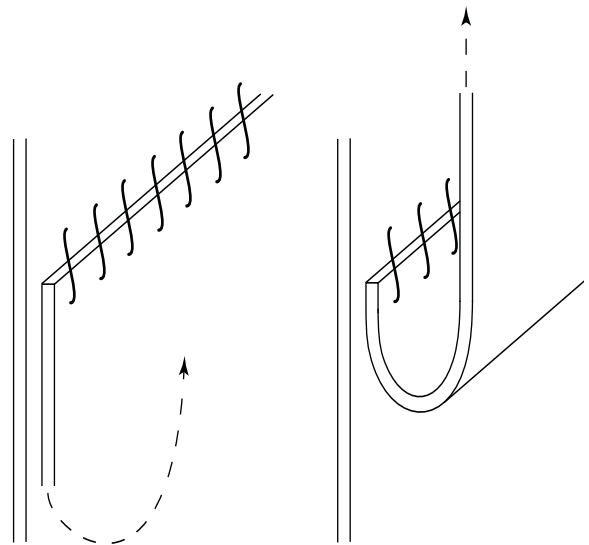


Figure 8. Assumed seam in whip stitching the upper to the sole's edge (as in EgCa 5174/5175) or of the upper to the lining (for example EgCa JE 30607). Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

The left shoe of the pair EgCa 5212/5213 (table 1, figure 5) is more complete, but lacks almost the entire medial part of the upper as well as the entire dorsal upper. The right shoe is broken in two bigger and several smaller pieces. Despite the rather incomplete condition, it could be determined that the pair is the same as

the pair EgCa 5174/5175 in all respects. The lateral side of the upper of the left shoe has several knife cuts at the back, close to the heel proper. The missing front part of the upper has clearly been cut off (for re-use?).

The isolated sole fragment BM EA 4392 (table 1, not illustrated) consists of two sole layers: the edge of the insole is folded around the treadsole. Remarkable is the repair of a long crack in the insole, which has been done with whip stitches. In contrast to previously described shoes, there are seemingly no reinforcement strips that cover the folded edges at the ventral surface of the treadsole. The sole layers are fastened with running stitches along the perimeter. Another repair is seen at the medial edge where the original flax stitches are replaced by several coarse leather thong stitches. The characteristic three-quarters-of-a-circle part of the toe extension indicates the type of shoe.

The pair of soles EgCa 5193/5194 (table 1, figure 9) is identified as curled-toe ankle shoes on the basis of the toe extension. The insole has a strip of white leather folded around the edge. The treadsole, however, lacks this addition. The two sole layers are stitched along the perimeter with running stitches, which includes the edge at the insole. The core of the extension is inserted in between the insole and treadsole rather than being inserted in the sole/upper seam, as seen in EgCa 5174/5175. It extends only several cm after which it is broken off. The stitches at the fracture (red arrow in figure 9) suggest that it was broken in ancient times and repaired.

EgCa 5195 (table 1) is the back part of the upper, including the triangular instep flap. Although the colour seems beige, the covered parts of the outer upper shows it was green originally. The presence of a lining could not be determined with certainty. The flap has elaborate openwork decoration (figure 10) and consists of at least four (partial) layers. The top layer (A in figure 10) is now beige but was green originally and is bound with a red strip of leather (B in figure 10), which function as edge binding. Seen from anterior to posterior, there is a band of four, roughly triangular-shaped cut outs (C in figure 10), with their point facing anteriorly. The inner side of the triangles is red; note the two levels of the border. Posterior to this, above each triangle, are semi-circular cut outs (D in figure 10), in the empty spaces of which are, at right angle, narrow leather strips. Next follows

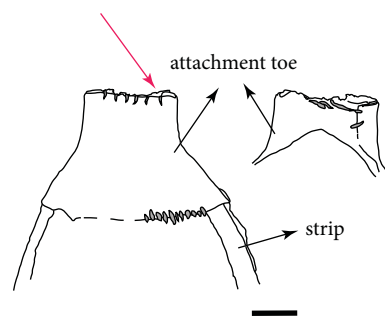


Figure 9. Toe of the left of a pair of soles, EgCa 5193/5194. A) Ventral view; B) Dorsal view. The elongated toe is broken off, the fracture of which is repaired. Scale bar is 10 mm. Drawing by A.J. Veldmeijer. For photographs see Veldmeijer (Forthcoming).

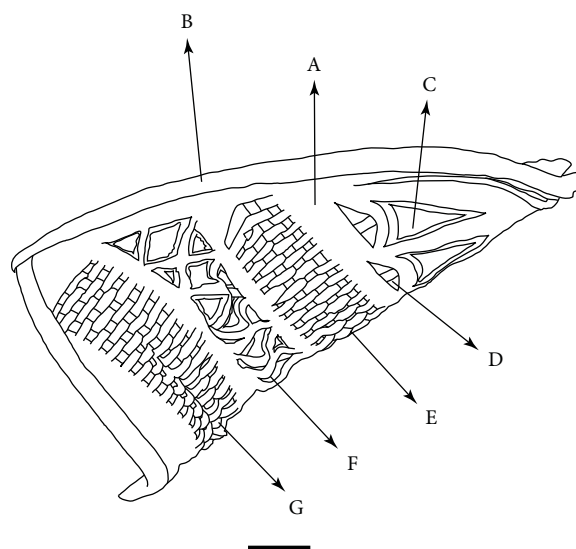


Figure 10. Openwork decoration of the instep flap in shoe EgCa 5195. The letters are explained in the text. Scale bar is 10 mm. Drawing by A.J. Veldmeijer.

a wide band of four connecting rows of transverse (*i.e.* from medial to lateral) slits through which red (and other?) narrow strips of leather are pulled (E in figure 10). The strip in one row is woven through the slits opposite the ones in the next row. The next band of decoration consists of cut out diamonds (F in figure 10), again with a red inner space and two levels of the border. Finally, there is a band of four connecting rows of transverse slits (G in figure 10).

The pair of shoes MEgT 5149 (table 1, figure 11), excavated by Schiaparelli in the early 20th century AD in the Valley of the Queens, is well preserved except for their original colour, which could not be determined. The sole (figure 12) consists of a leather(?) midsole, which is covered with a thin insole, the edges of which are folded around the edges of the midsole and are thus sandwiched between this sole and the raw-

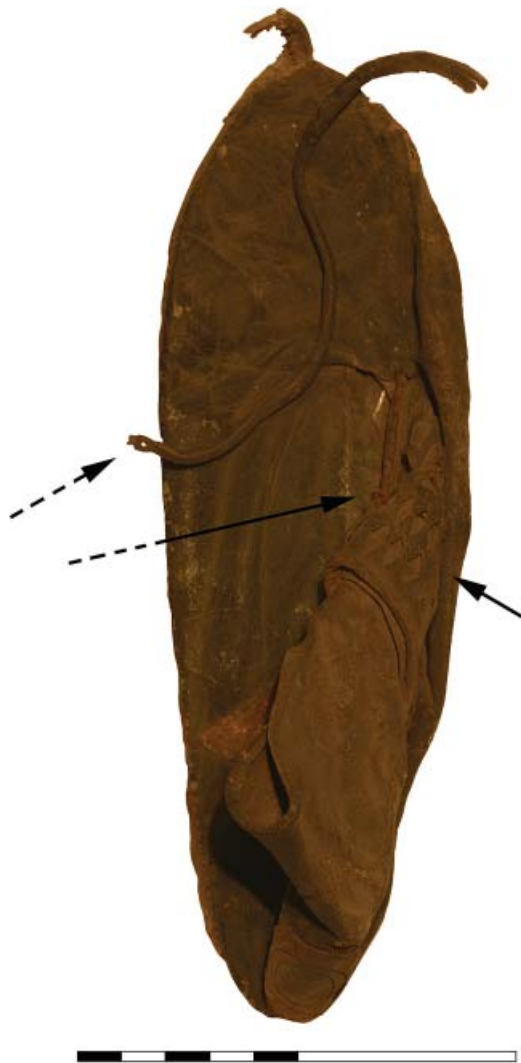


Figure 11. Right shoe of the pair MEgT 5149. The dashed arrow point to the end of the extremely long toe extension, the slit of which must have been used to fasten it to the triangular instep flap. The arrow indicate the openwork decoration of the flap. Scale bar in cm. Photography by E. Endenburg. Courtesy of the Museo Egizio, Turin.

hide treadsole. The three sole layers are stitched with running stitches of sinew. The ventral upper is stitched with flax whip stitches to the edge of the thin insole. It is uncertain whether it includes the entire fold but most likely it did (*cf.* figure 7A & 8; see also below). Another difference is that the decoration patches at the lateral and medial sides as well as the heel are substantially smaller (length 37.5 mm; largest width: 25.5 mm) than seen in the others. Moreover, they are more distinctly tear-shaped.

The instep flap is not precisely triangular but rather V-shaped. The perimeter shows the presence of a lining comparable to the flap in EgCa 5195. The flap consists of at least three

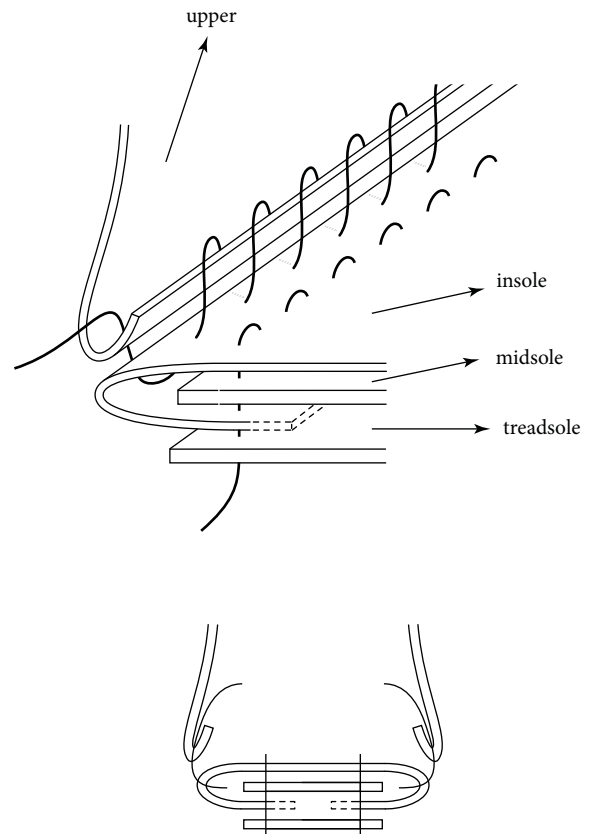


Figure 12. Sole/upper construction of shoe MEgT 5149. The inclusion of the entire fold is hypothetical but most likely. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

layers, showing openwork decoration (arrow in figure 11). Looking towards the heel, there are two irregular triangles cut out parallel to the lateral and medial edges and at both sides of the longitudinal centre. Half in between these are roughly triangular cut out motifs, the inner part of which is lined with a second layer; the centre is red. Above these are semi-circular cut outs. These triangles and semi-circular cut outs are the same as described for EgCa 5195. The openwork decoration is surmounted by two transverse rows of cut out diamonds that occupy roughly the posterior half of the instep flap (figure 11). A last difference between MEgT 5149 and the previously-described shoes is seen with the extended toe. Although the construction is the same (note, however, that the core extends only few cm from the attachment, after which the extension only consists of the cladding), it is less wide, thick and stiff. Moreover, it is longer and runs back to the instep where it was attached to the upper involving the small slit at the end of the extension (dashed arrow in figure 11). Possibly, it was attached to the flap,

which shows a stitch approximately at its centre (partially dashed arrow in figure 11).

Even though in appearance the pair of shoes MEgT 5150 (table 1, figure 13), also excavated by Schiaparelli in the Valley of the Queens, equals the other examples, there is one important difference: the triangular instep flap, which is a separate piece in the other examples, is cut out of the same sheet of leather as the dorsal upper (figure 14). The sole construction is probably comparable to MEgT 5149. The right shoe is incomplete, consisting of a complete sole and part of the lateral side of the upper. The left, however, is largely complete. As the leather is hard and brittle, a detailed study has become impossible.



Figure 13. The left and best-preserved shoe of the pair MEgT 5150. The triangular instep flap is one piece with the dorsal upper. Scale bar in cm. Photography by E. Endenburg. Courtesy of the Museo Egizio, Turin.

Variant 2

The upper of the left shoe of the pair BM EA 4408 (table 1, figure 15) is almost complete; the upper of the right one is incomplete. The soles of both shoes are incomplete, but enough remains in order to be able to identify the sole/upper construction, which differs markedly from the previously described shoes.

The sole has a rounded heel from which the width towards the front increases continuously without a constricted waist (figure 15). The lateral edge increases more rapidly at about the ball of the foot after which it runs rather abruptly towards the toe area. As the medial edge runs less curved, a slightly swayed sole is created.

The two sole layers are rather thick compared to the examples in variant 1. An isolated red strip of leather is sandwiched between the insole and treadsole and stitched with running stitches of leather (figure 16A). These are the only leather stitches, as the rest of the shoe is stitched with flax thread. This contrasts with the shoes in variant 1, which are entirely stitched with flax thread. The ventral part of the upper is stitched inside the edge with whip stitches.

The construction of the upper is much the same as described for variant 1; the leather is slightly thicker, however, and without lining. The instep flap (figure 16B) has openwork decoration consisting of two triangles (A in figure 16B) and an almond shape in the dorsal layer at the anterior and lateral margins (seen when the triangular part is folded over the instep; B in figure 16B). The inside of the motifs shows the red leather of the lower layer. A small edge, possibly white originally, lines the edges of the cut out motifs.

Only the heel has a red decoration patch, which obscures the seam of the ventral upper. This is the only decoration of the shoe, except for the already mentioned openwork decoration of the flap. Also variant 2 shoes have a separate extension of the toe, which consist of a core (here of vegetable material) and is clad with thin green leather. The extension is roughly circular in cross-section rather than rectangular as seen in variant 1 shoes, and rather long, possibly running until posterior to the instep flap. It might have been fastened to the upper. It compares well with the Turin shoes. The attachment seems comparable to variant 1, but it remains uncertain whether the core is attached to the sole in a comparable way due to incomplete preservation.

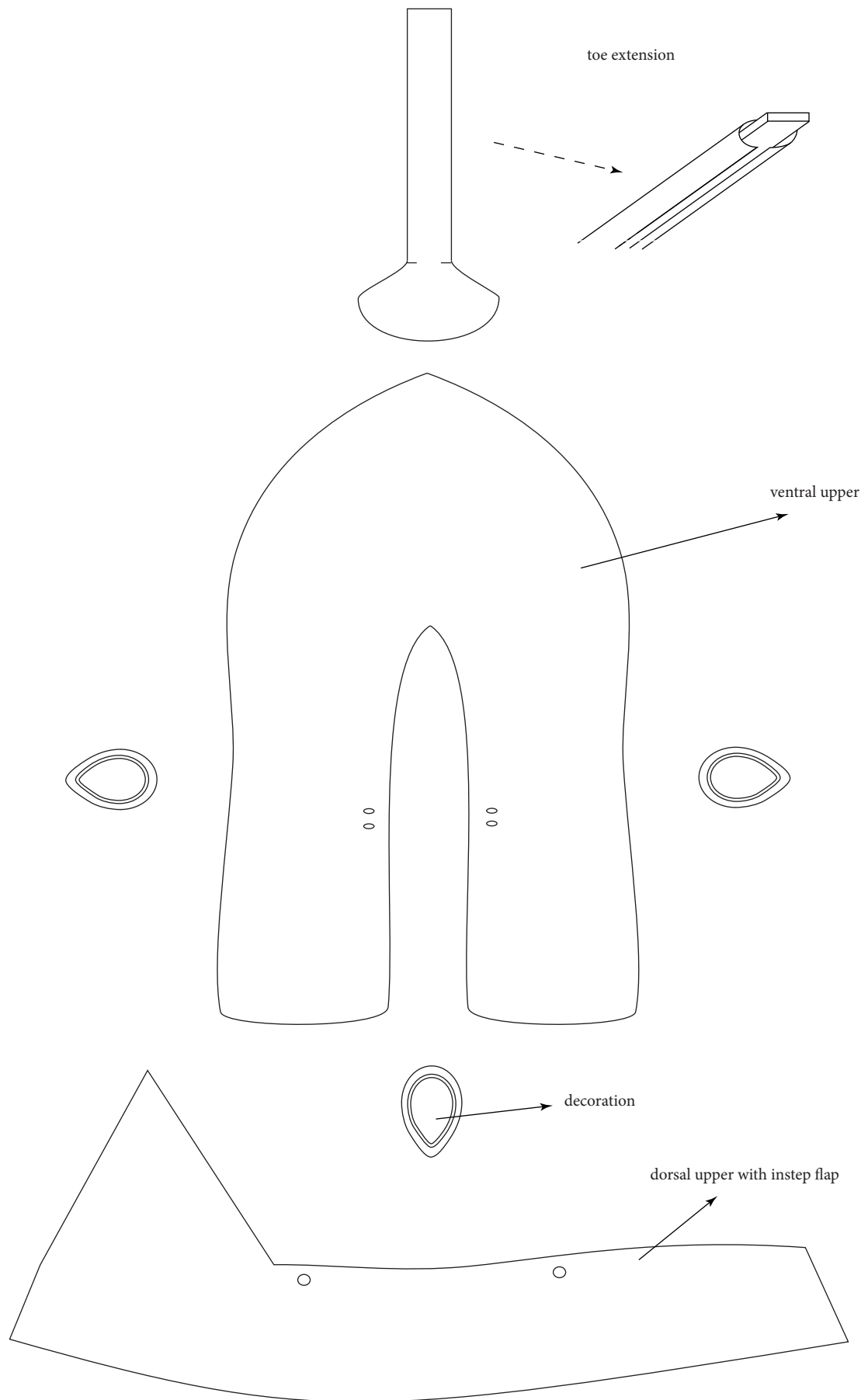


Figure 14. Cutting pattern of the pair of shoes MEgT 5150. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.



Figure 15. BM EA 4408/4409. Dorsal view of the left and ventral view of the right shoe respectively. Scale bar in cm. Photography by A. 't Hooft. Courtesy of the British Museum, London.

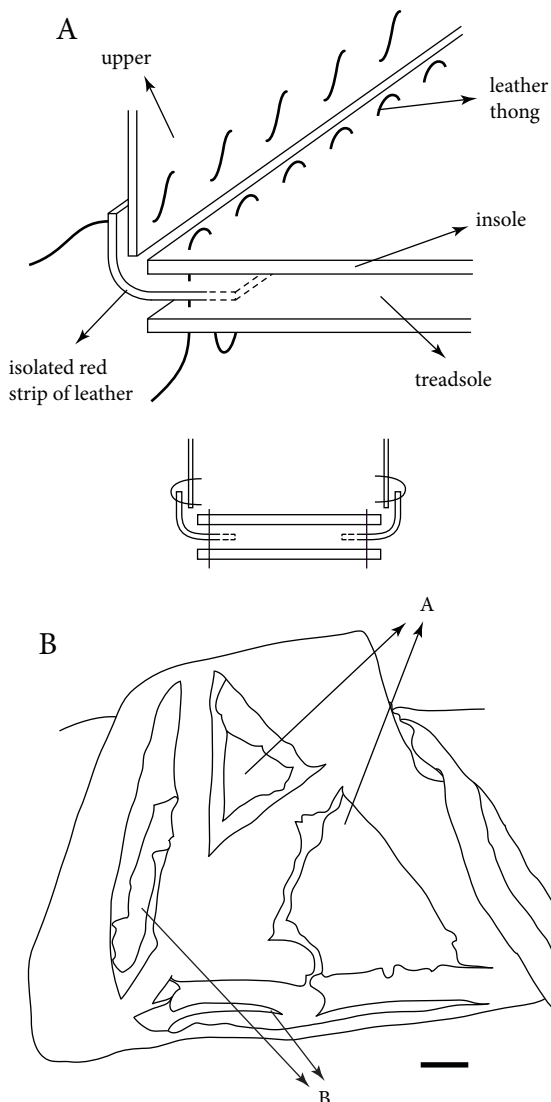


Figure 16. BM EA 4408/4409. A) The sole/upper construction. Not to scale; B) Openwork decoration of the instep flap. The letters are explained in the text. Scale bar is 10 mm. Drawings by E. Endenburg/A.J. Veldmeijer.

Uncertain type

Shoe ÄMPB ÄM 21767 (figure 17) needs consolidation before it can be studied in detail. Until then the shoe is referred to as an 'Uncertain Type' within the discussed category (closed leather shoes) on the basis of its construction.



Figure 17. Right shoe, ÄMPB AM 21767, with isolated big toe. Since the construction is comparable to the other shoes, a tentative classification within the discussed category is justified. The shoe was too fragile to untie the blue strings that hold the shoe together. Scale bar in cm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung Berlin.

The heel of this right shoe is rounded and the width increases towards the front. Because the bright red upper obscures clear vision, it is not clear whether or not the sole has a distinct

waist, but seemingly it is without. At the front, the lateral edge curves distinctly towards the area of the four outer toes. The big toe is isolated from the rest. The medial edge curves more gently towards the big toe, which is separated from the other toes. The construction, as far as could be seen without damaging the shoe, is comparable to variant 1, although there might be only one sole layer. An elongated toe could not be observed, but study of the ventral surface of the sole needs to confirm this. A strip of leather is folded around the edge of the sole, to which the upper is attached with whip stitches. A dorsal upper is attached to the ventral upper with whip stitches. Possibly, a triangular instep flap is attached at the lateral side and folded over the instep. The upper is made of a single layer, thin leather. Laces are present; the shoe is undecorated.

Manufacturing Methods

Van Driel-Murray (2000: 302) reports that the upper of the brightly coloured shoes are made of goatskin, which can be confirmed on the basis of macroscopic investigation of the external texture. However, this should be confirmed by microscopic research. Some examples of leather composite sandals (Veldmeijer, Submitted) show insoles of comparable leather (by macroscopical investigation) to the shoe's upper; these have been tentatively identified as gazelle or antelope, neither of which is based on thorough (microscopic) research (Schwarz, 2000: Catalogue C, No. 16 [no page numbers]; see also Veldmeijer, Submitted).

Several tools were used to stitch leather, the choice of which was dictated by the property of the leather. It cannot be stated with certainty whether the leather was pricked prior to the stitching or not. In the objects presented here, the stitch holes do not give any indication: the eye of the needle might have caused the holes. Future research will include experiments to identify the traces of the different tools, such as bone and metal needles, awls and the like. The leather of most of the shoes presented here is very thin and supple, rendering pricking previous to the stitching unnecessary. However, thicker layers, such as the soles, might have been pre-pricked as it would have been difficult to push the needle through the, sometimes, stiff leather. Whip stitching is done roughly at right

angle to the orientation of the stitches (figure 18), due to which it is less difficult to stitch thicker layers and easy to use when stitching has to be done from one side only.

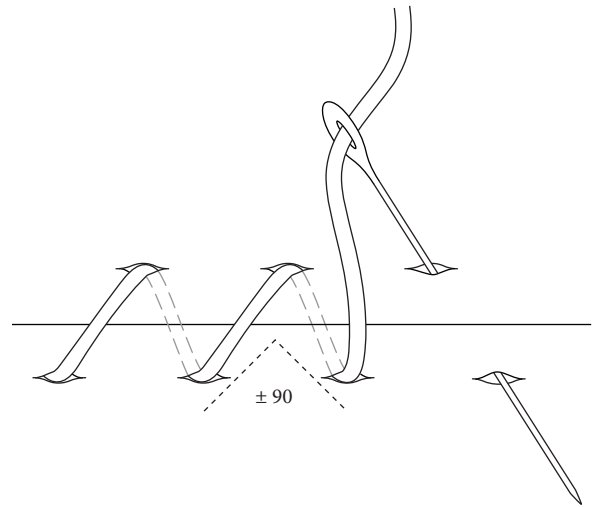


Figure 18. Whip stitching can be easily done from the outside by stitching at roughly right angle to the orientation of the previous stitch. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

Due to the study of several specimens, a general description of the way a shoe was put together can be suggested, albeit mainly based on the most elaborate examples from variant 1. The soles were made separately from the upper. In the case of an upper with lining, such as in EgCa JE 30607, the lining was first attached to the sole. It is not clear whether the lining was already attached to the outer layer of the upper or not. It would, however, be easier to attach the lining to the sole without the outer layer attached. The whip stitching that attaches the outer upper to the lining or the upper to strips at the sole's edge most likely includes the fold. This not only makes the seam stronger but it is easier to stitch too: the two layers are laid next to each other, stitched and the outer layer folded over the seam (figure 8).

A seam at the heel's back cannot be observed due to the presence of a decorative patch, undoubtedly to obscure it, and the fact that a clear view of the inner of the shoe is not possible as it might damage them. However, a closing seam at the back is visible in for example EgCa 5174/5175 and, since the construction is so similar, it can safely be assumed a closing seam is present in all of the presented shoes. The attachment of the upper to the sole must have started here, at one side of the seam,

all the way around the sole and ending at the other side. The last bit of stitching would have been rather difficult but the suppleness of the leather allowed it to be pushed out of the way to gain easy access.

In the pair EgCa 5174/5175, the patches are stitched to the ventral upper after it was fastened to the sole, which is evident from the fact that the side patches run over the seam of the upper and the sole, where the patch is attached to the side of the sole rather than at the upper. The fact that the dorsal part of the patches are inserted in the seam between the dorsal and ventral uppers suggests that the dorsal upper was attached after the patches and thus after the ventral part was already attached to the sole. The triangular instep flap is added to the ventral upper together with the dorsal upper, as it inserts in the seam between the two uppers at the lateral side of the shoe.

The core of the elongated toe is inserted through a slit in the insole. It is not clear if it penetrated the treadsole too as this is not visible at its ventral surface, but if so, it would be obscured by the roughly semi-circular attachment of the cladding; otherwise it is sandwiched between the two sole layers. Because the stitches of the semi-circular part of the cladding goes through all sole layers and because the front edges of the attachment of the toe is inserted in the sole/upper seam, it must have been attached before the upper was closed. It is not certain whether the two parts of the toe extension were put together before or after the attachment to the sole: both options are possible.

The use and range of colours in leatherwork⁷ increased in the New Kingdom with bright red and green being among the most common combination. The colours thus gives an indication of date, but one should be careful in using this as a sole means of dating in the light of the absence of other dated material and chemical analyses of the colour.⁸ Van Driel-Murray (2000: 306) remarks on the shading of the pair of shoes BM EA 4408/4409 that they seem to have been corroded by black metallic pigment decay products.

Construction

The very fine, well-made curled-toe ankle shoes show a high degree of craftsmanship and must have been expensive. Although the variant 1

shoes are comparable to a high degree, there are nevertheless small differences, such as the presence or absence of lining, the sole/upper construction (including the instep flap in one piece with the rest of the upper), colour scheme and decoration. It is tempting to suggest that especially the differences in manufacturing techniques indicate different shoe makers/leatherworkers or perhaps an evolution in shoe manufacturing, but this cannot be confirmed nor rejected at the moment: in order to prove such a hypothesis more provenanced and better-dated material is needed.

The construction of the many examples of leather stubbed-nosed low ankle shoes (Montembault, 2000: 204-205; Veldmeijer, In preparation), is always the same. These shoes are more numerous and coarser in terms of manufacturing technology (stitched with leather thong, thicker and undecorated leather) and might therefore be regarded as cheaper than the curled-toe ankle shoes.

The examples with small tear-shaped patches are earlier in date than the one with large patches, which might suggest that the small decoration patches evolved into the larger ones. If so, the Turin examples are later than the 18th Dynasty (the one from the Louvre has smaller decorative patches) but earlier than the 21st Dynasty (those from the 21st Dynasty have larger patches; table 1). An upper consisting of one piece (Turin example) might be expected to be a rather late invention but this does not seem to be the case.

The use of several techniques is also seen in other footwear (*cf.* leather composite sandals in Veldmeijer, Submitted), such as folding a strip around the edges of a sole rather than folding over the edge of an entire sole layer, which would have been somewhat stronger. Other examples of the use of strips in soles of footwear are the shoes from the tomb of Tutankhamun, where the front part (*i.e.* the part in front of the upper) is bound with a narrow strip of leather (EgCa JE 62680 and EgCa JE 62681, see Veldmeijer, In press a). In EgCa JE 30607, the lining sticks out of the outer layer at the sole and is folded around the edges, rather than that a separate strip of leather was used to fold around the sole's edges. It would be interesting to see if this is a development which has its origin in the strip to which the upper is attached in other shoes (*cf.* figure 7A and 16A respectively).

Decoration of footwear seems to be largely limited to the more expensive items: a coarser and simpler type of shoes for example does not have decoration (Montembault, 2000: 204-205; Veldmeijer, In preparation). Openwork decoration does occur in footwear but on a limited scale: in the shoes discussed here it is limited to the instep flap. The use of strips of leather of different colours in partial overlap is not seen in shoes, but does occur in sandals. Single strips of leather for aesthetic purposes are abundant in sandals (Veldmeijer, Submitted) but are noted in certain open shoes. It is, however, more common in other leatherwork (for example Van Driel-Murray, 2000: 306-307, 311-312; Veldmeijer & Endenburg, 2007: 37; Veldmeijer, In press b). Openwork in non-footwear leatherwork is not common either but still seen regularly, often in combination with appliqué (Veldmeijer, In press b; Veldmeijer, Submitted). The decoration technique of slits, through which a strip of leather in different colour is woven, is not often seen but is fairly common in Tutankhamun's footwear (Veldmeijer, In press a).

The choice of using a whip stitch is dictated by the fact that it is easy to use when stitching has to be done from one side only: the needle is inserted at roughly right angle to the orientation of the stitch (figure 18). Whip stitches and running stitching are the most common types of stitches in pharaonic footwear and non-footwear leatherwork.

Wear⁹

The weakest point of the variant 1 shoes clearly is the extended curled toe, which is broken in all examples. Especially the pair EgCa 5174/5175 lack clear signs of wear, but does show damage to the instep flap (which is missing entirely in the right shoe), the toe extension and the decoration patches. The sole, is intact although it does show some discoloration at the heel. Moreover, the attachment of the toe extension is crumpled, which might be due to use as well. It is clear, however, that they were worn sporadically and when worn, worn in such a way that wear was limited (*e.g.* the owner did not drag his heel over the floor). It has been suggested that (some of the shoes) were part of a chariot assemblage (Veldmeijer, 2009b), which might explain the (near) absence of wear. The upper is, due to the use of a thin, single layer of thin

leather, very fragile and would have got damaged fairly quickly when used intensively. One wonders, therefore, whether the shoe had a special function and/or was made specifically for burial. EgCa JE 30607 and EgCa 5212, although much damaged, show comparably little wear of the sole.¹⁰ The back part in EgCa JE 30607, close to the sole, as well as the heel is clearly worn, which is caused by friction with the ground.

Other examples show much wear and even repair (BM EA 4392). The incompleteness of the treadsole in MEgT 5149 and MEgT 5150 is not caused by wear; rawhide often shows the same kind of deterioration, which is too erratic to have been caused by friction of the sole with the surface.

Discussion¹¹

The Turin shoe, with a dorsal upper and instep flap in one piece, could have been regarded as a separate subvariant of variant 1. However, this was decided against as in appearance¹² it is not different from those shoes in which the upper and flap are separate parts.

The few examples of shoes that are dated clearly point to the New Kingdom: the (late) 18th until the 21st Dynasties. It is as yet unclear what the origin of shoes is in Egypt, although it has been suggested that Hittites, wearing pointed boots, introduced them in the late New Kingdom (Van Driel-Murray, 2000: 316) but this hypothesis cannot be supported nor rejected as yet. As explained elsewhere (Veldmeijer, 2009a), closed shoes might have evolved from open shoes.

Montembault (2000: 19, 204-205) has published a pair of red shoes with green decoration from the collection of the Louvre. The shoes were recovered from tomb 1386 of the eastern cemetery at Deir el-Medinah and date to the 18th Dynasty (Bruyère, 1937: 64-65). On the basis of the present study, it seems likely that the stub of the nose is actually the remains of a much longer, extended toe. There is no mention of the attachment at the ventral surface of the treadsole, but the cladding of the core, visible in the photographs, clearly suggests a comparable construction. The upper seemingly consists of one layer and has small decoration patches, which are much comparable to the ones seen in the pair of shoes in the Turin collection, even though the patches of this latter are still some-

what larger. The red triangular instep flap has an edge binding of a narrow green strip, which is attached with running stitches.

Van Driel-Murray (2000: 316) states, on the basis of studying ASH E 2430 and BM EA 4408/4409 that "The soles are often red, the uppers green [...]" but, as is clear from the presented examples, there is much more variation. Also the statement that the long curl is made of a rolled strip of leather can be challenged and is certainly not true for most of the investigated shoes. The toe in pair BM EA 4408/4409 has a core (not mentioned by Van Driel-Murray), albeit smaller relative to for example EgCa 5174/5175 and made of vegetable material rather than leather or rawhide.

As explained, ÄMPB AM 21767 (see also Schwarz 2000: Katalog C, No. 20 [no page number]) is somewhat enigmatic, partially, unfortunately, due to the fact that it could not be investigated. The remark by Anthes (1943: 66) and repeated by Van Driel-Murray (2000: 316) that the shoe was worn together with fibre sandals¹³ is without foundation. Footwear with an isolated big toe is not uncommon in Egypt, although it seems to have been largely limited to sandals. In support to the suggestion that the shoes were worn with sandals, Van Driel-Murray (*Ibidem*) mentions Tutankhamun's so-called 'court slippers' (Carter & Mace, 1923: 167-169), which supposedly consists of a leather sole attached to fibre sandals. Recent research, however, has shown that the leather treadsole is covered with a gold insole (Veldmeijer, In press a). It is as yet unclear when the isolation of the big toe was seen first. This is partially due to the unclear dating of so-called 'fibre tomb sandals', which is a type of fibre sandals showing a notch at the front that suggests a separation of the big toe from the other toes.

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Endnotes

¹ See also Veldmeijer (In press a).

² Note that Goubitz *et al.* (2001: 23) avoid "terms outside the context of their period." Since the typology of ancient Egyptian footwear is, as yet, preliminary, Goubitz *et al.*'s definition will be used here and evaluated at the final stage of the Project.

³ Discussion of ASH E 2430 is not possible due to the fact that the specimen (upper only) is too fragile to study prior consolidation. But see Van Driel-Murray (2000: 314-315).

⁴ The excellent condition of the shoes prohibited measurements of the width of the folded strip at the dorsal surface of the insole.

⁵ There is only one in the lateral side.

⁶ A conservation/restoration project is currently being development by Lucy Skinner and me in close collaboration with the Authorities of the Egyptian Museum, the Conservation Department and the Supreme Council of Antiquities (see Veldmeijer & Skinner, 2008: 4-5).

⁷ Note, however, that the range of colours in leather composite sandals is wider (Veldmeijer, Submitted). Moreover, shoes occurred of leather that was not coloured but had their own, leather-brown colour (Montebault, 2000: 204-205; Veldmeijer, In preparation).

⁸ Van Driel-Murray (2000: 317) published the result of the XRF scan of the Ashmolean pair of shoes (ASH E 2430), showing the distribution of copper salts. Moreover, the scan identified mineral based colour "as well as one of the substances (Ca) used at some stage in processing, but does not reveal details of the curing method or whether alum was used. Furthermore, account needs to be taken of the overlap between mordants and curing agents."

⁹ Note that, as stated previously, some shoes were too fragile to identify wear of, for example, the ventral surface of the (tread)sole.

¹⁰ Only for EgCa 5212; the ventral surface of the sole in EgCa JE 30607 could not be studied.

¹¹ On date, see also above. A more exhaustive comparison between curled-toe ankle shoes and other leather shoes is in progress.

¹² More exactly what Goubitz *et al.* (2001: 132) more appropriately call 'recognisability'.

¹³ Anthes (1943: 66) speaks of 'sandals'; Van Driel-Murray (2000: 316) of 'fibre sandals'.

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Table 1. Summary of the most important features and measurements of leather curled-toe ankle shoes, showing collection (first column), identification (second column), provenance (third column), date (fourth column) and variant (fifth column). The measurements and shape of the sole as well as the number of sole layers and its colour is shown in the sixth, shared column. Details of the upper can be found in the seventh, shared column. Additional remarks are inserted in the last column. All measurements are 'as preserved'. Institutional abbreviations: ÄMPB = Ägyptisches Museum und Papyrussammlung Berlin; ASH = Ashmolean Museum Oxford; BM = British Museum London; EgCa = Egyptian Museum Cairo; MEgT = Museo Egizio Turin.

Collection	Identification	Provenance	Date	Variant	Measurements	Shape	Sole Number	Colour	Lining (present (✓) or absent (-)).	Upper Decoration/laces (Present (✓) or absent (-))	Colour	Remarks
EgCa	5193 (9 1 + 26 20) left	?	?	1	L sole: 217; W sole front: 63.9; W sole waist: 43.8; W sole heel: 43.3. T sole: 4.3	swayed, (rounded heel, constricted waist and pointed toe)	2	brown, beige	?	?	?	pair with 5194 (9 1 + 26 21)
EgCa	5194 (9 1 + 26 21) right	?	?	1	L sole: 205; W sole front: 62.7; W sole waist: 43.9; W sole heel: 41.1. T sole: 4.2	swayed, (rounded heel, constricted waist and pointed toe)	2	brown, beige	?	?	?	pair with 5193 (9 1 + 26 20)
EgCa	5195 (9 1 + 26 22) right	?	?	1	L: 170. W: 80. H: 40	?	?	?	✓?	three triple layer red, grey (originally: red?), black 'tear shaped' patches; highly ornamental tongue/✓	beige, but green origi- nally	ornamental cover instep differs from 30607; braided string of red and green leather, the function of which is uncertain.
EgCa	5175 (9 1 + 26 3) left	Deir-el Bahari	21 st Dynasty	1	L sole: 225. W sole front: 80; W sole heel: 54.5. T sole: app. 2.2. H heel: 94.2; H top upper: 33.8; H folded edge top upper: 28.6. D. patch medial side: 65.5. W thong: 12.0	swayed, (rounded heel, slightly constricted waist and pointed toe)	2	red, white	✓	three triple layer, green, gray (originally: red?), black 'tear shaped' patches/✓	red	pair with 5174 (9 1 + 26 3)
EgCa	5174 (9 1 + 26 2) right	Deir-el Bahari	21 st Dynasty	1	L sole: 225. W sole front: app. 79.6; W sole heel: 53.7. T sole: app. 2.2. H heel: 85.2; H top upper: app. 28.1; H folded edge top upper: 33.2. D. patch medial side: 64.8	swayed, (rounded heel, slightly constricted waist and pointed toe)	2	red, white	✓	three triple layer, green, gray (originally: red?)/black 'tear shaped' patches/✓	red	pair with 5175 (9 1 + 26 2)
EgCa	JE 30606/7 (5205) ¹⁴ left	Deir el- Bahari? ¹⁵	Schiaparelli 1921a: fig. 15, 38 See Van Driel- Murray, 2000: 315	1	L sole: 215. W sole front: 68.6; W sole waist: 53.4. ¹⁶ W sole heel: 43.5. D. patch lateral side: 54.9x61.4. W strip treadsole: 4.5	swayed, (rounded heel, slightly constricted waist and pointed toe)?	2	brown. green	✓	three(?) triple layer, red, gray (originally: ?), black 'tear shaped' patches ¹⁷ /✓	beige (but green origi- nally); red lining	-
EgCa	JE 30606/7 ¹⁸ right	Deir el- Bahari?	Schiaparelli 1921a: fig. 15, 38 See Van Driel- Murray, 2000: 315	1	L sole: 230. W sole front: 72.6	swayed, (rounded heel, slightly constricted waist and pointed toe)?	2	brown. green	✓	three triple layer, red, gray (originally: ?), black 'tear shaped' patches; highly ornamental tongue /✓	beige (but green origi- nally); red lining	ornamental cover instep differs from 9 1 + 26 22

EgCa	5212 (11 1 + 26 3) left	?	?	1	L sole: 235 ¹⁹ . W sole front: 68.9. W waist: 57.8 ²⁰ . W heel: 49.6	swayed, (rounded heel, slightly constricted waist and pointed toe)	2	brown	-	three triple layer, green, white, black 'tear	red, white	pair with 5213 (11 1 + 26 4)
EgCa	5213 (11 1 + 26 4) right	?	?	1	L front part: 128.2. W front part: 74.1. L back part: 170.0. W back part: 95.6		2?	brown	-	three triple layer, green, white, black 'tear	red, white	knife cuts at the lateral back side; pair with 5212 (11 1 + 26 3)
MEgT	S. 5149 pair	Valley of Queens	New Kingdom	1	measurements of left one. L: 215. W heel: 46.9. W toe: 76. T sole: about 3.5. H ventral upper at heel: 38; H dorsal upper at heel: 58		3	red, brown	-	three triple layer red, beige (originally: ?), dark (originally: ?) 'tear shaped' patches/✓	green?	-
MEgT	S. 5150 pair	Valley of Queens	New Kingdom	1	measurements of left one. L: 205 W heel: 53.0. W front: 67.3. T sole: about 4.5		3?	red, brown	-	three, triple layer black (originally: green?), red, green(?) 'tear shaped' patches/✓	red	dorsal upper and tongue one piece
Musée du Louvre Paris ²¹	E 14502	Deir el-Medinah, tomb 1386	2 nd half 18 th Dynasty	1	(left/right) L: 19.4 cm; W: 7.5 / l: 21 cm; W: 8.8	swayed, (rounded heel, slightly constricted waist and pointed toe)	2	brown?	-	three one layer green 'tear shaped' patches; tongue lined with green strip/✓	red	pair
BM	EA 4392 left	?	?	1(?)	W front: 72. W back: 55.5. T: 4.4		2?	brown	?	?	red	-
BM		?	?	2	L total: 135. W front: 54.4; W heel: 39.2. T upper/sole at edge: 3.2. H upper heel (appr.): 30; at begin instep: 40. ²² D curled toe: 3.2		2	brown, red(?)	-	-?/✓	green, red	pair
ASH	E 2430	Abydos, Grave W2 ²³	late 18 th -early 19 th Dynasty	2	?		?	?	?	three(?) double(?) layer red, green 'tear shaped'/✓	green	too fragile to study (see also Van Driel-Murray, 2000: 314-315)
ÄMPB	AM 21767	Deir el-Medinah, Tomb 1108, E8	New Kingdom	Uncertain	L: 225 ²⁴		1?	brown	-	-	red	indented big toe; too fragile to study

¹⁴ The specimen was too fragile to include a full set of measurements. Moreover, due to its fragile condition some details remains conjectural. This also prevented me from noticing the number and it is therefore uncertain if the left one is 30606 or 20607.

¹⁵ The registry books in the Egyptian Museum do not mention any provenance. However, since Van Driel-Murray (2000: 315) mentions that Schiaparelli found green ankle shoes, these might be the pair: the shoes in the Turin museum are red.

¹⁶ About halfway the length of the sole.

¹⁷ Note that the upper is not enough preserved to ascertain the cut out triangles.

¹⁸ The specimen was too fragile to include a full set of measurements; the available measurements are approximate. Moreover, due to its fragile condition, some details remain conjectural. This also prevented me from noticing the number and it is therefore uncertain if the right one is 30606 or 30607.

¹⁹ Including the remnant of the elongated toe.

²⁰ Halfway the length of the shoe.

²¹ After Montembault (2000: 19, 204-205).

²² Note that the right upper part seems to be higher than the left: this would mean that the instep was off centre.

²³ But see Van Driel-Murray (2000: 315).

²⁴ Schwarz (2000: Katalog C, no. 20).