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The present paper focuses on the technological aspects of an extraordinary pair of leather open shoes, currently housed in the Department of Ancient Egypt and Sudan at the British Museum (EA 4391), having been acquired from the Henry Salt collection in 1835. Unfortunately, nothing is known about their provenance, except that the pair comes from Egypt.

The paper is part in a series about footwear in ancient Egypt with a focus on manufacturing technology, which is the first phase of the Ancient Egyptian Footwear Project (AEFP). Therefore, other topics, such as philological and iconographic aspects, will be dealt with in passing. For a more elaborate explanation of the framework of the project the reader is referred to the forthcoming publication on Tutankhamun's footwear.[1] Suffice to say here that, in discussing footwear, terminology is after Goubitz *et al.*[2] For the use of directions, such as ventral and dorsal, the reader is referred to Veldmeijer.[3]

Typology

The classification of EA 4391 suggested here is preliminary, as the AEFP is an ongoing research project. Ultimately, a final typology will be presented, which, in contrast to published footwear typologies such as that of Montembault,[4] will include date and distribution besides the diagnostic technological features.[5] Moreover, the AEFP is based on significantly more objects than those upon which Montembault's typology is founded, resulting in expansion and refinement of the typology. Finally, recognisability is used, as suggested by Goubitz *et al*.[6] Leguilloux[7] has established a typology on the basis of the objects from Didymoi but because this is based on the finds from only one site, restricted to the Roman era, it is not used in the present paper.

The open nature of the upper, the differences in sole/upper construction and the presence of a combined strap/lace construction warrant a classification separate from the closed

[1] Veldmeijer, *Tutankhamun's Footwear*, but see also Veldmeijer, *JEOL* 40, 62; Veldmeijer, *JEOL* 41; Veldmeijer, in a *Festschrift*, 562.

[2] Goubitz *et al*, *Stepping Through Time,* 317–24. A more complete glossary on footwear and leatherwork can be found in Veldmeijer, *Tutankhamun's Footwear.*

[3] Veldmeijer, *JEOL* 41.

[4] Montembault, *Catalogue des Chaussures*.

[5] Veldmeijer, *Tutankhamun's Footwear.*

[6] Goubitz *et al*, *Stepping Through Time,* 23-24. See also Veldmeijer, in a *Festschrift*, 563.

[7] Leguilloux, *Didymoi,* 2006.

Curled-Toe Ankle Shoes[8] or the closed Stubbed-Nosed Low Ankle Shoes.[9] It differs from other open shoes in that the pair is made of leather only, whereas the other known open shoes are either made of fibre only,[10] or from a variety of materials.[11] Differences are also found in the fastenings, which are unique in Tutankhamun's footwear.

Description

British Museum EA 4391 (fig. 1) is a pair of small sized shoes. The heel is rounded and from here, the width of the sole increases continuously but especially at the lateral side: the sole is therefore slightly swayed. At the front it terminates in a short, pointed toe, which curls upwards. The dimensions are as follows:[12]

Length	230mm
Maximum width, at the front	58mm
Width at heel	47.5 mm
Thickness of sole	8mm
Height of upper at heel	65mm
Diameter of front strap	3.5mm

The sole consists of two thick layers (fig. 2A): the dorsalmost one, however, has an additional, thin layer, which is the actual insole and thus the thick layer is a midsole. The insole is folded around the edge of the midsole, but to what extent could not be determined, hence the dashed line in the drawing. A narrow, red leather strip (since the soles are intact, it cannot be ruled out that a sheet of leather covers the entire dorsal surface of the treadsole) is folded over the edge of the treadsole and is sandwiched between it and the midsole. The sole layers are stitched along the perimeter with running stitches of sZ-plied flax threads, which are slightly thicker than the threads in the rest of the shoe, which seemingly are only s-spun. The front of the sole is curled and has an additional, green cover of the dorsal surface (fig. 2B).[13] The lateral and medial edges of this cover are not inserted between the sole layers. As there is no sign of stitching, this cover may have been glued in place. The posterior edge, however, is fastened with whip stitches to the ventral surface of the treadsole, as is usually done with this kind of additional cover in leather composite sandals.[14] It is uncertain, however, whether the stitches pass straight through one or more sole layers, or pass only partially through the

[8] Veldmeijer, *PJAEE* (in press). See also Montembault, *Catalogue des Chaussures*, 204–5; Van Driel-Murray, in Shaw and Nicholson (eds), *Ancient Egyptian Materials and Technology*, 315–16.

[9] Veldmeijer, in preparation [a] See also Montembault, *Catalogue des Chaussures*, 194; Van Driel-Murray, in Shaw and Nicholson (eds), *Ancient Egyptian Materials and Technology*, 316.

[10] Veldmeijer, in preparation [b]. See also Gourlay, *Les Sparteries de Deir el-Médineh*, I, 64–5; Montembault, *Catalogue des Chaussures*, 36–8; Teeter, *Ancient Egypt*, 110 (for comments on Teeter's catalogue entry, see Veldmeijer, in preparation [b])

[11] Only found in the tomb of Tutankhamun (Veldmeijer, *Tutankhamun's Footwear*).

[12] All measurements are of the right shoe, except for the front strap.

[13] Ventral surface but visible in dorsal view because the toe curls.

[14] Veldmeijer, *PJAEE* (in press [a]).

thickness.[15]

The upper shoe consists of two pieces (fig. 2C),[16] the main part of which decreases in height towards the toe and extends until the start of the ventral cover of the curled toe. The lower edge of this main part is attached inside a strip of leather that is put in between the midsole and possibly treadsole (fig. 2A). The two elements are secured with whip stitches and includes the corner of the insole (fig. 3, arrows). It could not be determined how far the main part of the upper extends; it might be folded over the edge of the dorsalmost sole layers too, as is the attachment strip. In front of the terminal end of the attachment of the main part of the upper, this strip is cut in and folded over the dorsal surface of the curled toe and secured.

The dorsal edge of the upper of the left shoe, i.e. the instep, is folded and secured with running stitches as an alternative edge binding (fig. 2A). However, the right shoe has a true edge binding, consisting of a narrow strip of leather that is folded over the edge of the instep at either side and fastened with running stitches (fig. 2A). It is uncertain which of the two constructions is the original one, but one of them might be a repair.

Remnants of a front strap (a longitudinally-folded leather strip), piercing the sole, are still *in situ* (upper arrow in fig. 1). It is fastened at the ventral surface of the treadsole by bending the end towards the sole (lower arrow in fig. 1). Detached fragments of the front strap are still present, showing a slit at its other end for accommodating the lace. At the back of the upper, at either side and roughly at the ankle proper, just under the upper's edge, are two slits for the reception of a lace running behind the back of the upper. Another pair of holes is situated more towards the front, but in the edge binding of the upper. The lace went through the holes, running behind the heel and possibly through the slit in the front strap, thus combining lace and front/back strap of shoe and sandal (fig. 2D, 4).

Manufacturing methods

Van Driel-Murray[17] reports that the upper of brightly coloured shoes are made of goatskin, as is the case for most of the leather Curled-Toe Ankle Shoes.[18] In EA 4391, however, the upper is made of much thicker and less flexible leather and more detailed analysis is needed to identify the leather. The thick sole layers are made of rawhide.

The overall construction of EA 4391 is unique and thus far seen only with this pair of shoes (despite Petrie's statement of shoes, i.e. plural; see below). The upper imitates the upper in fibre shoes in appearance, though, of course, not exactly in construction,[19] or vice versa: it is not yet clear which type appeared first. It might be, however, that the leather variant already occurred in the Middle Kingdom as Petrie[20] mentions leather shoes from Twelfth Dynasty

[15] Referred to by Goubitz *et al*, *Stepping Through Time*, 322–3 as 'stitching' and 'sewing' respectively.

[16] The attachment strip, to which the so-called 'main part of the upper' is fastened, might be regarded as belonging to the soles, but since it extends slightly upwards, lining the 'main part of the upper', it is described as 'upper'.

[17] Van Driel-Murray, in Shaw and Nicholson (eds), *Ancient Egyptian Materials and Technology*, 302.

[18] Veldmeijer, *PJAEE* (in press [a]).

[19] See n. 10.

[20] Petrie, *Kahun, Gurob and Hawara*, 28.

Kahun,[21] which are similar in layout to the well-known fibre ones in that

> 'all of them have the leather sandal strap between the toes, and joining to the sides of the heel, to retain the sole on the foot; the upper leather being stitched on merely as a covering without its being intended to hold the shoe on the foot.'

The shoes have not been traced yet and hence have not been studied by the author. It is certain that the pair of shoes published here were not among the ones Petrie mentions, as EA 4391 entered the British Museum in 1835. This, however, not necessarily means that they did *not* come from Kahun. Moreover, Petrie's description is too general to understand the exact construction of the straps but they seem to equal the straps in fibre shoes.[22] The strap in EA 4391, however, differs from the one usually seen in fibre open shoes with straps in the fact that it is relatively short and the laces are pulled through a slit in the terminal point, after which they run through slits in the upper, rather than being fastened to the sole as in fibre shoes (and apparently the 'Petrie shoes'). This strap/lace construction can be seen as a combination of sandal-straps and shoe-laces and might be an intermediary phase, i.e. between shoes with a sandal-like strap complex and shoes with laces.[23]

Discussion

The 'sole/upper' construction of these shoes is comparable to that seen in other leather shoes[24] although differs in details. We are not certain about some details, as visibility is obscured in some parts. For example, the leather of the upper may be folded around the insole's edge or only attached to the attachment strip. Considering the fact that securing the upper to the attachment strap alone would be a weak construction too, we might assume that it too was folded over the edge of the insole and secured with the stitching that fastened the sole. Adding an attachment strip, which might be an early predecessor of the rand or welt,[25] certainly reinforces the construction. In the shoes discussed here, it is beyond doubt that the whip stitching that attach the upper to the attachment strip went through the thick insole but this could not be ascertained in other shoes with a comparable construction. However, if not, the construction would be weak and prone to tearing at the stitching and thus it is likely they did in all cases (or, alternatively, to the strip that covers the edge of the insole separately)[26]. The construction has another advantage: the upper itself is limited in its outwards movements due to the fastening to the sole and thus less prone to tearing. The thick, relatively inflexible leather of the upper might have been chosen for the same reason.

A pair of shoes in the Egyptian Museum (Cairo), currently under study, are broadly

[21] We should bear in mind that Petrie's dating of Kahun is not reliable, and confirmation of this dating by means of well-provenanced material is sorely needed.

[22] Although it is plausible that the strap complex in open fibre shoes originates from sandals (Veldmeijer, in press[b]), this cannot be said with certainty about the 'Petrie shoes' without studying them.

[23] See ns. 8–9.

[24] Veldmeijer, *PJAEE* (in press [a]).

[25] Ongoing research on a pair of shoes in the Egyptian Museum will further elucidate this type of footwear.

[26] Veldmeijer, *PJAEE* (in press [a]).

comparable, particularly the cutting pattern of the upper and the sole/upper construction. The Cairo pair is, however, decorated and has a sandal-like strap complex,[27] including the 'ear' pre-straps that are cut out of the same sheet of leather as the soles.

Examples of well-dated closed shoes fall within the (late) Eigtheenth until the Twenty-first Dynasties.[28] 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,[29] but this hypothesis is difficult to prove or refute. Petrie on the other hand, suggests that the open leather shoes, which might compare well with the open fibre shoes that possibly evolved from sandals, originate in the Middle Kingdom. If we accept his dating of the Kahun material, the three shoes he found would support such a thesis. We cannot ignore, however, that leather open shoes compare very well with some types of leather sandals, albeit in varying degree. If we accept a development from open shoes with a sandal-like strap complex, through the shoes with the strap/lace complex discussed in the present work to, finally, closed shoes with laces, than this would mean that EA 4391 is older than the closed shoes from the later New Kingdom[30] (which does not show any signs of a sandal-like strap complex), but younger than Petrie's shoes from Kahun. This sequence, if this is what happened, could mean that the closed shoe evolved within Egypt from open shoes rather than imported from abroad. However, it does *not* mean that the open shoe was an Egyptian invention. Another problem is that we assume EA 4391 is Egyptian but we do not know this for certain: it might have been imported from abroad. Additional problems are caused by the lack of knowledge of contemporary footwear from Egypt's surrounding areas.[31]

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[27] Also comparable to the fibre open shoes. See n. 25.

[28] Veldmeijer, *PJAEE* (in press [a]).

[29] Van Driel-Murray, in Shaw and Nicholson (eds), *Ancient Egyptian Materials and Technology*, 316. Note that Van Driel-Murray only refers to 'true' shoes when they entirely enclose the foot; if they are open dorsally, as seen in EA 4391, she does not regard them as true shoes. With the AEFP, a piece of footwear in which an upper encloses the heel is regarded as shoe.

[30] Note that the all of the shoes found in the tomb of Tutankhamun are open shoes. However, they display varied methods of closing, which might be an Egyptian invention rather than foreign (Veldmeijer, *Tutankhamun's Footwear*) but might have been based on foreign footwear.

[31] Research on the foreign influence on Egyptian footwear is in progress by Ilja Nieuwland and the present author.

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Figure 1: The right shoe, EA 4391, in ventral and dorsal view respectively. Inset: Toe of the left shoe with part of the front strap and lace. Scale bar in centimetres. Photographs by A. 't Hooft. Courtesy of the British Museum, London.

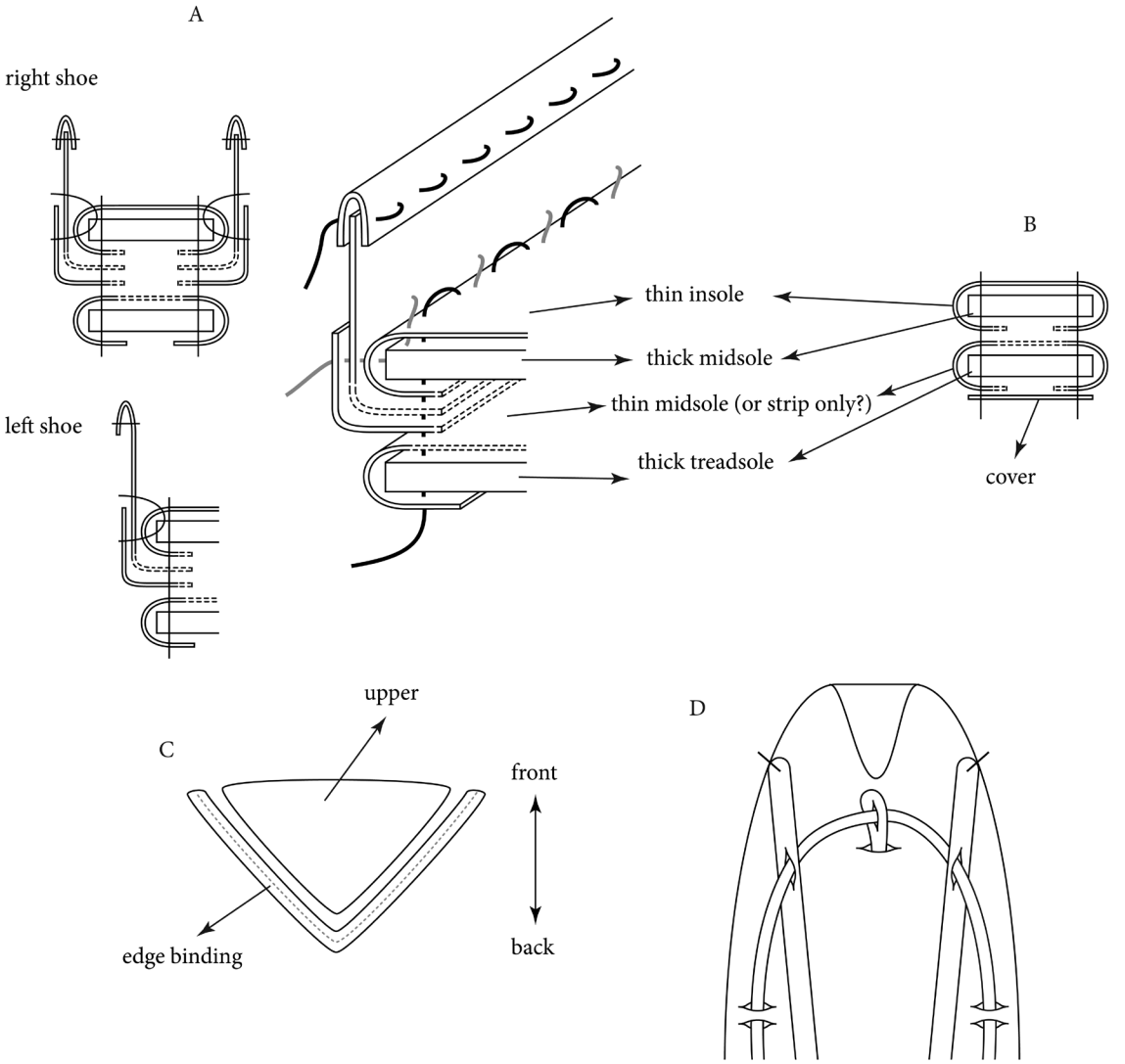


Figure 2: Construction details of EA 4391. A) Sole/upper construction of the right shoe with details of the 'edge binding' of the left; B) Construction of the curled toe; C) Cutting pattern of the upper; D) Schematic rendering of strap/lace complex. Not to scale. Drawings by E. Endenburg/A.J. Veldmeijer.



Figure 3: The left shoe in lateral and medial view respectively. Scale bar in centimetres. Photograph by A.J. Veldmeijer. Courtesy of the British Museum, London.

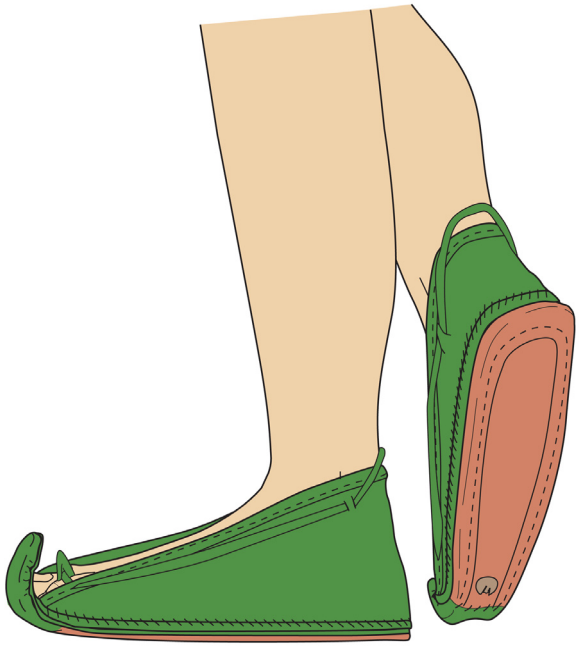


Figure 4: Artist's impression of EA 4391. Drawing by M.H. Kriek.