FINAL ARCHAEOLOGICAL ANALYSIS

André J. Veldmeijer



THE ANCIENT EGYPTIAN FOOTWEAR PROJECT



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Adrianus (Adri) 't Hooft

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Preface

The study of ancient Egyptian footwear started rather unexpectedly with the find of a cordage sandal in Berenike (a site on the Egyptian Red Sea Coast) and the subsequent discovery that no relevant literature existed that could elucidate this find specifially, or that even examined ancient Egyptian footwear in a more general way. Now, over ten years later, enough material has been studied to present the 'final' archaeological analysis of the Ancient Egyptian Footwear Project (AEFP), with a focus on the Pharaonic period material. This does not mean that the work on footwear is finished. On the contrary – as will be explained – but it is a start that aims to provide a foundation on which to continue the work.

One of the main tasks of a scientist is to publish their work in a scientific setting (and well over 1500 pages have been produced by the AEFP) but no less important is it to make this research available to the public at large. One can do this with nicely illustrated books and articles, with documentaries for television, and also by organising exhibitions. I am proud that, as with my work in vertebrate palaeontology, for which I organised an exhibition on pterosaurs in *Het Natuurhistorisch* museum in Rotterdam, I have been able to present my scientific work in Egyptology in the Egyptian Museum, Cairo. It feels like a nice finishing touch to this part of the research. The archaeological work will of course continue, as will the work on imagery and texts, so that, in the future, these results can be combined and analysed in order to further our understanding of footwear in ancient Egypt.

During the years I have been helped by many foundations and many kind people including curators, conservators, administrative staff, directors, photographers, artists, Egyptologists, librarians, archaeologists, and others – whom have been thanked in the various publications. Once more I would like to thank you all for the help, support, suggestions and admissions – in general, work has gone smoothly thanks to your efforts! Three persons, however, I would like to thank here separately: Salima Ikram has critically read through the present manuscript, which greatly improved it. She also checked the English. Ariel Singer has checked the English, for which I am grateful. Erno Endenburg is thanked for his allround support, assistance and companionship, as always.

> André J. Veldmeijer Dwingeloo (The Netherlands) 9 October 2018

Introduction

A Short History of Footwear in Ancient Egypt

It is often said that the ancient Egyptians went barefoot most of the time. Though undoubtedly they did on occasion, this supposition is contradicted by the large quantities of footwear that have been recovered from archaeological sites across the country (present work, but see also, e.g., Gourlay 1981a: 55-64; 1981b: 41-60, pl. V, XX; Montembault, 2000: 87-91, 106, 194, 205-205). Moreover, if we take P. Harris (BM EA 9999: 72.12 and 73.1) literally, Pharaoh, at least in the Ramesside period, gave away thousands of sandals (Grandet, 1994: 96, pl. 34). Additionally, Janssen (1975: 292-298), in his work on Deir el-Medinah, has shown that sandals were a very common commodity within that community. Also Siebels (1996) and Schwarz (2000: 229-230) suggest that footwear was not uncommon in the society. But despite the wealth of shoes, sandals and other footwear in numerous Egyptological collections all over the world, footwear in ancient Egypt has been poorly understood due to a lack of scholarly attention. It was because of this deficiency that the AEFP was initiated. Little to no work at all was done on footwear prior to the AEFP, especially with regards to the archaeological examples.¹ Montembault's catalogue on the collection in the Louvre Museum, Paris (Montembault, 2000), and the work on the finds from Didymoi (on the leather finds in general) by Leguilloux (2006) and Quseir el-Qadim (Winterbottom, 2001) are exceptions. Russo's work on footwear (2004) includes archaeological specimens, but her book mainly deals with footwear mentioned in texts. Schwarz's (2000) volume on leatherwork in ancient Egypt does include sandals, but the focus is on the imagery of leather footwear, and the descriptions in the catalogue are fairly basic. Excavation reports sometimes mention footwear, but rarely does it go beyond simply noting that footwear was

¹ Some work was done prior to the AEFP on the imagery of footwear, such as Cherpion (1999) and Siebels (1996). Only recently Van Walsem (2013) published a paper on depicted sandals.

found (*e.g.* Dunham, 1982²; Garstang, 1907³). There are few exceptions though, such as Petrie's short but important account of the footwear from Lahun (Petrie, 1890: 28), the interesting reports by Junker (1920; 1925) about the finds from Nubian Ermenne and el-Kubanieh, and the more detailed treatise of Williams (1983) on the footwear that was found in Adindan. Recently, more attention has been given to footwear from excavations (such as Dzierzbicka, 2008; Huber, 2011; Livingstone, 2011), but the quality of these studies varies. Nonetheless, more and more interest has arisen lately, not least because of the work of the AEFP, resulting in exhibitions,⁴ more publications, and increased attention from conservators.⁵

Research Objectives

The long-term scholarly neglect of footwear as a research topic is a bit surprising. Footwear must have played an important role in the society, as is suggested by the sheer size of the archaeological corpus and from texts and imagery. Footwear not only served the practical purpose of a protection for the feet, it also had a considerable socio-economic and symbolic significance from the very early stages of history onwards (*e.g.* Kelder, 2013⁶), and should therefore not be isolated

² Dunham, however, did a great job on the finds from Kerma, and fortunately we know which graves contained sandals, although the type of sandals were not specified. For example: pp. 28-29: "K 5505. Pair of thin leather sandals. Sandals found on feet. Not measured. Not illustrated"; p. 29: "K 5510. Pair of soft leather sandals"; pp. 32/33: "K 5535. Pair of thin leather sandals. Not measured. Not illustrated"; pp. 85-86: "N 26. Pair of rawhide sandals (on feet)"; pp. 86-87: "N 28. Pair of fine rawhide sandals on feet. Not measured. Not illustrated"; pp. 87-88: N 33. "Rawhide sandal on floor. Not measured. Not illustrated"; p. 93: "N 51. Leather sandal with thin straps"; p. 98: "N 61. Pair of leather sandals on feet. Not measured. Not illustrated"; pp. 104-105: "N 83. Pair of leather sandals on feet"; pp. 112-113: "N 95. Pair of leather sandals. Not measured. Not illustrated"; pp. 113-114: "N 96. Pair of leather sandals on feet. Not measured. Not illustrated," etc. Remarkably, Dunham wrote in his preface in 1979 that he "began [in 1975] the study of what can now, after some sixty years, be made available of the unpublished work of the late Dr. George A. Reisner at the site of Kerma" and explained the troublesome past of "a considerable volume of what he [Reisner] considered to be of secondary importance". Unfortunately, it happened (and still happens) fairly often that excavations were (are) not (exhaustively) published: Gebel Adda, excavated by Nicholas B. Millet in the 1960s is another example (Grzymski, 2010; the footwear was recently published, Veldmeijer, 2010a; 2016c - and the second volume of the leatherwork is in preparation), and so are the excavations in the Unas necropolis in Saqqara, first by Zaki Youssef Saad in the 1930s/40s and then by Peter Munro in the 1970s-1990s (in both cases, several preliminary reports were fortunately published; a project was started in 2012 by the author to publish the archive of Munro's work; Veldmeijer et al., 2014).

³ The publication is a good example (and comparable to Dunham's work on Kerma) of the kind of information given about footwear: T 139: part of sandal; T 186: two sandals (fig. 71-78); T 187: pair of sandals, decayed; T 524: pair of sandals; T 540: portion of wooden sandal, broken in two pieces; T 541: portion of wooden sandals, one having 2 pegs and portion of strap; T 574: portion of sandal; T 585: sandals (fig. 80); T 592: part of woven sandal and bottom of basket (is this also a bottom of basket rather than a sandal sole?); T 613: portions of three sandals; T 842: sandal; T 708: pair of sandals; T 723: pair of male sandals; T 800: 3 pair of female's sandals; T 842: sandal.

⁴ An overview exhibition on ancient Egyptian footwear was organised in 2012 in the office of Leiden University; a more elaborate version of this was organised in the Egyptian Museum, Cairo (the text is published by Veldmeijer, 2016b).

⁵ Including the visual condition recording of leather footwear by Stefanie Staab in 2013 and 2014 in the Egyptian Museum, Cairo and the reconstruction work done on the footwear from the tomb of Tutankhamun by the Organic Lab of the Grand Egyptian Museum Conservation Centre (GEM-CC; on such work on the Sewn Sandals see Morshed & Veldmeijer, 2015).

⁶ Kelder discussed the Narmer Palette, which is one example of very early two-dimensional representations of footwear. Here, a sandal-bearer is shown behind the king. The significance as well as status is, however, unclear.

from studies. However, in order to understand footwear,⁷ a thorough knowledge of the objects is required, which is the main and most important task of the archaeological component of the AEFP.⁸ The archaeological record is rich, but texts and two- and three dimensional art are also abundant and provides us with insight into footwear, often from a different point of view. As so often is the case, these different research foci complement each other and are thus all part of the AEFP.

It is poorly understood how footwear was used and conceived of in practical terms. Moreover, we know very little about the development over time and the geographical distribution of footwear. The choice of material, the shape, the technological features, and the distribution of types in time and space are potentially powerful traits to understand the practical use as well as any symbolic content.⁹

In order to find answers to the above-mentioned questions, this research departs from merely being a hands-on study of items, both in major museum collections as well as those that have been recently excavated (see below under section 'Studied Objects' of chapter 'Materials and Methods'), to include:

- i. Manufacturing Technology: differences in seams, stitching, number and shape of various elements, quality of production, and application and type of decoration. These features may indicate different workshops/traditions (including whether the footwear has an indigenous or foreign origin), and also shed light on the development of knowledge. Furthermore, it provides insight in the importance of certain technologies (including the origin) as well as changing preferences in the society.
- ii. Materials: the choice of materials may have been practical (for a specific functional reason e.g. tougher material to make it more durable), it may have had a more symbolic reason, or it may have been a combination of these.
- iii. Shape (including decoration): although shape and overall appearance did not undergo the kind of rapid changes seen in our modern-day society, modifications can be noted throughout the history of Egypt. Additionally, the absence of change is equally important.
- iv. Use, wear and repair: these are important traits to gain insight into how footwear was used and understood. This topic will be examined by taking into account the practical aspects of the footwear (their properties as functional items and the ease with which they were discarded/repaired) as well as the perspective of the owner. An analysis of such issues will help us to further understand various aspects of society, such as wealth and health.

⁷ As well as to be able to properly study and interpret imagery and texts.

⁸ But not exclusively, see below.

⁹ More elaborately explained in Veldmeijer (2010f: 11-14).

At this stage, the emphasis of the work of the AEFP lies in the Pharaonic material since a representative sample of this material has been thoroughly studied – although some categories of Roman,¹⁰ Byzantine,¹¹ Islamic,¹² and Ottoman¹³ footwear are also analysed. This study of post-Pharaonic material has enabled the comparison and interpretation of the continuation (or not) of features, as well as the identification of new features. However, more well-dated and provenanced material from post-Pharaonic times¹⁴ is needed in order to confidently present details on the origin and development of technological features and its influence.¹⁵ This is especially true since there was a distinct break in footwear tradition between Pharaonic material has been published (*e.g.* the Ottoman footwear: Veldmeijer, 2012b; the Nubian footwear: Veldmeijer, 2016c), whereas the AEFP has classified other material within Montembault's typology (2000), as explained elsewhere (Veldmeijer, 2012b: 74-75).

Layout of the Present Work

The size of the record made a division of the research inevitable: the present work, focusing of the actual remains of the footwear (*i.e.* the archaeological objects) is referred to as Phase I and is the final archaeological analysis. The pictorial and textual evidence will only be mentioned in passing in the current volume; however, the AEFP's Phase II will deal with these topics in detail.¹⁶ This means that the information on footwear here is incomplete – only once the imagery and footwear-related ancient texts are also dealt with will it be possible to present a much more complete picture.

The footwear that was studied in Phase I is published in a series of publications, with each discussing one category of footwear. These published descriptions are summarized and evaluated here in the chapter 'Description', to which are added the images of all discussed objects since usually it was impossible to depict them all in the papers themselves. The bibliography in this chapter only presents relevant papers that were published after the specified publication and were thus not inserted in the original. In some cases, additonal photographs are included. Finally, previously unpublished objects are added as well. Several collections or find assemblages have been published either as monograph or as part of a volume on the overall leather finds of a site (Amarna, Deir el-Bachit, Elephantine, Dra

¹⁰ Mainly from Qasr Ibrim (housed in the British Museum, London and the Coptic Museum, Cairo as well as in other storage facilities of the Ministry of Antiquities in Egypt, but these have been studied only from the excavation's find cards).

¹¹ Among others from the Sammlung des Ägyptologischen Instituts der Universität, Heidelberg. The publication of the pre-Ottoman finds from Qasr Ibrim is in preparation.

¹² The publication of the finds from Fustat is in preparation, but see Veldmeijer (2013e; In Press b).

¹³ Mainly from Qasr Ibrim (Veldmeijer, 2012b) but examples from Gebel Adda and Dra Abu el-Naga have been published too (Veldmeijer, 2016c: 54, 229-239; 2017a: 53-54, 116-119 respectively).

¹⁴ With the exception of material from Nubian sites: the Gebel Adda material is mainly dated to post-Meroitic times.

¹⁵ The problems with better understanding certain (sudden) features and phenomena are discussed in more detail below.

¹⁶ An exhaustive study of two- (and three-)dimensional representations, partially based on the inventory of well over 300 Theban tombs by the late Jac J. Janssen, started in 2015, in collaboration with the American University in Cairo. Hagen has written an account of footwear in New Kingdom texts for the volume on Tutankhamun's footwear (2010). A survey is currently being done in preparation for additional work.

Abu el-Naga). The bibliographies of all publications (*i.e.* including those in the published series and books) are merged into the bibliography at the end of the present work.¹⁷ At the beginning of each chapter references are made to the relevant pages of the published work.

The aforementioned publications include detailed descriptions and interpretations of technology, shape, and typology. Such detailed descriptions of a large number of objects are necessary for various reasons – it is a misconception that, by studying one or few examples of a particular object, one can come to general conclusions on the whole corpus of these objects. Materials, dating, and distribution are all discussed in these publications and, occasionally, other topics as well (such as development, manufacturing sequence, status and use/wear/repair). It proved impossible to give the same level of detail for each category or even type of footwear for each topic. There are many reasons for this variability. In some cases the provenance is much better known than in others. Additionally, there are types of footwear for which the category or type is represented by only one or at least very few example(s).¹⁸ Yet there are also types of footwear for which there are many more examples known.¹⁹ Of course those categories with considerable detail allow for a better-founded discussion of the topics.

The reader is referred to these publications for specific information on these categories and types of footwear; the present final archaeological analysis focuses on summarizing and suggesting conclusions about the wider, overall picture that emerged from the study of the archaeological material and should be seen as the conclusion of this part of the project.

Terminology

Using one general set of terminology for footwear is not as logical as one might think. Terminology is usually based on leather footwear from areas where the circumstances of preservation are unfavourable for organic materials, such as Europe. Moreover, they are often based on fairly 'recent' material from Roman times or, still more often, from the Middle Ages of Europe onwards. This is further complicated by the fact that shoemakers and leatherworkers in Europe had their own, specialised terminology, terms that have not been attested in ancient Egypt.²⁰ Note that this only relates to footwear that is made of leather – organic materials

¹⁷ This means that in the present work, they have extensions ('a', 'b', 'c' etc.) that might not be the same as in the published work.

¹⁸ The leather open shoe (see the section 'Open Shoes' of 'Footwear Made of Leather' in the 'Description' chapter) and the Meir sandals (see the section 'Side-Covering Sandals' in the 'Description' chapter), both in the Egyptian Museum, Cairo are just two examples.

¹⁹ Sewn Sandals and Composite Sandals respectively (see the section 'Footwear Made of Vegetal Material' in the 'Description' chapter).

²⁰ Schwarz (2000) has done a comprehensive study and compared modern-day leatherworkers from Morocco with the ancient Egyptian leatherworkers. A visit to the Egyptian leatherworkers in Fustat (Cairo) in 2012 was also in this respect worthwhile and confirmed, not surprisingly, the findings of Schwarz. The part of the AEFP that deals with ancient Egyptian texts will look into this topic too.

(other than wood²¹) must have been used in Europe, especially in southern areas such as Italy, Spain and Greece, but next to nothing is known about footwear that was solely made of vegetal materials and its production.²²

Finally, in general, footwear from post-Roman Egypt (shown by finds from Fustat, Qasr Ibrim, and Antinopolis, among others) and, especially from Europe shows a more complicated technology, including vegetable tanned leather,²³ resulting in various specialised terms for features in addition to those for the technology. These are, needless to say, not particularly useful for the Pharaonic Egyptian material. Still, in an attempt to make the study as comprehensible as possible for specialists worldwide, the terminology of Goubitz *et al.* (2001: 317-324) was taken as a basis. Expansion and adjustment then proved to be inevitable for the Egyptian material (Veldmeijer, 2012b: 27-29²⁴; see also 2010f: 266-269). The terminology for cordage is after Veldmeijer (2005a, b) and the terminology for knots is after Veldmeijer (2006).

Note that in the published AEFP studies, the term 'fibre' is often used to indicate that footwear is made of material that had a vegetal origin. Cartwright & Veldmeijer (2017) however, remark that in plant anatomy the term 'fibre' refers to a particular type of cell, which functions as support. However, the term has acquired a more general usage (sensu lato) in literature, which can be confusing particularly when the plant parts actually represent the external surface of a leaf or stem (so, strictly speaking, should not be termed 'fibres'). In this report,²⁵ the word 'fibre(s)' has only been used (sensu stricto) to refer specifically to the particular type of cell that functions as support, e.g. in the case of Linum usitatissimum (flax), but not to describe cells that occur adjacent to fibres such as parenchyma, collenchyma, phloem or xylem. If it has been possible to identify more specific details - e.g. the epidermal surface of a leaf, or parts of a stem - that information has been provided in the figure (image) captions. In some instances, where the sample had been termed 'fibre' already (and there are other cells present besides fibres [sensu stricto]), the term has been retained for ease of reference,²⁶ but placed in single inverted commas *i.e.* 'fibre'." The more general meaning is used in the descriptive chapter, since the relevant papers have already been published, but in the remainder of the work this term is no longer used.

²¹ Wood, of course, is an often used material for footwear, ranging from pattens and wooden shoes to elements in soles and heels.

²² A famous example which hints at a much wider use of vegetal materials is the shoes of Ötzi, the Prehistoric man who was found in the ice on the border between Austria and Italy (Egg & Goedecker-Ciolek, 2008; Groenman-Van Waateringe, 2000: 380-381).

²³ A reason for this is, among others, the climate, which forced the Europeans to make footwear that better withstood the cold, rain and snow, and the wet surface that occurred as a consequence of these environmental circumstances.

²⁴ Also included in Veldmeijer (2016c).

²⁵ See below in section 'Methods' in chapter 'Materials and Methods' for the identification of the material for the samples from the British Museum, London, the Petrie Museum for Egyptian Archaeology, University College London, and Ägyptisches Museum und Papyrussammlung, Berlin.

²⁶ Since the AEFP used the term.

Material and Methods

Studied Objects

Footwear in the following collections²⁷ have been studied and published²⁸:

- Ägyptisches Museum und Papyrussammlung, Berlin (ÄMPB)
- Ashmolean Museum, Oxford (ASH)
- British Museum, London (BM)
- Coptic Museum, Cairo (CM, sometimes combined with MSA = Ministry of State for Antiquities)
- Egyptian Museum, Cairo (EgCa or EgMus, sometimes combined with MSA = Ministry of State for Antiquities)
- Luxor Museum, Luxor
- Metropolitan Museum of Arts, New York (MET)
- Museo Egizio, Turin (MEgT)
- Museum of Fine Arts, Boston (MFA)
- Medelhavsmuseet, Stockholm²⁹
- National Museum of Antiquities, Leiden (NMAL)
- National Museums of Scotland, Edinburgh (NMS)
- Oriental Institute Museum, Chicago (OIM)
- Petrie Museum of Egyptian Archaeology UCL, London (Petrie)
- Roemer- und Pelizaeus-Museum, Hildesheim (RPM)
- Royal Ontario Museum, Toronto (ROM)³⁰
- Sammlung des Ägyptologischen Instituts der Universität, Heidelberg (SAIUH)
- World Museum, Liverpool (WML).

Finds from the following excavations have been studied and published:

- Amarna
- Amenhotep II Temple Luxor
- Berenike
- Deir el-Bachit
- Dra Abu el-Naga
- Elephantine
- Fustat (awaits publication)
- Hierakonpolis (awaits publication)
- Mersa/Wadi Gawasis
- Qasr Ibrim.³¹

- 29 Veldmeijer (2014b/2017b).
- 30 Veldmeijer (2016c).
- 31 The Ottoman footwear is published (Veldmeijer, 2012b) and several objects of pre-Ottoman date are published in the catalogue of the Coptic Museum footwear collection (Veldmeijer & Ikram, 2014)...

²⁷ Several objects in the collection in Manchester are under study by Lucy Skinner and the present author.

²⁸ An estimated 85% of all Egyptian objects from pre-Roman times that have been studied have also been published; the remainder is either too fragile to study prior to consolidation and/or did not fit into the typology (usually because the remains were too scanty to be able to determine which type it would have been; these will be published in the future). Sometimes objects in a collection were not studied, for different reasons, such as not being available because they were part of a temporary exhibition abroad, or the showcases could not be opened. References are only included to monographs that discuss the 'complete' collection, rather than to publications that only discuss one particular type of the collection.

Methods

Hands-On Study

Work started with macroscopic observations of the objects, aided by simple tools such as a magnifying glass, measuring equipment, pincers and soft brushes. Drawings were made (overall as well as technical) and all studied material was photographed in overview and in detail³² in order to have an archive against which to check the original observations. The methodology, however, was not uniform for all collections/excavations or even for each type of shoe or sandal because the methodology was dependent upon various factors. These included the condition of the objects, the quantity of specimens to be studied and available time, material from which the objects were made, and more specific working circumstances in the museum. Simultaneously, the museum archives were consulted to gain information on the history of the objects. However, in several cases this work was postponed, usually due to time constraints, until the (near) future. It is due to the excellent help of the responsible curators that this proved less problematic than might have been.

Vegetal Materials (Other than Wood)

Often, the preservation of organic materials in Egypt is so extraordinary that adequate identification of certain elements of plants, such as the leaves of the date and dom palm, can be done without any equipment more specialised than a magnifying glass (see for example the vegetal footwear from the tomb of Tutankhamun, Veldmeijer, 2010f).³³ For the fibrous parts of plants, distinguishing between taxa that are closely related (such as grasses), and when preservation is poor, such easy identification is not possible and other ways are necessary to identify the material. Therefore, a representative sample (i.e. one or a few items from a particular group) was taken for shoes and sandals in the Ägyptisches Museum und Papyrussammlung, Berlin, the British Museum, London and the Petrie Museum for Egyptian Archaeology, University College London (see below)³⁴ in order to examine them by optical and scanning electron microscopy. The shoes and sandals that are made of vegetal material in the Medelhavsmuseet in Stockholm have been sampled as well and hopefully identification will be done in the near future. Wood, except for the pattens from Ottoman Qasr Ibrim, has not been identified; here sampling is necessary in order to obtain reliable identification, which needs to be done by an archaeobotanist rather than by the footwear specialist.

³² At the start of the project, only overviews were taken. In some cases, detailed photography was done during a later visit to the collection. All photographs and other illustrations are by André J. Veldmeijer/E. Endenburg unless stated otherwise.

³³ Carter and his team have taken a number of samples; see http://www.griffith.ox.ac.uk/ discoveringTut/. See also Veldmeijer (2010f: 147).

³⁴ The paper (Cartwright & Veldmeijer, 2017) is updated and included here partially.

Selecting and Sampling Three Collections (With C.R. Cartwright)³⁵

Fifty-four samples (each comprising one or more type of plant) from twelve sandals in the Ägyptisches Museum und Papyrussammlung, Berlin were submitted for Scanning Electron Microscope (SEM; Figure 1) examination, imaging, and identification of plant materials (Figure 2, Table 1). In addition to these samples, seventeen others were taken from footwear (six pieces; Figure 3, Table 2) in the collections of the British Museum, London, and twenty-eight (from eight objects; Figure 4, Table 3) from the collection in the Petrie Museum of Egyptian Archaeology, University College London.



Figure 1. The variable pressure scanning electron microscope (VP-SEM) at the British Museum which was used for the identification of plant materials from the selected ancient Egyptian sandals. Image: C.R. Cartwright. © The Trustees of the British Museum.

³⁵ After Cartwright & Veldmeijer (2017). Grateful thanks are due to Alan J. Clapham for kindly providing and discussing some modern reference specimens of Poaceae from North Africa. Mike Dallwitz is acknowledged for permission to publish photographs of the epidermis of modern leaf blade of *Imperata cylindrica*. Further thanks are due to the collections for allowing us to sample the footwear and publish the photographs. [...]



Figure 2. The footwear in the Ägyptisches Museum 346); J) ÄM 6994, dorsal and ventral view; K) ÄM ventral view; I) 6992 (Z-3324, dorsal and ventral 1397, dorsal and ventral view; L) ÄM 620, dorsal dorsal and ventral view; und Papyrussammlung, and ventral view. Scale 18448, dorsal view; H) ÄM 6992/1, dorsal and samples were taken. A) ÄM 3324, dorsal view, ÄM 26547, dorsal and ÄM 17081, dorsal and sewing of the edge; B) ventral view; C) ÄM E) ÄM 20471, dorsal ventral view; G) ÄM view; D) ÄM 18473, and ventral view; F) with a detail of the Berlin from which bars are 50 mm.



Figure 3. The footwear in the Petrie Museum of Egyptian Archaeology, University College London. Photography by the Petrie Museum.



Figure 4. The footwear in the British Museum, London from which examples were taken. Photography by A. 't Hooft/A.J. Veldmeijer. A) EA4418, dorsal and ventral view; B) EA4432, dorsal view; C) EA4445, dorsal view; D) EA4465, dorsal and ventral view; E) EA55411, dorsal and ventral view; F) EA36210, dorsal and ventral view. Scale bar is 50 mm.

Accession number and sample details	Type of footwear	Sample Description	Cyperus papyrus, papyrus sedge	Desmostachya bipinnata, halfa grass	<i>Imperata cylindri</i> ca, halfa grass	Hyphaene thebaica, dom palm	Linum usitatissimum, flax (for linen)	<i>Phoenix dactylifera,</i> date palm	unidentifiable
ÄM 3324	sewn-edge plaited sandal, type	insole strip							
	D, variant i	edge sewing							
		core of the edge							
		treadsole strip							
ÄM 3325	composite sandal, type	insole strip							
	elongated straight, variant	braid treadsole							
	notched	core of the edge							
		braid insole							
ÄM 17081	composite sandal, type	insole strip							
	elongated straight, variant	cladding of the strap							
	unnotched	core inside the insole edge							
ÄM 19472	soiled condel type 1	Strip treadsole							
AWI 10473	colled sandal, type 1	strips insole							
		cladding of the strap							
		strip tying the front strap							
ÄM 20471	composite sandal, type	insole strip (coloured red)							
	elongated swayed	insole strip (beige strip)							
		sewing of the edge							
		attached cloth							
		braid treadsole							
L		braid treadsbie							
ÄM 26547	sewn-edge plaited sandal,	insole strip							
	type A	core of the front strap							
		sewing of the edge							
XM 40440	and then fill instantions	core of the edge							
AW 16446	upright upper variant	sole strip							
	apright apport tandit	sewing of the edge of the sole							
		cladding of the strap							
		core of the strap							
ÄM 6992/1 open shoe, pa	open shoe, partial upper type,	outer surface of the upper							
	short toe variant	inner layer of the upper							
		sole							
	•	core of the edge of the sole							
ÄM 6992	open shoe partial upper type	outer surface of the upper							
(Z-346)	short toe variant	inner laver of the upper							
()		core of the edge of the upper							
		sewing of the edge upper							
-		sole strip							
AM 6994/2	sewn sandal, type A	sewing strip of the sole	ļ						
		core of the sole's bundle	ļ						
<u> </u>	1	core of the strap							
	1	cladding of pre-strap							
ÄM 1397	sewn-edge plaited sandal	cladding of the front strap							
	type C	sole strrip							
	1	cladding of the strap							
ÄM 620	sewn-edge plaited sandal,	sole strip							
	type B	cladding of the strap							
		core of the strap							
1	1	sewing of the edge	1						

Key: filled cell = plant part present

TABLE 2. Identification of plant materials used for footwear in the British Museum, London.

Accession number and sample details	Type of footwear	Sample Description	<i>Cyperus papyrus</i> , papyrus sedge	Desmostachya bipinnata. halfa grass	Imperata cylindrica, halfa grass	<i>Hyphaene thebaica</i> , dom palm	Phoenix dactylifera. date palm	Arundo donax giant reed
EA4418	coiled sandal, type 3 (looped)	left sandal						
EA4432	coiled sandal, type 4 (sewn)	core of the coil						
		sewing of the coil						
EA4445	sewn-edge plaited sandal, type A, variant 1	core of the strap						
		cladding of the strap						
		insole strip						
EA4464	open shoe, partial upper type, extended toe variant	outer layer of the upper (left shoe)						
		middle layer of the upper (left shoe)						
		inner layer of the upper (left shoe)						
EA55411	sewn-edge plaited sandal, type B, variant 4	four samples of the sole strips						
		sewing of the edge						
		core of the edge						
EA36210	sewn-edge plaited sandal, type A, variant 1	core of the edge						
		edge of core						
		core of the strap						
		cladding of the strap						
		Insole strip						

Key: filled cell = plant part present

TABLE 3. Identification of plant materials used for footwear in the Petrie Museum of Egyptian Archaeology, University College London.

Accession number and sample details	Type of footwear	Sample Description	<i>Cyperus papyrus,</i> papyrus sedge	Desmostachya bipinnata. halfa grass	Imperata cylindrica, halfa grass	<i>Hyphaene thebaica,</i> dom palm	Phoenix dactylifera, date palm	Linum usitatissimum, flax (for linen)
UC769	sewn-edge plaited sandal, type A,	sewing of the edge						
	variant 1	core of the edge						
		woven material under the sole						
UC28015	composite sandal, type elongated straight, variant notched	sole strip						
		binding at the toe						
UC28033 coi	coiled sandal, type 2, variant 2	wrapping of the edge (heel)						
		cladding of the strap						
UC28302	coiled sandal, type 3 (looped)	cladding of the strap (right sandal)						
		looping material cores sole (right sandal)						
UC28303	coiled sandal, type 3 (looped)	strap (right sandal)						
		looping material cores sole (right sandal)						
UC28314i	coiled sandal, type 4 (sewn)	sewing of the outermost core (at heel)						
		core of the edge						
UC28362i	composite sandal, type elongated	sole strip						
swayed	plaited strip at sole							

Key: filled cell = plant part present

Sampled Objects

Pieces were chosen because no plant identification had been made yet, the identification was only partial (*e.g.* only the material of the soles was identified), or the identification was somehow unclear. There were several types³⁶ of sandals selected, all of which have been described in detail elsewhere³⁷:

- Sewn Sandals ÄM 6994/2 (Gourlay 1981a: 62; 1981b: 56, pl. XXb; Montembault 2000: 38-39; Veldmeijer, 2009d; 2010f);

³⁶ Here, the footwear is only referred to by type; no further distinction will be made. See chapter 'Typology' for more details.

³⁷ Only those publications are mentioned that include a detailed description as well as detailed information on the typology, dating and distribution; see chapter 'Description'.

Sewn-Edge Plaited Sandals ÄM 3324, ÄM 26547, ÄM 1397, ÄM 620 (all, Figure 2) UC769 (Figure 3), EA4445, EA55411, EA36210 (all, Figure 4) (Gourlay, 1981a: 58-64; 1981b: 45-59, pl. Vd-f; XXa, c³⁸; Montembault, 2000: 33-35; Veldmeijer, 2010d);

- Coiled Sandals ÄM 18473 (Figure 2); UC28033, UC28302, UC28303, 28314i (all, Figure 3); EA4418, EA4432 (both, Figure 4) (Veldmeijer, 2007a; 2009g; 2011a³⁹);

- Composite Sandals ÄM 3325, ÄM 17081, ÄM 20471 (all, Figure 2); UC28015, UC28362i (both, Figure 3) (Montembault, 2000: 39-43; Veldmeijer, 2013c);

- Open Shoes ÄM 18448, ÄM 6992/1, ÄM 6992 (Z-346) (all, Figure 2); EA4464 (Figure 4) (Veldmeijer, 2009f; 2010b).

Taking Samples

Sampling selection for SEM examination, imaging, and the identification of the plant materials of the twelve sandals in the Ägyptisches Museum und Papyrussammlung, Berlin was carried out by André J. Veldmeijer (AJV). Fiftyfour samples were taken in total. In addition, six sandals from the collection of the British Museum, London were selected by AJV, and twenty samples were taken from these by Caroline R. Cartwright (CRC). Finally, seven sandals from the collection of the Petrie Museum of Egyptian Archaeology, University College London, were selected by AJV, and seventeen samples were taken from these by CRC.

It is standard practice to keep sample sizes to a minimum and to try to avoid sampling any areas with macroscopically visible adhesives or conservation consolidants that might affect identification (see below), or areas that may have been restored or repaired in modern times. After years of handling, objects often have some modern material (including fibres) that have adhered to their surfaces (Figure 5), although these may not have been apparent macroscopically at the time of sampling.

Some samples (*e.g.* 6992/1 'core of the edge of the sole') showed fungal hyphae and evidence of frass (fine powdery refuse produced by the activity of boring insects) when examined microscopically (Figure 6), which would have been very difficult to detect with a hand-lens (much less with only the naked eye).

Due to the generous permission of the three museums mentioned above to sample material in their collections, a large sample size could be obtained. Samples were not only taken from a wide variety of types of footwear, but also from various parts of each sandal or shoe, such as the edges, the sole, and the straps (Table 1).

Identification Procedure

Examination of the samples and comparative reference specimens was undertaken using a Variable Pressure (VP) SEM (Hitachi S-3700N), with the BackScatter Electron (BSE) detector mostly at 15 kV but sometimes also at 12 kV, depending on the sample. Magnifications ranged from x20 to x750. The preferred working distance was c.12 mm, but extended from 7 mm to 19 mm (as required). As the

³⁸ But see Veldmeijer (2010d) for reclassification.

³⁹ But see Veldmeijer & Ikram (2014: 21-22) for reclassification.



Figure 5. VP-SEM image of 6992/1 core sole edge showing how the widespread adhesive or conservation consolidant and modern cotton (and other) fibres adhering to its surface have masked the key features needed for plant identification. Image: C.R. Cartwright. \bigcirc The Trustees of the British Museum.



Figure 6. VP-SEM image of 6992/1 core sole edge showing fungal hyphae and areas of frass, some of which are marked by white rectangles. Image: C.R. Cartwright. © The Trustees of the British Museum).

plant samples were in variable states of preservation, the SEM chamber was only partially evacuated (mostly 40 Pa, sometimes 30 Pa). With the BSE detector, 3D mode (rather than Compositional) was preferentially selected to maximize the opportunity to reveal diagnostic features for identification as well as traces of wear and abrasion due to preparation and/or use of the materials and to show dirt, encrustations, frass, and fungal hyphae.

Most of the (uncleaned) plant material examined was placed uncoated on adhesive carbon discs mounted onto aluminium SEM stubs; no other sample preparation was undertaken. The Oxford Instruments energy-dispersive X-ray spectroscopy (EDX) analyser attached to the SEM was used to provide elemental identification and semi-quantitative compositional information where necessary (*e.g.* to determine whether original crystals and inclusions were calcium or silica, and also the elemental composition of recent adhesions on sample surfaces). In one instance (see below) the Hitachi S4800 field emission scanning electron microscope (FE-SEM) was used with the Secondary Electron (SE) detector at 5 kV to identify a very fragile sample.

To assist readers who might wish to refer to the conditions of SEM operation associated with the SEM images in the Figures accompanying this report, attention is drawn to the information provided in the data bar at the foot of each image. Reading left to right, the data bar information gives the model of the SEM, (sometimes) operator initials (S3700CRC or S4800), accelerating voltage (kV), working distance (mm), electron detector and mode (BSE3D or SE), signal (M = mixed), partial evacuation status (Pa), magnification (x) and scale (in micrometres or millimetres).

VP-SEM analysis of comparative reference specimens of Egyptian plants was crucial to the identification process (Cartwright, 2015). The advantages and drawbacks of using plant/wood anatomy atlases, online image databases and descriptive texts as references have long been the subject of debate, and key points relevant to this study are reiterated here. Online and printed atlases frequently contain Light Microscopy (LM) images of thin-sectioned plant specimens (including wood). Whilst these are extremely useful for modern material (e.g. Watson & Dallwitz, 1992: Figure 7), it is always difficult to try to compare with, and attempt to match key features on, historical, aged or archaeological plant remains, many of which have been altered through burial and/or through use, wear and tear, and the natural processes of ageing and deterioration. 'Textbook' images of clean, recent plant parts, whether using LM or SEM, cannot replicate the complex characteristics visible on historical or archaeological plant remains, many of which are clearly apparent in the Figures (images) accompanying this report. Although the following observation by Carr et al. (2008: 252) refers to a different dataset entirely (that of plant fibres from New Zealand and the Pacific), a useful fundamental principle emerged that can be applied much more widely in time and space. They noted that such databases may assist in identifying plant materials but "should not be regarded as a substitute for a confirmed identification by a plant scientist," hence the collaboration of the two authors of this report.



Figure 7. Light microscope image showing the epidermis of a modern leaf blade of Imperata cylindrica (*halfa grass*). *Image:* © *L. Watson & M.J. Dallwitz.*

Skin and Leather

The identification of the type of skin and leather is far more problematic.⁴⁰ The worn character of much archaeological leather, in combination with postdepositional circumstances, even if the preservation can be qualified as excellent, prohibits in most cases identification by absence of the upper surface (which displays the diagnostic follicle pattern) and/or hairs (which are also specific to species).⁴¹ Identification on the basis of fat content, DNA, or protein sequencing of the collagen using soft-ionization mass spectrometry has not been done; one of the reasons is that these research methods are expensive and might only be partially successful,⁴² another is that they require specialised laboratories and these lab's need samples to work with. The preservation of leather goes hand-in-hand with the method that was used to make a skin durable (curing [or perhaps better, leathering],⁴³ tanning, tawing etc.). The slaughtering of the animal, depilating

43 See Veldmeijer (2018).

⁴⁰ The following paragraph is after Veldmeijer (2016a; see *e.g* Michel, 2014). The identification through various steps found at http://www.furskin.cz is helpful, but it relies heavily on hair. Moreover, powerful microscopes are needed, which are not always available in the field. New research to identify the type of skin from ancient Egypt and Nubia (on the basis of objects in the British Museum, London), how it was processed into leather, how it was coloured, and with what kind of materials has just been started by Lucy Skinner.

⁴¹ Nonetheless, there are examples of extraordinary well preserved leather which still shows the characteristic follicle pattern, among which a pair of Curled-Toe Ankle Shoes (see the 'Description' chapter).

⁴² For fat content, see especially Trommer (2005). Regarding DNA, Thomson (2006: 58) wrote: "Work is being undertaken to analyse DNA extracted from skin-based objects. It might well be possible to develop such procedures for untanned materials and successful results have been reported with oil-tanned chamois leathers (Langridge, 2004). It is less likely, however, that successful methods will be found for use with vegetable- or mineral-tanned leathers as the cross linking mechanisms involved in the tanning processes will probably interfere with the extraction procedures." This means that the way a skin is prepared (so-called 'skin processing') needs to be known first in order to increase the possibility of positive skin type identification.

the skin, and preparing it for curing/tanning – the first phases of skin processing, together with the actual curing/tanning, which occurred before the manufacturing of the objects – will not be given attention here since this process cannot be deduced from the objects themselves without advanced analytical techniques.

Processing of skin into (pseudo-)leather is rather universal and described in various handbooks, giving a good idea of the process; the reader is therefore referred to these general overviews (focussing on ancient Egypt, see Van Driel-Murray, 2000: 299-306; Forbes, 1957: 1-21; Veldmeijer, 2008: 3; Veldmeijer & Laidler, 2008: 1216; a description of these parts of the process on the basis of two-dimensional art and anthropological data see Schwarz, 2000: 39-70). Note that exactly how this was done in Pharaonic Egypt is, in its detail, not well understood (and) the way a skin is made durable by leathering can only be confidently identified by chemical analyses.⁴⁴ Even with these modern methods many problems have been noted (Van Driel-Murray, 2000: 316-317). A field-test for identifying vegetable tanning (Van Driel-Murray, 2002a; 2002b; Leach, 1995) is a fairly simple test but the results are not always as unambiguous as one would hope (Personal Observation Qasr Ibrim; see also Thomson, 2006: 59; Van Driel-Murray 2002a: 19-20; Van Roode & Veldmeijer, 2005). This test has been applied to most of the leather finds from Elephantine but the results are troublesome and should be checked with the aforementioned proper analytical means. A comparison of these data could elucidate the validity of field-tests.⁴⁵ A recent reevaluation with a leather conservator (Personal Communication Lucy Skinner, October 2016) suggests that even such a fairly simple field-test still should be done by specialised scientists since a discoloration of much-decayed leather could have been caused by water rather than as a result of the reaction of iron salts with vegetable tannins. Water causes gelatinisation of the collagen – effectively turning it to hide glue, and the test in fact accelerates this process (Veldmeijer et al., 2013: 260). Despite these difficulties, it proved possible to identify the type of leather of several sandals and shoes. Note that it is a misconception that the shades of brown colour of leather gives one a definite identification of the process to make a skin more durable, as suggested by Hanasaka (2003: 4: 9; Personal Communication Lucy Skinner 2016/2017)⁴⁶ who concluded that the colour of the leather objects found in Akoris⁴⁷ were, therefore, vegetable tanned.

⁴⁴ Schwarz (2000: 58) mentions sesame oil, but this is debated. Carter (1927: 176-178) mentions vases with oil in the tomb of Tutankhamun, but it is not clear whether these oils were used for curing skin. Moreno Garcia (2017) made a strong point that castor oil was used.

⁴⁵ Another major problem for the identification of both vegetal material and skin type and the process of making it durable is the costs involved, for which money was lacking.

⁴⁶ See section 'Tanneries, Workshops and Craftsmen' in chapter 'Production' for more problems with the identification of Akoris as a leather workshop.

⁴⁷ Dated to the late Third Intermediate Period to early Late Period rather than the Greco-Roman Period, as erroneously mentioned elsewhere (Veldmeijer, 2008: 6).

Wood

Although organic materials, such as leaves of palm, grass, and papyrus, can occasionally be identified with simple aids due to extraordinary conservation, this is usually not the case for wood, unless it is a more exotic species, such as ebony.⁴⁸ For a secure identification samples are needed, which have not been possible to acquire for the larger part of the sandals studied by the AEFP.⁴⁹

Metal

The identification of metals (gold, silver, bronze) is perhaps the easiest of all the materials examined. However, the exact composition of a metal cannot be done without specialised equipment.⁵⁰ This has not been done for the present research.

⁴⁸ See Gale *et al.* (2000: 334-335). However, even ebony can easily been mistaken for African hardwood (Personal Communication Alan Clapham 2018).

⁴⁹ Requests for sampling the four wooden sandals in the Medelhavsmuseet, Stockholm have been submitted and are pending.

⁵⁰ To get an idea of the analytical methods, see Ogden (2000:171-172).

Archaeological Context: A Problematic Inheritance

Vegetal:

Leather or String Reinforced Plaited Sandals: 2009h: 112. Plain Plaited Sandals: 2009i: 34. Sewn Sandals: 2009d: 78; 2010f: 19-34 (all footwear within the tomb rather than only Sewn Sandals). Coiled Sandals: 2009g: 89-90; 2011a: 67; 2007a: 140-142. Composite Sandals: 2013c: 98-99. Sewn-Edge Plaited Sandals: 2010d: 200-201. Fibre Open Shoes: 2010b: 304-305; 2009f: 107-108.

Leather:

Eared Sandals: 2011c: 12-14. Composite Sandals: 2009a: 21. Side-Covering Sandals: 2013b: 58. Open Shoes: 2009j: 4-6. Curled-Toe Ankle Shoes: 2009b: 16-17. Stubbed-Toe Ankle Shoes: 2013a: 69-72. Tailed-Toggle Shoes: 2011e: 319. Mules: 2013b: 79. Pattens: 2008: 152.⁵¹

Various:

Deir el-Bachit: 2011b: 12. Qasr Ibrim Ottoman footwear: 2012b: 15-19. Leather footwear from Gebel Adda: 2016c: 8, 10-11. Elephantine: 2016a: 11-15. Dra Abu el-Naga: 2017b: 22-35.

Finding (remnants of) footwear made of organic materials is highly dependent on preservation conditions. Either continuously wet (waterlogged⁵²) or arid circumstances are favourable. The lack of either of these conditions, therefore, is a key reason that footwear is not often found in the Delta region of Egypt. This, of course, greatly limits the interpretation of distribution through space (and time), as well as the origin of or, perhaps better⁵³ the influence on, footwear from those cultures that had to go through the Delta, such as the Hyksos.

In archaeology the context is, of course, important, but it alone is not enough. A context should be well described and properly studied. Moreover, objects should be recorded with sufficient detail. If only the presence of footwear is mentioned, without specifying what kind of footwear,⁵⁴ the context may be of only little help in the process of further elucidating any specifics. Hence, the importance to engage specialists in an excavation from the beginning onwards rather than letting students, volunteers or other laymen be responsible for the registration (and publication) of the material. An example is the finds from Kerma, which were (partially) published many years after the excavations.⁵⁵ In this particular case, one can now only draw the conclusion that some people were buried with leather sandals. Yet if more information had been given about the sandals (such

⁵¹ But see Rose (2012) on problems with stratigraphy in Qasr Ibrim.

⁵² Often seen in Europe, hence the fairly large body of material from this part of the world.

⁵³ Of course, we cannot assume that the ancient Egyptians were not themselves inventive and innovative when it came to footwear.

⁵⁴ See note 2, 3.

⁵⁵ See note 2.

as type, size, decoration), one could also provide an interpretation for a variety of socio-economical factors.⁵⁶

Another problem that has hampered work is that expeditions sometimes were not up to date with their database. Thus, despite the very systematic and well organised excavations, lists of contexts and finds were not available and relationships between finds could not, therefore, be studied.⁵⁷ Even simply going through the database to see if there were tools that could be linked to leatherworkers or sandal makers proved impossible in these cases.

Still, if the context is known, this does not necessarily mean that it offers an important surplus of information⁵⁸ or even clarifies dating. A waste deposit from which heavily worn, discarded (remnants of) footwear was recovered is an example in which not much can be gained from the provenance.⁵⁹ Another example is the footwear from the tomb of Tutankhamun: if the tomb had truly been undisturbed, the exact provenance might have given important information, but the tomb was disturbed in antiquity and priests cleaned up the mess. It is unlikely that these priests stored the objects in their original places, and thus the context is of little use to us.⁶⁰ This is not to undermine the importance of knowing where objects were found in order to determine patterns of distribution and development, as well as, of course, for dating. In the case of the latter, however, a well-described provenance still does not mean that it is a dateable context.⁶¹ Nonetheless, material from excavations can clearly be set apart from obtained objects in museum collections. This cannot be better phrased as done by Carter & Mace (1923: 125) in response to people who think that a bought artefact is as valuable as one from careful, systematic and scientific excavations: "There was never a greater mistake. Field-work is all-important, and it is a sure and certain fact that if every excavation had been properly, systematically, and conscientiously carried out, our knowledge of Egyptian archaeology would be at least 50 per cent. greater than it is."

⁵⁶ Bruyère's work in Deir el-Medinah is outstanding and in many ways ahead of his time. His incredible notebooks have been made available online by the IFAO (http://www.ifao.egnet.net/bases/archives/bruyere/about). Although the provenance is known and descriptions are sometimes (but not always!) clear and/or detailed (*e.g.* Bruyère, 1937: 63-65), images are not always included (and even if they are, there seems a preference for the leather footwear). Moreover, another problem was noted regarding a pair of Sewn-Edge Plaited Sandals (Veldmeijer, 2017b): First, the Journal d'Entree does not give any specifics, not even the year in which each entered the museum. Second, the photograph in Bruyère (1937: 64) is reworked – the loincloth at the left top is cut out of the photograph from below right, as can be seen in the original (intact) photograph that is included by Montembault (2000: 63). In doing so, the image of the loincloth was put over a pair of sandals. Bruyère (1937: 63) mentions that no footwear made of vegetal material was found. He means, it is assumed, from the same excavation area and season as the leather footwear. Thus, it was not found in the 1934-1935 season. With thanks to Hanane Gaber for helping trying to solve this issue.

⁵⁷ See for example Veldmeijer (2011b).

⁵⁸ See the work on the leather from Dra Abu el-Naga (Veldmeijer, 2017a) with examples of both helpful and less helpful provenances.

⁵⁹ Much of the material from Qasr Ibrim was found in such contexts, see Veldmeijer (2012a). But see Rose (2012) on other problems of these Ottoman layers.

⁶⁰ Assuming the footwear that was recovered from the tomb was actually meant for Tutankhamun.

⁶¹ See for examples Veldmeijer (2017a).

Museological Context: Problems and Priorities

Various museological collections have been visited (see above) and the majority of their footwear collections have been studied and published. Although this is a more than representative sample, there are still various collections that need attention, such as the collection in the Manchester Museum. These collections are particularly important as they can aid studies using statistical significance, elucidate wear, repair, use patterns, and socio-economic background (if they have proper provenances), and generally add to the variety of footwear known from ancient Egypt.

Many museum collections around the world were established in the 18th and 19th centuries AD, usually by buying antiquities from collectors and antiquity dealers. However, museums might (also) have material from (their own) excavations, which came through the division of finds between the archaeological mission and the Egyptian Authorities.⁶² The larger part of finds from the Egypt Exploration Society's (EES) excavations at Qasr Ibrim, for example, were moved to Great Britain, where they were stored in one of the buildings of the Faculty of Oriental Studies of the University of Cambridge, and subsequently moved to the British Museum, London in 2008.⁶³ Pieces from these early years of excavation, and all finds from 1980 onwards, remained in magazines in Egypt and/or⁶⁴ were moved to the Egyptian Museum, Cairo. At least several of these objects were (later?) moved to the Coptic Museum, Cairo, where they were discovered in 2012 (Veldmeijer & Ikram, 2014).

In many collections the amount of attention that is given to fragile objects such as footwear is, in general, insufficient. This is not the case for all objects that are made of organic materials. Coffins and wooden statues, just to name a few, are of great value for exhibition purposes, and thus are usually given priority over more mundane objects such as footwear. Though understandable,⁶⁵ the danger is that without conservation many objects lose much of their potential informative value or might even completely disappear before having been studied properly. In

⁶² Until 1979 the objects found during excavations were divided between the foreign institutes and the Egyptian Antiquity Organisation.

⁶³ By then, detailed study of the footwear was already finished and the collection in the British Museum, London was visited only to fine-tune the work. The Ottoman footwear was published four years after the move (Veldmeijer, 2012b); the volumes on the pre-Ottoman leather finds as well as the non-footwear leather from the Ottoman layers are in preparation.

⁶⁴ Initially, it might have remained in the magazines in use at the time. But since, on several occasions, officials from the Ministry of State for Antiquities/Supreme Council of Antiquities have collected finds for exhibition purposes, they might have been moved afterwards. Moreover, the finds might have been moved to other magazines for a variety of reasons, such as new construction or uniting the objects from various magazines. It is, therefore, extremely difficult or even impossible to find out where objects are currently stored, and attempts to locate them in the Egyptian Museum, Cairo and the magazine in Dashur has not been successful thus far.

⁶⁵ Curators do the best they can with a tight budget and limited manpower and space, and are usually highly cognisant of the flaws in the system – often even more so than a visiting scholar.

some cases, the poor condition of footwear in collections⁶⁶ is due to the lack of specialised, custom-made care. For leather objects such lack of care is worse than for vegetal materials: once leather starts to rot, one cannot reverse this condition and the deterioration, unless the process is stopped, continues and the object will be lost forever.⁶⁷ Vegetal material in comparable condition, however, though it becomes brittle and fragile, does not rot beyond recognition. It might get mouldy but mould can be removed. Unfortunately, such unfavorable conditions have been noted in many collections (and magazines) that have been visited, sometimes to such an extent that the once well preserved objects are now completely destroyed.

There are numerous reasons for the deterioration of objects that are made of organic material, especially leather. In one collection, the finds of an early excavation were not unpacked from the casings in which they were brought from Egypt in the early 20th century (needless to say, the objects were in an advanced state of deterioration), for which no good reason can be given. In another collection, a poor conservation situation was clearly pointed out to the board by the curator, but the lack of financial means prohibited (probably until this day) an improvement in the conditions or any consolidation/conservation of the objects. Although in this latter case the financial situation influenced the stability of the entire collection, it is even more common that money is simply too limited to properly curate the entire collection and thus those responsible are forced to prioritise. An additional problem is that good conservational interventions have sometimes (completely) ruined leather objects rather than improved them. There are also a number of problems that arise from poor presentation. Improperly placed showcases, such as those which people might bump into – resulting in the shaking of the case and thus the objects - have caused considerable damage to unique pieces. Sandals are sometimes stacked on top of each other in the dark corners of cabinets, or placed on display without suitable support. Moreover, organic material is very sensitive to (changes in) the environment (especially humidity and temperature, but also pollution⁶⁸) and thus this should be as stable as possible. Due to this, monitoring is of utmost importance and, above all, an appropriate response to this environmental data is imperative, but is not always done.⁶⁹

The majority of the material in collections, if not from recent excavations, is usually without (reliable) provenance and thus (reliable) dating.⁷⁰ There are, of course, exceptions, such as the finds from the German excavations at Amarna, currently housed in the Ägyptisches Museum und Papyrussammlung, Berlin. It was not uncommon in the time when the trade in antiquities was still the most important way of putting together a nice collection for a museum that 'less important' material such as sandals accompanied the sale of a collection as a gift. Moreover, in the early days of Egyptology, one could simply buy objects in the

⁶⁶ The condition in magazines in Egypt is often unfavourable for organic finds too.

⁶⁷ See for example Tutankhamun's shoe 270a (Veldmeijer, 2010f: 36, fig. 2.1) or some of the Amarna leather (esp. the decorated chariot leather, Veldmeijer, 2010g: 93-143).

⁶⁸ Note that the fact that objects of organic material is preserved in Egypt is due to the extremely dry climate after all.

⁶⁹ Stephanie Staab, for example, monitored the exhibition conditions of several leather shoes and sandals in the collection of the Egyptian Museum, Cairo, which lead to recommendations to improve the conditions as well as to the restoration and conservation of the objects (Visual Condition Recording of Egyptian Leather Footwear, 2014).

⁷⁰ This makes any significant statistical analysis impossible.
lively antiquities market anywhere in Egypt.⁷¹ Moreover, a proper registration of work from early excavations is often lacking causing much information to be lost: it was by no means uncommon in the 19th and especially the early 20th centuries to hire hundreds of workmen at a time, limiting proper supervision and any opportunity to register everything that happened. Besides the large scale of exavations, often Egyptologists worked at various sites at the same time, even further limiting proper control and the ability to take notes on progressing work. Furthermore, still today scholars excavate in Egypt without the proper background in archaeological sciences. Finally, it is, unfortunately, by no means uncommon that excavations were not at all, or only partially, published (a problem which still happens present-day).

⁷¹ A rare example of footwear is part of an upper of a leather Curled-Toe Ankle Shoe, which was among the 'chariot' leather Howard Carter bought and gave to the Metropolitan Museum of Arts, New York (Littauer & Crouwel, 1985: 67, 87; Veldmeijer & Ikram, 2018).

Description

The descriptions of the various categories of footwear have been published as individual papers and monographs or chapters in monographs, referred to in the sub-headings. The works are, in the present chapter, evaluated and discussed and additional bibliography is added. The dating of the footwear is visualised by a time line.

Footwear Made of Vegetal Material (Other than Wood)

Sandals

Leather or String Reinforced Plaited Sandals Veldmeijer (2009h)

Bibliography

A possible example is found in Elephantine, but this one is sewn with rope (Veldmeijer, 2016a: 52). Other examples were found in Gebel Adda (Veldmeijer, 2016c: 45-47; 160-162).

Dating

Some examples are late Christian, but most are Ottoman.



Leather or String Reinforced Plaited Sandals

Distribution

The majority of the finds of this type of sandal comes from one site: Qasr Ibrim, although several have been excavated from Kulubnarti (Personal Observation British Museum, London). There is a fragment that hints at the occurrence of comparable sandals coming from Elephantine. Unfortunately, this fragment is in an extremely poor state, which prohibits a definite identification. Only a few fragmented examples are known from nearby Gebel Adda. It thus seems that this type of sandal was mainly popular in Qasr Ibrim.

Discussion

Errata

General: This paper is referred to in subsequent papers as 'Veldmeijer (2008/2009)', which is not correct: it is published in 2009 but covers the years 2008/2009 of the journal; p. 107, last line, 2nd paragraph: The remark that it is remarkable that the thong used for sewing is not vegetable tanned but the leather of the patch is, should be viewed with caution, judging the problems with the field test to indicate vegetable tanning; a reference to '6. Production' should have been included as here this test is discussed; p. 108, 5th line, 2nd paragraph, 'leather soles' > 'leather sole layers'; -, 'four soles' > 'four sole layers'; -, 6th line, 2nd paragraph, 'leather soles' > 'leather sole layers'; -, 7th line, 3rd paragraph, 'plaited sole' > 'plaited sole layer'; -, 7th line, 4th paragraph, 'feather sole layer'; -, 110, 2nd line, 4th paragraph, 'the soles' > 'all sole layers'; -' '4th line, 4th paragraph, 'the soles' > 'the sole layers'.

Plain Plaited Sandals Veldmeijer (2009i)

Bibliography

Veldmeijer & Ikram (2014: 22-23).



Distribution

The majority of the finds of this type of sandal come from one site: Qasr Ibrim, although several examples have been excavated from Kulubnarti (Personal Observation British Museum, London). Russo (2004) describes a sole from Narmuthis but it lacks straps or even the indications of them. Moreover, on the sides are various holes between the fabric, which suggests the attachment of something (another strip of basketry perhaps?). Thus, the identification of the sole as the sole of a sandal seems rather uncertain. It also does not fit with the numerous examples from much later times and from farther to the south. One would expect more examples if these sandals were worn in earlier times.

Typology

Discussion

El Hadidi & Hamdy (2011: 1060) contradict the conclusion that Plain Plaited Sandals did not occur in Pharaonic times. However, they base this conclusion on their work on Sewn-Edge Plaited Sandals, but finds of Plain Plaited Sandals have not been recorded from this era (yet).

Errata

General: This paper is referred to in subsequent papers as 'Veldmeijer (2008/2009), which is not correct: it is published in 2009 but covers the years 2008/2009 of the journal; p. 127, 1st-2nd lines, last paragraph, '(housed in London[...] and Aswan)' > '(housed in the British Museum, London and the magazine of the Ministry of State for Antiquities in Aswan)'; p. 130, 6th line, 'The plain basketry sandals' > 'The plain plaited sandals'; -, 17th line, 'Petrie' > 'Petrie Museum for

Egyptian Archaeology UCL'; p. 132, 3rd line, 2nd paragraph, 'sewn edge plaited sandal' > 'sewn-edge plaited sandal'; -, 4th-5th line, 4th paragraph, 'lengthening the sole' > 'lengthening of the sole'; -, -, last sentence, 4th paragraph: "Finally, the shape and type of fabric used in sandals with a full insole is not found in sandals with a partial insole." > It is not clear what is meant with this statement; 3rd line, section '10. Acknowledgements', 'for is support' > 'for his support'; p. 133, reference 'Veldmeijer, A.J. 2007/2008' > 'Veldmeijer, A.J. 2008/2009' [but see comment above]; reference Veldmeijer, A.J. In press b, 'Ikram, S. & A Dodson.'.

























All asw-numbers: Courtesy of the Ministry of State for Antiquities; all cam-numbers: Courtesy of the British Museum, London. Sewn Sandals Veldmeijer (2009d)

Bibliography

El Hadidi & Hamdy (2011), though this mainly deals with material identifications; Veldmeijer (2010f; 2014b: 24-31; In Press, a; c).

Dating

It is certain that there are extant examples of this type of sandal from the Middle Kingdom to the end of the 19th Dynasty, running into the 20th Dynasty, and possibly the 22nd (sandal 6923 in the Manchester Museum, not included in the initial paper, was excavated from Sidmant and is thought to date to the 22nd Dynasty). However, the work discussing this type of sandal did not include examples from the Middle Kingdom. Additional proof that sewn sandals already existed before the start of the New Kingdom (pp. 562-564) are the two Type A sandals in the Allard Pierson Museum, Amsterdam (APM 3696). The two left sandals were excavated by Petrie from grave 271 in Sidmant el-Gebel and date to the First Intermediate Period (11th Dynasty).



Sewn Sandals

Distribution

A scene in the tomb of Rekhmire depicts products from Dakhlah Oasis (Davies, 1943: 46, pl. XLIX), including Type A sandals (they were meant for a temple). This, together with the examples from the Fayum and Luxor, at least suggests that the sandals were fairly widespread throughout the entire country. It does not, however, mean that Type A sandals were only made by sandal makers in these parts of the county and then distributed to the rest of the country. A small sandal fragment from Saqqara, tomb of Horemheb, has been described recently (Veldmeijer, In Press a).

Typology

The publications on Sewn Sandals did not include the wooden imitation, which was found in the tomb of Amenhotep II, although it was mentioned by Veldmeijer (2009d: 566). We can see this imitation as Variant D.

Discussion

- p. 561: "The sewing strip of one row was not used to continue sewing the next row as the connections [...] have not been observed." But if the sandal was sewn before cutting to shape, as suggested, these might have been cut off when shaping the sewn piece. - p. 561: The suggestion that the back strap would have been attached to the prestrap before the latter was secured to the sole is unlikely as it is clear that the prestrap was attached individually. The binding of the cladding that secures the back strap to the pre-strap also further secures the pre-strap itself.

- p. 562: The statement that the imitated sandals were not used in daily life should be taken with caution: footwear, especially if the symbolism was important, might have been worn while the owner was carried or just sitting, *i.e.* not actively walking with them (*cf.* Tutankhamun's marquetry veneer sandals, Carter Number 397, Veldmeijer, 2010f: 87-95).

- p. 564: Note that the sole of the C-Type is, besides not having a treadsole, also much thinner than that of the A-Type, hinting at a different use of the sandals.

- p. 564: Indeed, there is no clear pattern for the edge, but it is clear that the edge is not only an important technological feature (it further secures the transverse bundles and prevents the sewing from fraying) but also an important element to be seen. For example, the open shoes from the tomb of Tutankhamun had the triple edge placed inside of the sole's edge proper, to which the upper was attached, so that it was clearly visible. Even if the edge of the sole was covered with a strip of leather, it was the edge besides the triple edge, leaving the latter exposed.

Errata

p. 554, 4th line, 'the Pharaoh' > 'the pharaoh'; -, note 56, 3rd line, 'Seyfried 1984' > 'Seyfried (1984)'; p. 556, 6th line from below, '(19 mm as in' > '(19 mm in'; p. 557, 1st line, 'horizontal rows' > 'transverse rows'; p. 566, reference to Nicholson & Shaw, 'NICHOLSON, P. T. and SHAW, I (eds,)' > 'NICHOLSON, P. T. and SHAW, I. (eds.)' -, reference to Partridge, 'London, Rubricon Press)' > 'London: Rubricon Press); p. 557, reference to Schwarz, '(Frankfurt am Main: Peter Lange) > '(Frankfurt am Main: Peter Lange)'; p. 558, note 65, 4th line, 'the pre strap is in' > 'the pre-strap in'; p. 559, note 66, the loop in Tutankhamun's open shoe 270a through which the toes should be put, is erroneously referred to as 'foot strap' but meant here is the toe band (Veldmeijer, 2010f: 130-138); -, 'one pair of shoes' > 'one pair of open shoes'; -, 1st line, section 'Imitation', 'Daressy, 1902' > 'Daressy 1902'; p. 560, 9th line, 'horizontal-bundle-pattern' > 'transverse-bundle-pattern'; -; note 69, 'A.J. Veldmeijer)' > 'A.J. Veldmeijer.'; p. 561, note 71, 'Peet & Woolley, 1923' > 'Peet & Wooley 1923'; p. 563, 3rd line, section 'Discussion', 'horizontal, sewn bundles' > 'transverse, sewn bundles'; -, 10th line from bottom, 'Daressy, 1902' > 'Daressy 1902'; p. 567, reference to Veldmeijer et al., 'CARTERIGHT, C. R.' > 'CARTWRIGHT, C.R.'.

















ÄMPB-numbers: Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin; ASHnumbers: Courtesy of the Ashmolean Museum, Oxford; BM-numbers: Courtesy of the British Museum, London; MET-numbers: Courtesy of the Metropolitan Museum of Arts, New York; MFA-numbers: Courtesy of the Museum of Fine Arts, Boston; NMAL-numbers: Courtesy of the National Museum of Antiquities, Leiden; NMSE-numbers: National Museums of Scotland, Edinburgh; Petrie-numbers: Copyright by Petrie Museum of Egyptian Archaeology UCL, London. JE 47006 (pair) -- Type A SR 5256bis

Measurements (left/right): L: 305/315 W heel: 95.5/92.7 W waist: 98.7/98.7 W front: 130.4/132.5 W transverse bundle: 8.9 W sewing strip: 2.2-3.0 W edge: 24.0 T sole: 10.3/10.5 Pre-strap: 10.2x10.5/10.7x9.5 Back strap: 18.8 (incomplete)/n/a. Front strap: 14.0/n.a.

Provenance: Sedment

Date: ?

Courtesy of the Ministry of State for Antiquities/Egyptian Museum Authorities.



Coiled Sewn Sandals Veldmeijer (2009g; revised including 2007a; 2011a)

Bibliography

Revision by Veldmeijer & Ikram (2014: 20-22).

Dating

Type 1. Probably Roman and later.

Type 2. All but one is dated to Roman times; the one exception is dated to the New Kingdom, according the Museum archive, but it is not clear why as the provenance is unknown. The date seems very unlikely.

Type 3. Roman.

Type 4: Middle Kingdom.



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Distribution
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Typology

Coiled Sewn Sandals are included by Veldmeijer & Ikram (2014: 21-22) in the larger category of Coiled Sandals: "Coiled Sewn Sandals (Veldmeijer, 2009c) have previously been regarded as a category in itself, but we propose here to include these as Type in the broader category of Coiled Sandals because the basic layout, coiling, is the same in all sandals (Type 4). The types are distinguished on the basis of how these coils are secured. CM 4978 (Cat. No. 2), therefore, is a new type of Coiled Sandal (Type 5). Since the sandal is made of an unspun, coiled core that is wound around by unspun vegetable material too, the type is referred to as 'Core'. Russo's (2004: 185-186) n. 4 fits in this Type too, although the sole was built up differently (*contra* Veldmeijer, 2011a: 66, which is the result of the new material described in the present work)."

Thus, currently, besides the two just mentioned, three more types of coiled sandals are recognised:

Type 1: The sole is made of a plied string. One exception is CM 4974, which has a coiled plied string sole, the string of which has been woven with plied string too. Note that this differs from Woven Sandals (Veldmeijer, 2007a: 66-69), in which the core of the sole (woven through with string) is not coiled, but consists of individual pieces;

Type 2: The sole is made of braids. Here, two Variants are distinguished: those made with coarse braids and those with fine braids. The latter usually has, besides the finer braids, neatly finished edges, which are absent in Variant 1;

Type 3: Looped, in which the sole "is made of a flat strip that consists of two cores around which unspun fibre is looped" Veldmeijer (2011a: 61).

Discussion

- p. 87, 89: The differences in the technology used to increase the width in the two sandals from the British Museum, London (EA4432) is obvious. The suggestion that, therefore, these were not a pair originally is not impossible, but does seem premature. The ancient sandal maker, for example, could have decided to use a different technique after the production of the first sandal for a reason that eludes us.

- p. 87: Based on the small fragments of attachment areas at the edges of the soles of several sandals, it was concluded that the strap complexes were the same as in Sewn Sandals. Also, the back straps in Sewn-Edge Plaited Sandals (Veldmeijer, 2010b: 87-88) were secured in the same way. Thus both types of straps could have been used in these Coiled Sewn Sandals.

- p. 89: The dating of Sewn Sandals goes back to, at least, the First Intermediate Period (see above) rather than the Middle Kingdom.

- Shape, in contrast to what is mentioned in 'Discussion' (p. 89), is a poor feature to use for dating because straight sandals were worn throughout history. Moreover, many types of sandals (including Sewn Sandals) and shoes had straight soles, although they were not as common as swayed soles in Pharaonic Egypt. It should be noted that, as explained above, swayed soles can be helpful for dating: the swayed shape described for Coiled Sewn Sandals did not occur after the Middle Kingdom. Note that some Wooden Tomb Sandals have this shape too. This particular shape is also seen in Old Kingdom footwear (Personal Observation Imhotep Museum, Saqqara [SQ.FAMS.641 and SQ.FAMS.637]).

- The dating of Type 4 to the 12th Dynasty is further suggested by the find of a left sandal in Kahun (el-Lahun) by Petrie (Griffith, 1910: 17; David, 1986: 158, 245-246, pl. 11).

Errata

p. 86, 1st line 2nd paragraph, 'horizontal bundle' > 'transverse bundle'; p. 87, 3rd line, 'horizontal bundle' > 'transverse bundle'; -, 1st line 2nd paragraph, 'EA 4432' > 'British Museum EA 4432 (figure 3)'; p. 88: 2nd line, 3rd paragraph, section 'Production and wear', 'EA 4432' > 'British Museum EA 4432'; -, note 6, 'UC 28314iii' > 'Petrie Museum UC 28314iii'.

Coiled Sandals Veldmeijer (2011a)

Bibliography

Veldmeijer & Ikram (2014: 20-22).

Discussion

- p. 66, 2nd paragraph: It was suggested to postpone an adjustment of the typology until the 'Russo sandal' has been studied hands-on. Yet, a comparable sandal in the collection of the Coptic Museum, Cairo was studied, and a suggestion for a new typology of Coiled Sandals has subsequently been proposed by Veldmeijer & Ikram (2014; see above).

- p. 67, last sentence, 2nd paragraph: 'their [fibre composite sandals] use seems to have been very limited' > added should be that a fair number do show signs of wear nonetheless.

Errata

General: The objects are referred to by their inventory number, but this should have included the name of the collection (*cf.* the table) as done in the other parts of the series; p. 59, text figure 1, 'from with which' > 'from which'.

Cordage Sandals from Qasr Ibrim Veldmeijer (2007a)

Discussion

- The paper uses the term 'basketry' but in later parts of the series, the term 'plaiting' is used (see for example Veldmeijer, 2010b). The latter is preferable as it explains better the technique of the fabric.

- See above for a discussion of the re-classification of the sandals.

Errata

General: This paper is referred to in subsequent papers as 'Veldmeijer (2006/2007), which is not correct: it is published in 2007 but covers the years 2006/2007 of the journal; p. 61, 4th line, 2nd paragraph, 'Veldmeijer (2007)' > 'Veldmeijer (2006)'; p. 61, table: 'QI 18024/A1 > 'QI 18024/A13'; p. 62, 7th line, section '2.1. Coiled sandals', 'sown through' > 'sewn through'; -, one but last line, 'The CIP' > 'The Cord Index of Ply' [a reference to Wendrich, 1991 should have been included]; p. 63, 9th line, 'stitching to the sole' > 'stitched to the sole'; p. 64, text figure 3, 'toe straps' > 'front straps'; p. 66, 5th line, 'and run' > 'that run'; p. 67, 1st line, 2nd paragraph, 'the oldest encountered' > 'the oldest cordage sandal encountered'; p. 68, text figure 6, 'oldest thus far encountered' > 'oldest cordage sandal thus far encountered'; p. 69, 1st line, 'Footwear made of cordage and basketry are more common' > meant here is footwear made of a combination of these two; p. 71, note 9, 'The techniques were' > 'The sewing technique was'; p. 73, 1st line, 2nd paragraph, 'The lack' > 'The relative low quantity'; 7th/8th line, 3rd paragraph, 'the spandals found in Kerma wear' > 'the sandals found in Kerma were'; p. 74, Reference to Gourlay (1981): 'Achéologie' > 'Archéologie'.







BM-numbers: Courtesy of the British Museum, London; Petrie-numbers: Copyright by Petrie Museum of Egyptian Archaeology UCL, London; WML-numbers: Courtesy of the World Museum, Liverpool. Composite Sandals Veldmeijer (2013c)

Bibliography

Veldmeijer (2014b: 54-57).

Dating

The dating is problematic, though evidence suggests use over a very long period of time.



Fibre Composite Sandals

Distribution

Despite the large numbers of this type of sandals in collections worldwide, distribution is based on only a few examples. These suggest that they were used from north to far south: examples of Composite Sandals were found in the Fayum region, as well as in the Theban region (Deir el-Bahari) and the Kharga Oasis.

Typology

Discussion

The stitching shown in figure 6 is referred to as 'continuous stitching'. However, a much better term to describe this technique is 'split stitching', which is a type of back stitching (see Sewn-Edge Plaited Sandals Revision).

Errata

The Table of Contents of JEOL 44 erroneously state page numbers 79-84, but this actually is pp. 85-115. Throughout: 'Scale bar in mm' (erroneously stated in all but figure 6 that the bars represent 50 mm); 'Petrie Museum of Egyptian Archaeology UC' > Petrie Museum of Egyptian Archaeology UCL'; p. 85, note 1, 2nd line, 'that the they' > 'that they'; -, 6th line, section '2. Typology', 'because by the AEFP' > because the sole types by the AEFP; -, 7th line, 'An concordance' > 'A concordance'; p. 90, text figure 6, 'continuous sewing' > 'split stitching' [see Revision]; p. 90, 1st line, 'continuous stitching' > 'split stitching'; -, 3rd line, 2nd paragraph, 'continuous reinforcement stitching' > 'reinforcement split stitching'; p. 93, text figure 8A, '20471' > 'AM 20471'; p. 95, note 32, 'British Museum' > 'British Museum London'; p. 97, 5th line, last paragraph, 'and is also present' > 'and dirt is also present'; p. 98, 6th line, 1st paragraph, section '6. Discussion', 'continuous sewing' > 'split stitching'; -, last line but

two 'the sewn-edge' > 'the sewn edge'; p. 99, 2nd line, section '7. Acknowledgement', 'the responsible curator' > 'the responsible curators'; p. 104, one but last entry (ÄM 20471), first column should read 'Ägyptisches Museum und Papyrussammlung Berlin'; -, third column: most probably 'Garara' should be 'Harara'; Table: first entry is a 'Wide' type, not 'Broad'; '1.888' > '1888'.
















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SR 5203 -- Elongated Swayed TR 16 1 26 5

Measurements: L: 285 W heel: 63.5 W waist: 46.4 W front: 74.0 T sole: 12.2 D straps: 4.0x5.4 W braid: 14.0

Provenance: ?

Date: ?

Courtesy of the Ministry of State for Antiquities/ Egyptian Museum Authorities.



Sewn-Edge Plaited Sandals Veldmeijer (2010d)

Bibliography

El Hadidi & Hamdy (2011); Veldmeijer (2014b: 32-39).

Dating

Dating is problematic, as most of the examples that were studied are without provenance. The few that have a provenance show a long period of use, but one should realise that this counts for the entire category: Type A, for example, seems earlier than Type B. It is likely, however, that some types already occured before the New Kingdom (see 'Open Shoes' below).



Sewn Edge Plaited Sandals

Distribution

Save some examples from Saqqara, the majority of the provenanced examples point to the south of Egypt (Theban region). Several examples (Type C and Uncertain) were also found even further south (Qasr Ibrim).

Typology

Discussion

General: the type of stitching shown in figure 1A is known as 'split stitching'. It is a type of back stitching where the working thread makes a backward movement and then a subsequent longer forward movement. In contrast to back stitching proper, in split stitching the thread goes through the working thread rather than next to it. The term 'back stitch' is used in Veldmeijer (2010b).

Errata

p. 80, note 6, 'ASH 1892.623' > 'ASH 1842.623'; p. 81, 5th line, 'type A, Variant 1' > 'Type A, Variant 1'; p. 82, note 16, 'ASH 197.154' > 'ASH 1971.154'; p. 83, 2nd line 2nd paragraph, 'the width increase' > 'the width increases'; p. 85, 1st three lines, 'or the type of stitch that is so often seen and shown in figure 1A' > 'split stitch' [see Revision]; -, 5th line 2nd paragraph, 'rows or stitches' > 'rows of split stitches'; 2nd line last paragraph, 'the same stitches as shown in figure 1A' > 'split stitches (figure 1A)'; p. 86, 5th line, section '2.2.4. Type D', 'category

'composite fibre sandals'' > 'composite fibre sandals'; -, 10th line, section '2.2.4. Type D', 'as often' > 'as often seen in'; -, 8th line 2nd paragraph, section '2.2.4. Type D', 'very fine stitching' > 'very fine back stitching' [see Revision]; -, 5th line, 3rd paragraph, section, '2.2.4. Type D', 'ASH 197.154' > 'ASH 1971.154'; -, one but last line, 'nine rows of stitches' > 'nine rows of split stitches'; p. 87, 5th line, 'an additional row of stitches' > 'in addition to this centre row, a row of split stitches'; -, 8th-9th line, 'comparable rows of stitches' > 'rows of split stitches too'; -, 3rd line, section '2.2.5. Type E', 'stitches' > 'split stitches'; p. 93, 1st entry table, 'ASH 1892.623' > 'ASH 1842.623'; p 97, note 10, 'back' > 'Back'; p. 106, figure text 1A, 'Type of stitch' > 'Split stitching is a type of back stitching and'; -, figure text 1B, 'Reinforcement stitch as seen' > 'Back stitching used as reinforcement'; p. 107 ff, figure texts, 'Type' and 'Variant' should be written with a capital 't' and 'v'; p. 109, 'Reinforcement running stitches' > 'Reinforcement split stitching'; p. 116, 'reinforcement stitching' > 'reinforcement back stitching'.

Sewn-Edge Plaited Sandals Veldmeijer (2017b)

The pair of sandals JE 63761 was excavated from at Deir el-Medinah by Bruyère and is currently housed in the Egyptian Museum, Cairo. It is described in the catalogue that accompanies an exhibition to celebrate that excavations by the IFAO began 100 years ago (1917). The text is not included here; the images are included below.































ÄMPB-numbers: Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin; ASH-numbers: Courtesy of the Ashmolean Museum, Oxford; asw-numbers: Courtesy of the Ministry of State for Antiquities/Egyptian Museum Authorities; BM-numbers: Courtesy of the British Museum, London; EgCa-numbers: Courtesy of the Ministry of State for Antiquities/Egyptian Museum Authorities; MEgT-numbers: Courtesy of the Museo Egizio, Turin; MFA-numbers: Courtesy of the Museum of Fine Arts, Boston; NMAL-numbers: Courtesy of the National Museum of Antiquities, Leiden; NMS-numbers: Courtesy of the National Museums of Scotland, Edinburgh; Petrie-numbers: Courtesy of the Petrie Museum of Egyptian Archaeology UCL, London; WML-numbers: Courtesy of the World Museum, Liverpool. JE 25987 (left)/25988 (right) -- Type B, Variant 3 SR 5273/?

Measurements (left/right) L: 550/610 seat appr. 270/250 W heel: 87.5/73.7 W waist: 76.7/78.7 W front: 71.7/94.7(?) T sole: 5.7/5.7 W strips insole: 21/24.1 W strips treadsole: 10.0-16.0/8.1-20.5

Provenance: ?

Date: ?

Courtesy of the Ministry of State for Antiquities/ Egyptian Museum Authorities.

SR 5259bis -- Type A, Variant 3 TR 14 1 26 3 (right)/4 (left)

Measurements (left/right) L: 600/600 (incl. elongated toe) W heel: 88.0/87.2 W waist: 98.5/98.3 W front: 107.8/111.5 T sole: 16.1/15.7 D front strap: 6.8x7.5/7.2x7.6 D back strap: 7.2x7.5/7.8x8.0

Provenance: ? Date: ?

Courtesy of the Ministry of State for Antiquities/ Egyptian Museum Authorities.







 SR 5201 -- Type B, Variant 4

 TR 16 1 26 3

 Measurements:

 L: 260

 W heel: 70.5

 W waist: 74.8

 W front: 78.7

 T sole: 9.8

 W strips insole: 12.5-14.5

 Provenance: ?

 Date: ?

 Courtesy of the Ministry of State for Antiquities/

 Egyptian Museum Authorities.

Shoes

Open Shoes I Veldmeijer (2010b)

Bibliography

Veldmeijer & Ikram (2014: 24-27).

Dating

These shoes date mainly to the 3rd to 9th c. AD, but with several examples dating to the Ottoman Period.

Distribution

Differences in details between shoes from Qasr Ibrim and Ismant el-Kharab suggest that it is possible to distinguish between footwear from different settlements (at least to certain extent). This is also suggested by research from other sites, such as Amarna and Fustat.



Shoes with Flexible, Full Uppers

Typology

A real typology has not been included here, but has been suggested elsewhere (Veldmeijer, 2009f, see below) and revised by Veldmeijer & Ikram (2014: 27): "Fibre Shoes are referred to as the 'Group' and the 'Open Shoe' as category. The category is divided into Type with Partial Upper (further divided into the Short Toe Variant and the Extended Toe Variant) and the Full Upper Type (consisting of the Upright Upper Variant and the Flexible Upper Variant). In the publication, the Flexible Upper Variant is not discussed: it is this Variant to which the three examples in the collection of the Coptic Museum belong. Veldmeijer (2010a) recognises differences in treadsoles, but has not used it for further division. However, the point of classification is to better understand development of technology as well as trying to pinpoint its origin (such as workshop or regional differences). Hence, an important difference such as the construction of the treadsole, should be used to further classify this material (contra Veldmeijer, 2009d: 98 saying that the shape of the soles has not been used in the classification because mostly these are the same, thereby ignoring the construction of the sole entirely [emphasis by present authors]). The four different types of treadsole, thus, can be seen as subvariants of the Flexible Upper Variant. As explained (Veldmeijer,

2010a: 299): 'The most common treadsole is made with bundles of unspun date palm [lear sheath](*Phoenix dactylifera*) and plaited in a simple 1/1 pattern [...]. Another type of treadsole is made with zS_2 string [of date palm leaf sheath ...]' In one case the sole "consists of five zS_2 warps and over 37 wefts, woven alternating over one, under one [...] A less frequently encountered type of treadsole consists of a plaited fabric in a simple 1/1 pattern. [...]." The fourth category is a repair with an old piece of basketry."

Discussion

- p. 299, right column, 9th-10th line: "slightly swayed treadsole, but without any indication of the foot's orientation". This is not correct: swaying means that the shape of the sole suggests the orientation. Thus, the sole is straight. See also p. 300, left column.

- p. 303-304: the term 'slipper' is to be used for footwear with an upper that only covers the toes or front of the foot. The term 'mule', as used by Veldmeijer (2013d), is interchangeable with 'slipper' (Goubitz *et al.*, 2001; Veldmeijer, 2013e).

- On p. 304, the difference between sandals, open and closed shoes is explained. In Veldmeijer (2010f: 266, 268), however, this is more clearly explained: "Closed shoe. Shoe with an upper that entirely encloses the foot. [...] Open shoe. Shoe with an upper that covers the sides of the foot only. The dorsal surface of the foot is not covered. [...]". In contrast to what is said on p. 304, both open and closed shoes were worn in Pharaonic Egypt, although the open shoes were much more common. There are ample examples of both from the archaeological record as is clear from the present work. None, however (and this is what was meant in the paper), have been shown in ancient Egyptian imagery as opposed to numerous examples in Mesopotamian and Meroitic art.

Errata

General: It would have been more logical to combine these shoes with the open shoes presented elsewhere (Veldmeijer, 2009f, see below). Moreover, the title refers to the site that provided the only examples studied by the author, rather than that these shoes only occurred at this site as the title might suggest; p. 299, left column, 5th line, delete 'of both fibre and leather'; -, figure text, 'the most common type' > 'the only type'; -, right column, 7th line from below, 'part of sandal' > 'part of the sole'; p. 300, left column, 4th-5th line, 2nd paragraph, 'two sandals' > 'two shoes'; p. 301, right column, last line, 1st paragraph, 'stickig out' > 'sticking out'; p. 303, left column, last line, 1st paragraph Straps, 'through the entire sole' > 'through the sole thickness'; -, left column, 6th line, 2nd paragraph Straps, ' a'a' ' > 'a'; -, right column, 3rd line, 2nd paragraph: "soles seem to have been cut in their form together" should read "sole layers have been cut in their form together (an example of this is Sewn-Edge Sandal (Petrie Museum of Egyptian Archaeology UCL, UC30548)"; p. 304, left column, 21st line, 'in contrast to sandals' (ignore 'or known from excavations and collections'). Open Shoes II Veldmeijer (2009f)

Bibliography

El Hadidi & Hamdy (2011); Veldmeijer (2014b: 43-44).

Dating

Dating is very problematic and is partially based on the occurrence of the sandals from which the shoes were created. The concept of open shoes was certainly known in the New Kingdom, but seems to have been introduced even earlier, as is explained below for the leather open shoes. It seems, therefore, unlikely that shoes of vegetable materials were only used in later New Kingdom times, since sandals of vegetable materials were much more common than leather.

Distribution

Only very few of the shoes studied by the AEFP have reliable provenances, but there have been shoes excavated at Saqqara, Luxor and Elephantine, suggesting that open shoes of vegetable material had a large distribution.



Open Shoes (Partial Upper and Full, Upright Upper)

Typology

See above with 'Open Shoes (from Qasr Ibrim) I'.

Discussion

- General: The finishing of the edge in some shoes, as mentioned in the last paragraph of 'Upper: Full upper shoes (upright upper variant)' (p. 103), consists of sewing over the edge. This stitch is known as whip stitch (also referred to as oversewing or overcast stitching, see figure 6 in Veldmeijer, 2010b). The text of figure 4 should be adjusted (split and back stitching respectively).

- p. 105: The identification of the material of the shoe in the Oriental Institute Chicago as the leaf sheath of the date palm ('palm fibre') is erroneous: the material is palm leaf, the species of which has not been determined. The identification as 'reed' needs further investigation as well. See chapter 'Materials Used in Footwear', section 'Vegetal Materials (Other than Wood)'.

Errata

p. 98, 4th line, 'Open shoes' > 'Open shoes, which are discussed in the present paper'; p. 100, 3rd line, 'rows of stitching' > 'rows of split stitching' [see above Revision Sewn-Edge Plaited Sandals]; -; note 10, 'usually referred to' > 'a process usually referred to'; -, 14th line, 2nd paragraph, ' 'treadsole' ' > 'treadsole'; p. 101, 1st line, '(arrows in Fig. 1 [c], 2 [a])' > '(arrow in Fig. 1 [c], see also Fig. 2 [a]); -, 2nd line, 'The type of stitching' > 'The type of stitching, split stitching'; p. 101, 1st & 2nd line last paragraph, 'reinforcement stitching' > 'reinforcement split stitching'; -, 3rd line last paragraph, 'a different type of stitching' > 'back stitching', -, 4th line last paragraph, 'has stitches as seen in Fig. 4 [a]' > has split stitching' (Fig. 4 [a])'; -, last line last paragraph, 'same type of stitching' > 'same type of stitching, viz. back stitching (Fig. 4 [b])'; p. 102, last sentence, 'the sole layers' > 'the sole layers, viz. split stitching'; p. 104, 4th line, '(slightly) swayed, show that this is done erroneously' > '(slightly) swayed to the opposite orientation', suggesting it is done erroneously (see above)'; p. 104, 12th line, 'pulled through' > 'pulled through a slit in'; -, 4th line Strap complex: Full upper shoes (upright upper variant), 'inserted through' > 'inserted through a slit in'; p. 112, table, 'Berlin 6992.1' & 'Berlin 6992.2' > 'Berlin AM 6992.1' & 'Berlin AM 6992.2'.
























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Footwear Made of Leather

Sandals

Eared Sandals Veldmeijer (2011c)

Bibliography

Veldmeijer (2014b: 50-53; 2016a); Veldmeijer & Ikram (2014: 32-34).

Dating

It was a common technique to integrally cut the pre-straps from the sole's leather, but the shape and position of the pre-straps differed through time. Although these sandals are usually shown in New Kingdom scenes of leatherworkers, the archaeological record is very scanty, with only very few well preserved specimens known. This prohibits detailed dating, but the earliest examples are from the Pan-Grave culture. Montembault (2000: 87-91) published several from 18th Dynasty Deir el-Medinah. From Nubian contexts we have many more examples. In post-Roman times, large pre-straps that were integrally cut from the heel's leather become the default in Nubia, although they were used already in Roman times (Leguilloux, 2006). The Egyptian Eared Sandals seem to have dissapeared at least by the Roman period, but this may have already happened by the Late Period. Nubian Eared Sandals are post-Pharaonic.



Red: Egyptian and Nubian Eared Sandals; Brown: Classic Nubian Sandals

Distribution

The majority of finds originate from the southern sites (*e.g.* Amarna or the Theban region) or even further south in the case of the Nubian Eared Sandals.

Typology

See the table on the next page (from Veldmeijer, 2016a), which is a revision of the typology suggested in the Eared Sandals-paper.

Discussion

Eared Sandals form the basis for more elaborate sandals with integral straps such as the Composite Sandals (see below) as well as the basis for open shoes.

					Single Front Strap	Front Strap Single	Front Strap Double	Front Strap					
Sub-Variant				Swayed Straight	Rounded	Square	,					Single Front Strap Double Front Strap	Single Front Strap? Double Front Strap?
Variant	Single Sole Layer Multine Sole Layers	Single Sole Layers Multiple Sole Layers	Single Sole Layer Multiple Sole Layers	Single Sole Layer Multiple Sole Layers	Variant A			Variant B	Variant C	Variant A	Variant B	Variant A	Variant B
Type	Straight Sole	Swayed Sole	Singe Front Strap	Double Front Strap	Type I					Type II		Type III	
Sub-Category	Egyptian Eared Sandals		Nubian Eared Sandals		Classic Nubian Sandals								
Category	Integral Pre-Strap												
						Errat	a						

Throughout: 'Scale bar in mm' (erroneously stated in all but figure 5 that the bars represent 50 mm); p. 9, 2nd line, 2nd column, 2nd paragraph, 'Sole Variants' > 'Sole Layer Variants'; p. 14, note 10, 'An alternative to the button' > 'An alternative to this button; p. 15, note 27, 'possible to recognisable' > 'possible to recognise'; table: S 8637 type designation 'straight' > 'swayed'.

Footwear Veldmeijer (In Press c)

MET 36.3.235 and 36.3.159, excavated from Sheikh Abd el-Qurna, below TT71, are described in the volumes on the Metropolitan Museum's excavations at Sheikh Abd el Qurna. The text nor the images are included here.



























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Composite Sandals Veldmeijer (2009a)

Bibliography

Veldmeijer (2014b: 54-57); Veldmeijer & Ikram (2014: 31-32).



Leather Composite Sandals

Distribution

All of the provenanced examples except one (and several examples in literature), come from the Theban region.

Discussion

- The reference to the way of securing the front strap at the ventral surface of the treadsole as the 'enlarged terminal end' has been replaced with the more convenient term 'button' (used in other work, *e.g.* Veldmeijer, 2009c).

- Sinew is default for securing sole layers, but ASH 1888.528 is an exception (Type B, Variant 2 sandal). Petrie UC 28350 and BM EA 36200 are stitched with flax thread too.

- Regading the thickness of cow's leather: it can also be made to be very thin, so not such a strong indication of species of the animal.

- A tapered tube of stained red (goat) leather from TT65 in Luxor (TT65.004a/ SH3 L37) has two edges that must have been glued, as there is no stitching present. The wide top part is torn, but the narrow lower end is intact. Lengthwise down the centre, the narrow impression of a sort of core is visible. The only exact parallel to date is the extraordinary sandal BM 36200 (Van Driel-Murray, 2000: 306; Veldmeijer, 2009a: 18-19). Here, the front strap is, at the top, sewn to the triangular openwork back strap. No mention is made of a core, but both the weird bend just before the front strap inserts through the sole and the round appearance of the strap, suggest there was one – and that this was used to secure the strap at the ventral surface of the treadsole. Such a construction would make sense for TT65.004a as well: the intact edge at the front would perhaps have inserted slightly into the sole (more likely, however, it stopped just above the hole) while the core continued through and was used to secure it. The provenance of BM 36200 is not known, but it is thought to come from the Theban area. It would by no means be unlikely that this unique single sandal originated from TT65, with the fragment of the strap being the (only?) remnant of the other sandal of the pair.

Errata

p. 2, 1st line, 1st column, 'without this' > 'without padding'; p. 4, 1st column, 4th-5th line from below, 'of which the longitudinal edges are folded' > 'also with folded edges'; -, 14th line, 2nd column, 'set of strips' > 'set of decorative strips'; -, 26th-27th line, 2nd column, 'one strip' > 'one decorative strip'; p. 8, 3rd line, 1st column, 'sets of strips' > 'sets of decorative strips'; p. 9, one but last line, 2nd column, 'leather strips' > 'decorative leather strips'; p. 16, 4th line, 2nd column, 'these penetrates' > 'it penetrates', -, 4th line, 2nd column, 'are visible' > 'is visible'; p. 23, note 10, 'the leatherwork various Nubian' > 'the leatherwork of various Nubian'.

Footwear

Veldmeijer (In Press c)

One pair (4824), excavated from Sheikh Abd el-Qurna, below TT71, is described in the volumes on the Metropolitan Museum's excavations at Sheikh Abd el Qurna. The text nor the images are included here.





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Side-Covering Sandals Veldmeijer (2013b)

Bibliography

Dating

Distribution

Typology

Discussion

Cutting the pre-strap from the heel's edge is not a common technique in Pharaonic Egypt, and seems to have been largely limited to predynastic times (but see chapter 'Diachronic Change in Technology'). A single report was made of this technique from El-Kubanieh (Juncker, 1920: 82-83).

Errata

p. 49, 4th-5th line: '[TR] 14 1 & 26 11' > '[TR] 14 1 26 11'; -, 3rd line, section '2.1 The Sole', 'and V-shaped?' > 'and V-shaped'; p. 50, text figure 1, 14 1 & 26 11' > '14 1 26 11'; p. 53, text figure 4C, Add: 'The single arrow is explained in the text'; p. 54, 4th line, section '2.2.3 The Heel Strap', ' the pre-strap.' > 'the pre-strap (double arrow in figure 5)'; p. 56, 2nd paragraph, 'toe-extension' > 'toe extension'; p. 57, 2nd line, 2nd paragraph, 'sandalmakers' > 'sandal-makers'; -, 3rd lines, 2nd paragraph, 'toe-extension' > 'toe extension'.

Shoes

Open Shoe Veldmeijer (2009j)



ather Open Shoes (mei. Tutankhann

Distribution

Typology

The leather open shoes are either based on Eared Sandals or Composite Sandals, the naming of these types was not mentioned previously (see chapter 'Typology').

Discussion

In the 2nd-3rd line, 2nd paragraph of section 'Description' it says: '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.' Thus, the sole consists of three sole layers. However, a bit later is mentioned '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)' meaning that possibly, the sole consists of four layers.

Errata

p. 3, 1st line: 'Stubbed-Nosed Low Ankle Shoes' > 'Stubbed-Toe Ankle Shoes'; p. 3, 4th line, delete 'which are unique in Tutankhamun's footwear' [although it is true that the closing systems in some of the king's shoes are not found in other Egyptian footwear, the statement here has no bearing on the previous text]; -, width of heel, '47.5 mm' > '47.5mm'; p. 4, 2nd line, 'The upper shoe consists of two pieces (fig. 2C)' > 'The upper consists of two pieces (fig. 2C)' | the attachment strip is not shown in the figure; see revised figure below]; p. 5, 10th line, 'in fibre open shoes with straps in the fact' > in fibre open shoes in the fact'; -, 5th line,

section 'Discussion', 'weak construction too' > 'weak construction'; p. 6, note 30, 'Note that the all of the shoes' > 'Note that all shoes'; p. 10, text figure 3, 'Photograph' > 'Photographs'.

Additional Open Shoe Veldmeijer (2009b)

Bibliography

Dating

Distribution

Discussion

Errata

The number mentioned, '48362/3' is the JE-number. 'Scale bar in mm' (erroneously stated in figure 1d-g that the bars represent 50 mm); p. 233, 9th line, note 1. 'suggestion' > 'suggestions'; p. 237, fig. 2b: the arrow-heads dropped off in press; p. 239, 1st line, '(figs. 1g, 2e)' > '(fig. 1g)'; -, 2nd-3rd line, 'enlarged terminal end' > 'enlarged terminal end' ('button'); p. 239, 1st-2nd line, section 'Wear', 'The damage of the heel' > 'The damage of the heel part of the upper'; p. 242, one-but-last line, 2nd paragraph, 'BM EA 4396' > 'British Museum, London (BM) EA 4396'; p. 243, 4th line, 1st paragraph, 'pair of shoes' > 'pair of open shoes'; -,'in the British Museum (see below)' > 'in the British Museum (EA 4391, see below)'.
Curled-Toe Ankle Shoes Veldmeijer (2009b)

Bibliography

Dating

The specimen in the Offenbach Museum (see below) is said to be 17th Dynasty (Gall, 1961: [no page numbers]), but the Museum has "no information about the place where they have been found and on which parameters the date was established" (Personal Communication 20 June 2017).



Leather Curled Toe Ankle Shoes

Distribution

These shoes are only known from the tombs of the Theban region, but are relatively common.

Typology

Discussion

A fragment of upper (erroneously referred to as chariot related leather *e.g.* Littauer & Crouwel, 1985: 68) was among the material that was given by Howard Carter to the Metropolitan Museum of Art in New York. It is similar to the pair of red shoes (EgCa 5174/5175) in the Egyptian Museum, Cairo in size, design and colour. This pair of shoes is dated to the 21st Dynasty and one wonders if the fragment of upper is not of a comparable date rather than from the time of Amenhotep III, as is assumed (see Veldmeijer *et. al.* 2018: 293-295).

The Deutsches Ledermuseum (DLM) in Offenbach has a pair of red shoes as well (6.70.35), and although comparable at first sight to the published examples, there are notable differences. The shoes at the DLM are more elongated and the curled toe seems to be a rod, circular in shape, rather than the flat, reinforced strip seen in the Bab el-Gasus shoes (EgCa 5174/5175). The extension in the shoes that are housed in the Turin Museum (MEgT 5149 and 5150) are comparable to those in the Offenbach Museum pair. However, the appliqué on the Offenbach shoes is different from the others: here, the teardrop-shaped enhancements are small and

do not cover the height of the lower upper until the sole seam as seen in some (such as EgCa 5174/5175). Although the appliqué in the Turin example (MEgT 5150) is fairly small too, it is intermediary in size to the Offenbach example and that from the Egyptian Museum, Cairo. The uppers of the Offenbach shoes seem to consist of only one piece – certainly there is no dorsal upper and a flap is lacking as well – thus making them different from all other described examples. The instep of the one-piece upper (closed with a back seam) has a green edge binding. There is another pair in the Offenbach Museum but these are mainly the soles with only small fragments of the upper still surviving. A small fragment of a curled toe suggests a shape similar to the shoes in the Egyptian Museum, Cairo rather than the other pair in the Offenbach Museum.

Close observations of the seams in Curled-Toe Ankle Shoes, together with Martin Moser, during the reproduction of these shoes, indicate a turnshoe construction may have been used in the Gasus-like shoes (EgCa 5174/5175). This would mean that the sole was sewn to the upper inside out and then turned right-side in to hide and better protect the seams. Yet the main purpose of this technique, at least in later ages (namely to protect the seam attaching the treadsole from being worn through easily), is missed here – the soles and the sole binding are sewn with a seam that goes through all layers. Even so, the multi-piece construction demands a high degree of sophistication in the process of building the shoe that can only have been achieved by properly trained craftsmen (see also the account jointly written with Martin Moser in Veldmeijer, 2016b: 11-14).

Two fragments of upper (22005 and 22006) are housed in the Manchester Museum, which have not been studied yet. Additional material is housed in the Vänersborg Museum (08053a; 08055; under study by the author), the Petrie Museum of Egyptian Archaeology, London (UC72703) and the British Museum, London (EA22005 and 6), all of unknown provenance.

Errata

p. 2, right column, 9th line: should be new paragraph; -, 14th line: 'The sole consists' > 'It consists': this section should not be a new paragraph; -, 6th line, 2nd (original) paragraph: 'hence, the' > 'hence the'; p. 5, left column, 1st line: 'the patches' > 'as well as the patches'; p. 6, left column, figure text, 15th line: 'grey' > 'gray'; -, right column, figure text, 5th line: 'grey' > 'gray'; 6th line, 'Veldmeijer (Forthcoming)' > 'Veldmeijer (In press a)'; p. 7, right column, one but last line: 'in situ' > 'in situ'; p. 9, left column, 3rd paragraph, 10th line, 'lined with' > 'bound with'; -, right column, figure text, 2nd line, add after EgCa 5195 'The letters are explained in the text'; p. 10, right column, 7th line, 'layer:' > 'layer;'; p. 13, left column, heading: 'Manufacturing methods' > 'Manufacturing Methods'; p. 15, right column, 2nd paragraph, 4th-6th line should read: 'is always the same. These shoes are more numerous and coarser in terms of manufacturing technology'; p. 17, left column, 2nd paragraph, 20th line: 'seen first, which is partially' > 'seen first. This is partially'; p. 18, left column, note 6, last line: '(cf. Veldmeijer & Skinner, 2008: 4-5)' > '(see Veldmeijer & Skinner, 2008: 4-5)'; p. 21, table. Third entry from below: BM [blank] > BM EA 4408/4409; -, note 15: 'the Egyptian Museum dface ofo not mentioned' > 'the Egyptian Museum do not mention'; -. note 18, third sentence: 'the right on' > 'the right one'.













ÄMPB-numbers: Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin; ASHnumbers: Courtesy of the Ashmolean Museum, Oxford; BM-numbers: Courtesy of the British Museum, London; EgCa-numbers: Courtesy of the Ministry of State for Antiquities/Egyptian Museum Authorities; MEgT-numbers: Courtesy of the Museo Egizio, Turin. Stubbed-Toe Ankle Shoes Veldmeijer (2013a)

Bibliography

Veldmeijer (2016a, b, c).



See Veldmeijer (2016c) for additional information on the dating.



Stubbed-Toe Ankle Shoes

Distribution

Only very few shoes were provenanced, but those that were mostly came from the Theban region. One supposedly came from Akhmim.

Typology

Discussion

See Veldmeijer (2016c) for additional discussion.

Errata

p. 61, 2nd line: 'Currently, however, there are only two categories. These are" > 'Currently, there are two categories known:'; last line: 'extends to or above the ankle' > 'extends to or just above the ankle'; p. 64, 3rd line: 'Exception are' > 'Exceptions are'; 8th line, 4th paragraph: 'with sinew of flax' > 'with sinew or flax'; 2nd line, last paragraph: 'Among this number is one pair' > 'There is one pair'; p. 70, 4th line, 'these shoes' > 'Stubbed-Toe Ankle Shoes'; p. 72, 6th line: 'to study and publish on the material' > 'to study and publish the material'.











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Bibliography

Swann (2013: 10-12).

Dating

Distribution

Typology

Discussion

Swann (2013: 10-12) mainly repeats what was said in the original publication, but she does include some short remarks on (rather than an exhaustive comparison with) Greek finds. Unfortunately, despite it being clear that Swann has done a lot of work on concealed shoes, only a bibliography is included rather than a discussion and interpretation.

Errata

p. 323, note 7 'of the split' > 'of the splitting'; p. 325, 2nd line: 'posteriormedial corner' > 'posteriomedial corner'; -, 8th sentence, 2nd paragraph: 'too tight' > 'too tightly'; p. 327, 7th sentence, 2nd paragraph: 'suggest that the owner' > 'suggests that the owner'; p. 333, last sentence: 'construction was used' > 'a construction was used'.

Mules

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Veldmeijer (2013d)

Bibliography

Dating

Distribution

Typology

Discussion

Distinction is made between the mules discussed in part XIX and the later Coptic mules (see Veldmeijer & Ikram, 2014: 59-60): the former consists of a pair of sandals that had, probably secondary, the uppers added to them. The latter are true mules (or slippers).

Errata

The Table of Contents of JEOL 44 erroneously state page numbers 85-116, but this actually is pp. 79-84. p. 80, 5th line, section '2.2. Upper', 'In an old photograph' > 'In the old photograph'; p. 83, 3rd-4th line, 3rd paragraph, section '3. Comparison and Discussion', 'Middle Kingdom Meir (Veldmeijer, 2012/2013 [this volume]' > 'Middle Kingdom Meir (Veldmeijer, 2013 [this volume]'; -, 7th line, 3rd paragraph, section '3. Comparison and Discussion', 'own observation' > 'own observation British Museum, London and Coptic Museum, Cairo'; p. 84, section '5. Cited Literature', 'Veldmeijer, A.J. 2012/2013' > 'Veldmeijer, A.J. 2013'.

Footwear Made of Wood

Wooden Footwear

Tomb Sandals Veldmeijer (2014b)

The focus of the AEFP has been, thus far, on utilitarian footwear. However, a paper on wooden tomb sandals is planned for the near future. Several examples have been included in the work on the Medelhavsmuseet collection in Stockholm (Veldmeijer, 2014b/2017b: 45-49) and images of those in the visited collections are included here.













Pattens Veldmeijer (2008)

Bibliography

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Dating

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Distribution

The described ones were found in Qasr Ibrim, but undoubtedly (more elaborately decorated) pattens were used in bath houses all over Ottoman Egypt, since they were a common item (see especially Bos, 2016: 144-150).

Typology

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Discussion

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Errata

p. 147, note 2, 3rd sentence: 'to identify the wood specimens' > 'to identify the wood'; p. 151, 1st sentence: delete '(Schweingruber 1990, Gale and Cutler 1999, Neumann *et al.*, 2001); -, 2nd paragraph, 2nd sentence: 'from abroad, it is not' > 'from abroad. It is not'; -, one but last sentence: 'Turkey¹⁰.' > 'Turkey.¹⁰'; p. 152, 1st sentence: 'Two of the pattens' > 'All pattens'.

Typology

Vegetal:

Leather or String Reinforced Plaited Sandals: 2009h: 105. Plain Plaited Sandals: 2009i: 130; Veldmeijer & Ikram, 2014: 22-23. Sewn Sandals: 2009d: 562-563; 2010f: 43-44. Coiled Sandals: 2009g: 86; 2011a: 57; 2007a: 71; Veldmeijer & Ikram, 2014: 21-22.⁷² Composite Sandals: 2013c: 85-87. Sewn-Edge Plaited Sandals: 2010d: 79. Fibre Open Shoes: 2010b: 303-304; 200f: 98-99; Veldmeijer & Ikram, 2014: 27.

Leather:

Eared Sandals: 2011c: 2-3; Veldmeijer & Ikram, 2014: 34. Composite Sandals: 2009a: 2; Veldmeijer & Ikram, 2014: 31-32. Side-Covering Sandals: 2013b: 49. Open Shoes: 2009j: 2-3.⁷³ Curled-Toe Ankle Shoes: 2009b: 2. Stubbed-Toe Ankle Shoes: 2013a: 61. Tailed-Toggle Shoes: 2011e: 333. Mules: 2013b: 79. Pattens: 2008: 152.

Various: Tutankhamun: 2010f: 225. Coptic Museum, Cairo: Veldmeijer & Ikram, 2014: 15. Deir el-Bachit: 2011b: 38-40 Qasr Ibrim Ottoman: 2012b: esp. 33-35, 47-49, 50, 64-68, 74-75, 88-95. Gebel Adda (incl. Eared Sandals): 2016c: 20-23, 44, 47-49, 50-51. Dra Abu el-Naga: 2017b: 36, 39, 43, 46, 53-54.

Table 4 presents an overview of the typology as established by the AEFP, based on the archaeological material. As explained in each publication (to which the reader is referred), the typology is based on numerous different critera, depending on the category of footwear, including overal shape (sandal/shoe/patten etc.), sole shape, sole construction and/or the less clearly defined 'recognisability' (see Veldmeijer, 2010f: 15; *cf.* Goubitz *et al.*, 2001). An initial sorting was based on materials as the various materials not only require different technology, knowledge and experience, but also have a different origin (see chapters 'Materals Used in Footwear' and 'Diachronic Change'). The typology excludes post-Pharaonic footwear, as defined by Montembault (2000), and includes some new types.⁷⁴ Although some work has been done on the typology of post-Pharaonic footwear, a reappraisal is necessary and will be presented in the future.⁷⁵ However, footwear with a (clear) relation to Pharaonic examples, such as Plain Plaited Sandals and Eared Sandals, are included. The typology is discussed in chapter 'Description', and includes (discussed) updates to the published typology.

⁷² The authors suggest a complete revision (see the relevant sections in the description chapter).

⁷³ But see the revision in the present work below, distinguishing between those based on Eared Sandals and those based on Composite Sandals.

⁷⁴ See Veldmeijer (2012b).

⁷⁵ This will include the pre-Ottoman finds from Qasr Ibrim, as well as from Gebel Adda (although this [post-] Meroitic material has been included in the typology of Leather Eared Sandals already, due to its relationship with Egyptian Eared Sandals) and Fustat.

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
				Type C	ı		1		
				Type D	ı	,	1		sy BM
				Type E	Variant 1				Courte
					Variant 2	r	r		
Vegetal	- Sole construction - Sole shape - Imitations (<i>cf.</i> Tutankhamun's footwear)	Sewn Sandals	1	Type A	Variant 1	,	1		Courtesy NMAL
	·				Variant 2		1		Courtesy BM

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
				Type B	Variant 1	,	ı		ssy BM
					Variant 2	ı	ı		Courte
				Type C	Variant 1	1	1		Courtesy MEgT
					Variant 2		1		
				Type D	Variant 1		1		Courtesy MSA/EgCa
					Variant 2	ı	1		

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
				<u> </u>	Variant 3	1		hills ellis casse alter of the	Courtesy Griffith Institute
					Variant 4				From: Daressy, (1902: pl. XX)
Vegetal	- Sole construction - Made of plied string/Made of braids/Looped/Coiling (sewn/ core)	Coiled Sandals		Type 1 (Plied String)	Plain	ı			Courtesy BM
					Woven	ı			Courtesy MSA/CM
				Type 2 (Braids)	Coarse Braids	I	r		y Petrie
					Fine Braids	ı	ı		Courtes

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		lmages	
				Type 3 (Looped)	ı	r	ı		Courtesy Petrie
				Type 4 (Coiled Sewn)	ı	ı	ı		Courtesy BM
				Type 5 (Coiled Core)	ı	r	ı		Courtesy MSA/CM
Vegetal	 Sole construction Shape of the sole Swayed/straight - notched 	Composite Sandals		Wide	ı	ı	ı		Courtesy MSA/EgCa
				Elongated Straight	Notched	1	1		Courtesy BM
					Unnoctched	1	1		Courtesy MET

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Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
				Elongated Swayed	r	r	ı		MSA/EgCa
Vegetal	- Sole construction - Sole shape - Recognisability	Sewn-Edge Sandals	r	Type A	Variant 1	r	ı		Courtesey
					Variant 2	ı	ı		esy BM
					Variant 3	r	I		Courte
				Type B	Variant 1	1	1		Courtesy ÄMPB
					Variant 2	1	1		Courtesy BM

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
		<u> </u>			Variant 3	ı	ı		MSA/EgCa
					Variant 4	ı	ı		Courtesy
				Type C	Variant 1	ı			Courtesy ÄMPB
					Variant 2	ı	ı		Courtesy BM
				Type D	Variant 1	1			Courtesy ÄMPB
					Variant 2	1	1		Courtesy BM

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
					Variant 3	r	ı		Courtesy OIM
					Variant 4	r	ı		Courtesy BM
Vegetal	- Shape of the upper (partial/ full) - Presence/absence of extended toe	Open Shoe	r	Partial Upper	Short Toe	r	ı		Courtesy NMAL
					Extended Toe	1	1		Courtesy MEgT
				Full Upper	Uprithc Upper	1	1		Courtesy ÄMPB
					Flexible Upper	1	1		Courtesy BM

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
Leather	 Shape of the sole (which includes the integrally cut pre-strap) Layout of the front strap Sole layers 	Integral Pre-Strap	Egyptian Eared Sandal	Straight Sole	Single Sole Layer	ı	1		Courtesy BM
					Multiple Sole Layers	1	ı		Courtesy Amarna Trust
				Swayed Sole	Single Sole Layer	ı			Courtesy Petrie
					Multiple Sole Layers	Rounded	1		Courtesy ÄMPB
						Pointed	1		Courtesy ASH
			Nubian Eared Sandals	Single Front Strap	Single Sole Layer	ı			Courtesy MFA

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
	<u>.</u>		<u> </u>	<u>.</u>	Multiple Sole Layers	Straight	r		WIO Ks
						Swayed	1		Courte
				Double Front Strap	Single Sole Layer		ı		Courtesy BM
					Multiple Sole Layers	Swayed	1	-	ı
						Straight	1		Courtesy MSA
			Classic Nubian Sandals	Type I	Variant A	Rounder	Single Front Strap		Courtesy BM
Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		ages 	
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							Double Front Strap		Courtesy ROM
						Square	Single Front Strap		Courtesy BM
							Double Front Strap		From: Leguilloux (2006: fig. 20)
					Variant B		,		
					Variant C	r	r		Courtesy ROM
				Type II	Variant A	1	1		

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
					Variant B	r	,		esy BM
					Variant C	r	ı		Courte
				Type III	Variant A	Single Front Strap	ı		Courtesy ROM
						Double Front Strap	ı	-	1
					Variant B	Single Front Strap	,		y ROM
						Double Front Strap	,		Courtes

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images	
Leather	- Sole shape - Curled toe or not	Composite Sandal	I	Type A	r	r			y ÄMPB
				Type B	Variant I	1			Courtes
					Variant 2	1			Courtesy ASH
				Type C	1	1			Courtesy BM
Leather	- Side flaps	Side-Covering Sandals	,	,		1	,		1SA/EgCa
Leather	- Sole shape (Eared or Composite Sandal)	Open Shoe	1	Eared Sandal	1	1			Courtesy N

Material	Summary Typological criteria	Category	Sub-Category	Туре	Variant	Sub-Variant		mages		
				Composite Sandal		r	r	00°V	Courtesy BM	
Leather	- Technological details (main- ly sole/upper construction)/ shape of sole/presence or absence of decoration)	Closed Shoe	·	Curled-Toe ankle Shoe	Variant 1	r	r		Courtesy MSA/EgCa	
					Variant 2	r	ı		Courtesy BM	
				Stubbed-Toe Ankle Shoe	Eared	Drawstring	1		Courtesy MSA/EgCa	
						Plain	ı		Courtesy BM	
					Plain	,	1		Courtesy ÄMPB	

Material	Summary Typological criteria	Category	Sub-Category	Type	Variant	Sub-Variant		Images		
Leather	- Closing system	- Closed shoe		Tailed Toggle Fastening	r	ı	ı		Courtesy CEFB	
Leather	- Shape of the upper	Mule	Pharaonic		r	1	1		Courtesy MSA/EgCa	
Persian Footwear (not further specified)										
	Post-Pharaonic Footwear (incl. Ottoman) not further specified.									

Materials Used in Footwear

Vegetal Materials (Other than Wood)⁷⁶

Leather or String Reinforced Plaited Sandals: 2009h: 106-107, 110-111. Plain Plaited Sandals: 2009i: 129. Sewn Sandals: 2009d: 567-568; 2010f: 145-147. Coiled Sandals: 2009g: 88; 2011a: 65-67. Composite Sandals: 2013c: 97. Sewn-Edge Plaited Sandals: 2010d: 199. Fibre Open Shoes: 2010b; 2009f: 104-105.

Deciding to examine the samples in the VP-SEM without first cleaning and preparing them or using the alternative method of thin-sectioning them for LM examination, has yielded significant additional information about the condition of the sandals themselves. Many of the samples of sandal components display adhesives and/or conservation consolidants, encrustation (possibly from the historical use of pesticides), (non-active) fungal hyphae, frass, loose particles (dirt), abrasion, wear, and deterioration. Figures 5, 6, 8-10, 15 and 17 (Cartwright & Veldmeijer, 2017) show typical examples of each of these. Despite the fact that sometimes these features masked anatomical characteristics or hindered secure identifications, only a small percentage of the samples were ultimately unidentifiable. Rather, these results can be seen as adding to a body of knowledge concerning the effects of preparation of plant parts specifically selected for the manufacture of the sandal or shoe, the use by its owner, and its subsequent storage. They can also inform active conservation and care of museum collections.

This is not the first time that the materials used to fabricate sandals have been identified. Greiss (1949) identified the materials in five sandals from various sources (Greiss, 1949: 270) but only two were illustrated. This limited our ability to verify the identification of the type to only these two, thus only they will be discussed here. The Sewn Sandal (383 C.M.) is made of Hyphaene thebaica (dom palm) and Imperata cylindrica (halfa grass), but it is not specified which parts of the sandal were sampled. The Sewn Sandal in the Berlin collection includes, in addition to the two materials identified by Greiss, also Cyperus papyrus (papyrus sedge) and Desmostachya bipinnata (halfa grass). Similarly, the materials of the sandals from the tomb of Tutankhamun have been identified as halfa grass⁷⁷ for the core of the transverse bundles, Hyphaene thebaica (dom palm) for the sewing material that wraps them, and Cyperus papyrus (papyrus sedge) for the straps (Veldmeijer, 2010f: 145-14678), but a greater number of samples from various parts of the sandals (cores of the edge or of the straps, for example) would possibly point to additional materials having been used. Reed(?) cores are suspected to have been used as cores in the Sewn Sandals from the tomb of Yuya and Tjuiu, as well as in

⁷⁶ After Cartwright & Veldmeijer (2017). Only the adapted discussion is included here.

⁷⁷ Not further specified, as this would need a comparable strategy to the material that is presented here; this was not done.

⁷⁸ These identifications, made by means of macroscopic investigation and assisted by magnifying lenses up to 20 times in strength, have been confirmed by the identification of one sandal by the GEM-CC (Morshed & Veldmeijer, 2015: 93-94).

an example from the Petrie Museum of Egyptian Archaeology, University College, London (Veldmeijer, 2010a: 145). El Hadidi & Hamdy (2011) published the results of the identification of various pieces of footwear, including a Sewn Sandal from Deir el-Medinah. Remarkably, the bundle of this sandal is made of *Cyperus papyrus* (papyrus sedge), rather than reed or grass; the wrapping strips are made of *Hyphaene thebaica* (dom palm). The use of *Hyphaene thebaica* (dom palm) for the sewing was registered in all Sewn Sandals that have been sampled (for which the sampled area was specified). Montembault (2000: 38; Dupéron-Laudoueneix, 2000) mentions *Hyphaene thebaica* (dom palm) leaf too in footwear housed in the Louvre, Paris, but it was not specified from which part the identification was made; the same can be said about the Sewn Sandals published by Gourlay (1981a: 62; 1981b: 56, pl. xxb) from Deir el-Medinah.

A comparable problem can be seen in the identification of the materials of other types of sandals and shoes: one should not assume that all elements were made of the same material as the identified sample. The Sewn-Edge Plaited Sandals from the three collections that were sampled for the present work were made of two, three, four or even five different materials, including Cyperus papyrus (papyrus sedge), Desmostachya bipinnata (halfa grass), Hyphaene thebaica (dom palm), Phoenix dactylifera (date palm) and Arundo donax (giant reed). Greiss (1949) identified Hyphaene thebaica (dom palm) for a Sewn-Edge Plaited Sandal and its border (we assume that by 'sandal' he meant the sole alone). El Hadidi & Hamdy (2011: 1052) identified Hyphaene thebaica (dom palm) for the plaiting strips and the petioles in the bundles of the edge of the sandal that they examined. Although analysis of the Sewn-Edge Plaited Sandals in the Louvre, Paris published by Montembault (2000: 33-35; Dupéron-Laudoueneix, 2000) has the same problem as the Sewn Sandal fragment from the Louvre collection (*i.e.* the exact part that was examined is not specified), *Phoenix dactylifera* (date palm) was identified. Gourlay (1981a: 55-64; 1981b: 45-59, pl. Vd-f; XXa, c) only mentions that palm is the material, without any further specification. The Composite Sandals in the Louvre collection include *Phoenix dactylifera* (date palm) and Cyperus papyrus (papyrus sedge), but again, the region from which the sample was taken is not specified (Montembault, 2000: 39-43; Dupéron-Laudoueneix, 2000). Composite Sandals have not been sampled by El Hadidi & Hamdy (2011), nor were they mentioned by Gourlay (1982a, b). The examples shown in the present work, therefore, are the most precise representation of materials used in this type of sandal.⁷⁹ A single sandal can have two, three or four materials in it (note that in the case of four materials, one material was unidentified). The identified materials are Desmostachya bipinnata (halfa grass), Imperata cylindrica (halfa grass), Hyphaene thebaica (dom palm), Phoenix dactylifera (date palm), and Linum usitatissimum (flax).

In both of the open shoes from the Agricultural Museum in Giza that were examined by El Hadidi & Hamdy (2011), the plaiting strips (it was not specified which plaiting strip) and the insole were made from *Cyperus papyrus* (papyrus sedge), but the straps on one shoe were made from *Phoenix dactylifera* (date palm) and on the other from *Hyphaene thebaica* (dom palm). The shoes in the Louvre collection also included *Phoenix dactylifera* (date palm) and *Hyphaene thebaica*

⁷⁹ The important publication of a burial with a pair of Composite Sandals *in situ* (Fiore Marochetti *et al.*, 2003) also mentions palm as material, without any further specification.

(dom palm) (Montembault, 2000: 36-38, Dupéron-Laudoueneix, 2000). Again, a greater diversity of material was noted for the footwear presented here, but, as with all sampled footwear, more samples were taken from each shoe (in some cases as many as five, see Cartwright & Veldmeijer, 2017: 116-119) than in the other studies. The open shoes were made with two, three or four different materials (only one shoe was made of three materials, and the only example that was made of four, included one unidentified material). The materials that were identified are *Phoenix dactylifera* (date palm), *Hyphaene thebaica* (dom palm), *Imperata cylindrica* (halfa grass), *Desmostachya bipinnata* (halfa grass) and *Linum usitatissimum* (flax).

Feindt (2000) examined the materials of eight sandals (among which are two pairs) in the Museums für Völkerkunde Hamburg: these were all Sewn-Edge Plaited sandals, except for one sole of a Sewn Sandal. Feindt concluded, as had other researchers (see above) that different parts of the sandals were made of different materials. However, in contrast to what Feindt says, the result of his study lists several sandals that were apparently made with one material only (dom palm - 1055a:05, 1055b:05; 14.92:39; 33.39:7a, b). In this, Feindt's findings clearly differ from the other studies and it would be worthwhile to see if these results are exceptions or that it was due to the sampling strategy (unfortunately, it is not explained how many samples were analysed and exactly from which part they were taken).

Leaving the four Sewn-Edge Sandals from the Hamburg collection out of the discussion, the findings based on the London and Berlin collections suggest that, if only one material is mentioned for a sandal or shoe, this probably means that it refers to only one part (e.g. the sole or the straps, although even these can be made of different materials) rather than to all the different components. This also indicates that several different plants are often used together in making footwear. The three main types that have been found consistently are *Phoenix dactylifera* (date palm) leaflets, Hyphaene thebaica (dom palm) leaflets (particularly for the stouter elements), and Cyperus papyrus (papyrus sedge) culms (which may be used for cladding and insoles as well as other components), which is also seen in other archaeometrical studies to identify the materials of footwear mentioned above. However, a combination of factors, including not identifying the part of the shoe or sandal from which the samples were made, and assuming that materials which were found in only one or two extracted samples are representative of all the materials used, has distorted our picture of the craft of footwear production. Even in the present work, the description of the samples is not always precise enough: in the case of a pair of sandals, for example, it was not specified which of the sandals/shoes were sampled (left or right).

Even keeping in mind all of these problematic issues, it appears that, unsurprisingly, the people producing footwear (whether they were professional sandal makers or not) used whatever material was available, and no distinct specific preference existed and/or specific preferences might have existed, but access due to environmental/climatic or economic reasons might have limited choice. Still, a slight inclination for dom palm and papyrus sedge for certain uses can be seen. The most obvious is the use of *Cyperus papyrus* (papyrus sedge) for the (cladding of the) straps in Sewn Sandals (although examples are known where these straps are made from other materials). A short note on papyrus sandals: as has been mentioned elsewhere (Hagen, 2010: 195-197), footwear referred to as 'papyrus sandals' in texts, if this designation meant sandals made solely of papyrus, are not known from the archaeological record, confirmed in the present study. This has led to the suggestion that the translation of the term should be reviewed.⁸⁰

Skin and Leather

Leather: Eared Sandals: 2011c: 13. Composite Sandals: 2009a: 20. Side-Covering Sandals: 2013b: 55-56. Open Shoes: 2009j: 4. Curled-Toe Ankle Shoes: 2009b: 14. Mules: 2013b: 82.

In general one can say that ordinary leather footwear is made of cow's leather (Personal Observation, but see also Van Driel-Murray, 2000: 302). The thickness of the leather used for most footwear leaves little doubt that this is the case: turning a thick skin (such as that which comes from a cow) into a thin one is no problem,⁸¹ but creating a thick layer of leather from thin skins can only be done by adding more layers. Goatskin has been identified in a pair of extraordinarily well preserved Curled-Toe Ankle Shoes. More exotic skins and leather, such as gazelle, antelope and leopard, have not been identified. However, a pair of sandals from Kerma is made of exceptionally thick leather, which seems to be hippopotamus, but this has not been confirmed yet by proper analysis.

Wood

Pattens: 2008: 150-151⁸²

Wood is not an important material for utility footwear in Pharaonic Egypt, but is sometimes used in parts of sandals. The strap in a pair of shoes from the tomb of Tutankhamun (Carter's Number 021f, g) is partially made from wood (Veldmeijer, 2010f: 109-121) as well as an isolated strap in the Medelhavsmuseet in Stockholm (Veldmeijer, 2014b: 71). The marquetry veneer sandals from Tutankhamun's tomb are made of a wood core (Veldmeijer, 2010f: 86-95) but it is debatable whether or not to refer to these as utility footwear.⁸³ Housed in the Egyptian Museum, Cairo is an extraordinary example (JE 31984) which has a sole that consists of a treadsole of cork (and an insole of leather). The sandals, unprovenanced but said to be of Greco-Roman date,⁸⁴ however, can hardly been seen as utility footwear.

⁸⁰ Note that in general "there is still much uncertainty about the identification of ancient Egyptian plant names" (Veldmeijer & Zazzaro, 2008: 27).

⁸¹ Splitting, however, does not seem to have been done; instead, the skin was scraped repeatedly to thin it. There are several examples of thinned leather, even to such an extent that the leather became translucent (Veldmeijer, 2017a: 164-168; Veldmeijer & Skinner, In Press), but such extremes have not been documented for footwear.

⁸² No other wooden footwear has been identified yet, which need sampling (see the section 'Wood' in chapter 'Materials and Methods').

⁸³ A wooden sole from Pepy I in the Imhotep Museum, Saqqara (SQ.FAMS.449) compares to these. It is decorated with the Nine Bows and the same question can be raised for it as well. Another sole in this collection (SQ.FAMS.641) is gilded but without any decoration. The function, therefore, seems less ambiguous and it should be seen as tomb sandal.

⁸⁴ According to the Journal d'Entree.

In post-Pharaonic times, wood became more important and was sometimes used in slippers. Montembault (2000: 49) published a clog-like sandal, unfortunately unprovenanced, that uses wood of a willow species. In Ottoman times, pattens, perhaps better referred to as bathclogs, were common and several have been found from Qasr Ibrim⁸⁵; the woods have been identified as fir, maple and lime.

In contrast to utility footwear, a very specific type of sandals was made of wood: the so-called tomb-sandals. Many examples are housed in collections all over the world.

Metal

Tutankhamun: 2010f: 107-108 (gold sandals), 109-139 (incl. gold insoles and other parts).

Metal was also not a material that was often used in utilitarian footwear, and if it was, it is usually for decoration. The footwear from the tomb of Tutankhamun is a good example: here, golden daisies, beads and narrow strips enhance the footwear - two pairs even have gold insoles (Veldmeijer, 2010f: 87-95, 98-107, 109-138). The remnants of the footwear on the feet of Tjuiu (Veldmeijer, 2010f: 169-172) also included metal sole layers. Furthermore, metal is used in tomb sandals. Examples include the golden sandals of Tutankhamun (Veldmeijer, 2010f: 107-108), the famous silver sandals from the tomb of the foreign wives of Thutmose III (Lilyquist, 2004: 133-135; Winlock, 1948: 45-46), as well as those of Psusennes (Montet, 1951: 158) and Sheshong (Montet, 1951: 41f). Lilyquist (2004: 133) relates that "The earliest evidence of precious-metal sandals was in the late Middle Kingdom royal tombs at Byblos, namely, full-size silver sandal soles (Montet I928-29: nos. 650-I). A gold toe strap of papyrus style^[86] was with the mummy of Maiherpri, [...] and a small silver sandal of papyrus type^[87] was meant for a child of Tawosret (T. Davis I908: 2f., 44; Aldred I963). Sheshonq I's precious sandals have thin straps, probably imitating leather (Montet 1951: 4If. no. 238), as do those for a wife of Piye (Dunham 1950: 8I, I9-3-I035, in bronze)."

Examples of bronze sandals with a layer of gold foil (3875) are housed in the Roemer- und Pelizaeus-Museum, Hildesheim.

⁸⁵ These were simple undecorated, or slightly decorated ones, as opposed to the often elaborately decorated examples in museum collections (see for example the excellent chapter by Bos, 2016: 144-151).

⁸⁶ The reader might be confused: the reference is to a particular shape of straps, which are usually made of papyrus but often of other materials as well. These are mainly used in Sewn Sandals (see Veldmeijer, 2009d; 2010f: 45-46).

⁸⁷ As with the remark on the 'papyrus type strap' in the previous note, this refers not to a specific type of sandal. Sandals only made of papyrus do not exist.

Diachronic Change

Introduction⁸⁸

Finds from the prehistoric period of Egypt suggest that skin was the most important material for the production of footwear. Usually the sandals (shoes were not yet used in this period) consist of one sole layer held in place with leather straps, all of which were cut out from a single sheet of leather as one piece. This situation changed slightly during the Old Kingdom and First Intermediate Period, as the society as a whole was much more likely to use vegetable fibres. This pattern is also visible in the footwear: the contexts of several Composite Fibre Sandals are (tentatively) dated to the Old Kingdom. In general, however, the number of sandals that can be dated without any doubt to this period is very low – and since representations of footwear in tombs are equally rare - it seems safe to say that only a few people possessed sandals. Wearing sandals seems to have been mainly restricted to the upper classes, as is also suggested by the wooden tomb sandals, currently housed in the Imhotep Museum in Saqqara (see above and below), that are ascribed to royals. The fact that tomb sandals existed does, however, hint at their importance for those who wore them (assuming that those having tomb sandals possessed sandals in life too). In addition to this, the imagery on the Narmer pallet, shows 'sandal bearers': men, standing behind the king, carrying his sandals.

The archaeological record for the Middle Kingdom and Second Intermediate Period is more scanty than for the New Kingdom. This is especially unfortunate because at this time there was an increase of foreign contacts. Of particular note, the Hyksos, who conquered and ruled Egypt for a while, seem to be (at least partially) responsible for new types of footwear, which they brought with them, together with the chariot and new types of weaponry. One of these types might have been open shoes and it was perhaps these which gave the Egyptians the idea of covering the sides of the foot by adding strips along the edge of the sandal. Foreign peoples are depicted in the tombs of local rulers (so-called 'nomarchs') showing, admittedly difficult to identify, footwear that cannot be matched with examples from Egypt's archaeological record.

At the beginning of the New Kingdom, a larger variety of footwear is seen then ever before. By far the largest part of the database of the AEFP consists of objects from the New Kingdom. This is partially due to the archaeological record itself: much more material is preserved from this time than from others. Moreover, traditionally, Egyptologists focus more on researching this era than others. However, this increase is also due to the increased number of people wearing footwear. Possibly, people even had more than one pair. This certainly was the case for royals, judging the more than 80 shoes and sandals that were found in the tomb of Tutankhamun and the multiple pairs in the tomb of Yuya and Tjuiu. The variety of sandals increases and entirely closed shoes were seen for the

⁸⁸ After Veldmeijer (2014b/2017b: 7-11; 2016b: 24-26). A more elaborate general survey of the occurrence of footwear was published by Van Driel-Murray (2000: 312-316).

first time in the later New Kingdom. Pharaonic leather footwear in particular was highly colourful – being dyed red, green or, more often, a combination of the two.

The Late Period is represented by only very few examples. The find of seven shoes in a jar between the walls of the temple of Amenhotep II (1424-1398 BC) in Luxor is, despite the New Kingdom date of the temple, dated to the Ptolemaic era. Those few examples that do exist appear to have a foundation in footwear from the earlier periods. When the Romans conquered Egypt, they brought their own footwear with them. Of course, this does not mean that the new styles entirely replaced the existing Egyptian footwear, but Roman military footwear (as is so well known from various European sites) constitutes a big part of the archaeological record and is known from many sites in Egypt. However, much of the technology introduced was not adopted and after the Roman era, typical Roman footwear and technology disappeared altogether.

The footwear after the Roman Period (grouped under the rather ill-defined 'Christian' or 'Coptic' period) again differs from the footwear seen previously. A focus on leather is easily detectable, although footwear made from vegetal material (such as open shoes from palm leaf) still did occur, and seems to have been especially popular in the more remote areas, such as the oases in the Western Desert, and settlements like Qasr Ibrim. Shoes from this time show a wide variety of types. Although sandals are usually of a construction more or less comparable to earlier models, there are many differences in straps and, especially, decoration. Sandals were always decorated using a plethora of techniques, among which are appliqué, open work, and stamping/impression. Mules become popular in this time, resulting in several different types. Another type of footwear seen in this period is boots. Decorating shoes and mules with gold foil and embroidery becomes especially popular. This contrasts with the Ottoman footwear from Qasr Ibrim (and some finds from other sites), which has no decoration (although some constructional elements might be made in a shape that pleases the eye, such as shaped extensions at the sides of the upper).

Technology

A more detailed picture than sketched above can be offered for the construction techniques of some types of sandals and shoes. Much of the technology⁸⁹ used for sandals and shoes that are made of vegetal material remained largely unchanged throughout history. A good example of this is the Composite Sandals, assuming that the dating is indeed correct (see below) and that, thus, these sandals appear over a broad range of time: they show the same technology. This assertion is further demonstrated by the fact that even when the ancient Egyptians did add an uppers to sandals, the sandals themselves were still made in the same way and the upper was simply secured with large running stitches along the edges.

⁸⁹ Shape, however, did change through time in some types of sandals and shoes, but this will be discussed below.

Footwear Made of Vegetal Materials

The earliest evidence of footwear made from vegetal material dates from the 4th Dynasty (a pair of so-called Composite Sandals still *in situ* on a mummy, Fiore Marochetti *et al.*, 2003), but the origin of this large category of sandals is obscure. However, the two finds, the previously mentioned pair and a pair from Dashur in the Egyptian Museum, Cairo are the only examples from this period⁹⁰ and no examples are known for the next roughly 2500 years. The remaining examples are 'dated'⁹¹ to the post-Pharaonic period and throughout this period the technology remained largely unchanged from that used in the 4th Dynasty example.

The technique of sewing⁹² was already fully developed in Neolithic times, and the main technique in basketry in Predynastic times (Wendrich, 2000: 256-258). This technique is the same as is seen in Coiled Sewn Sandals and, considering how simple it is to turn the bottom of an oval basket into a sandal sole,⁹³ it might have even lead to Coiled Sewn Sandals. The first sandals might therefore have been oval rather than having a constricted waist.⁹⁴ Perhaps after the basket's sides were for some reason torn off, the left-over bottom was used as a sandal. The combination of sewing and coiling seems to have disappeared as a preferred technology for making sandals during the Middle Kingdom. Yet the technique of sewing bundles of vegetal material with a strip of palm leaf remained popular and eventually became a major manufacturing technology, especially for sandals. Thus it is likely that Sewn Sandals evolved from Coiled Sewn Sandals.⁹⁵

The oldest Sewn Sandals so far identified are housed in the Allard Pierson Museum, Amsterdam (APM03696). According to the museum archive they come from Sidmant and date to the 11th Dynasty. Remarkably, Sewn Sandals were never used as the basis for open shoes – there are no examples from the archaeological record, and certainly some would have been expected if they ever existed. This absence might be due to that fact that the pointed type (Type C)⁹⁶ was a status symbol, thus it might have been inappropriate to turn them into a shoe. However, confusingly, the open shoes from the tomb of Tutankhamun are clearly based on this pointed type of Sewn Sandal, which might suggest that open shoes based on Type C Sewn Sandals did exist. This begs the question: why imitate the Sewn Sandal in other materials in open shoes without ever having used the vegetal Sewn Sandal as a basis itself? If open shoes based on the pointed Sewn Sandals were a royal prerogative, perhaps they were thus fairly rare and have just

⁹⁰ Note the uncertainty on the dating of the Dashur pair (Veldmeijer, 2013c).

⁹¹ Note that these sandals are by definition dated to post-Pharaonic times, even without any proper basis to do so.

⁹² See Veldmeijer (2009g: 86) for a discussion on the terms 'coiling' and 'sewing'.

⁹³ This has even lead to a misinterpretation of the oval bottom of a basket found in Mersa Gawasis as a sandal sole (see Veldmeijer, 2009g: 88-89).

⁹⁴ Examples of oval sandals are rare, but do exist, such as M 11902 in the World Museum, Liverpool, which is dated to the New Kingdom (Veldmeijer, 2011a).

⁹⁵ Thus this suggests an Egyptian origin, but this does not mean that the Egyptians invented the technique. However, just as anywhere else, these fairly simple techniques could have been invented easily and anywhere (as, for example, at the other side of the world, by the Anasazi; Kankainen, 1995), and there is no reason why this could not have been the case in ancient Egypt. Many techniques for making footwear have been developed in various places all over the world and in different time periods – another example is the use of plaited and folded strips of vegetal matter, comparable to the Nubian Plain Plaited Sandals from Late Christian and Ottoman times, by the Anasazi (Kankainen, 1995).

⁹⁶ Pointed soles are by far the most common in open shoes in the Pharaonic period, but there are rare examples of non-pointed soles too.

not survived. This explanation, however, is far from satisfying, since the number of Sewn Sandals from the tomb of Tutankhamun and Yuya and Tjuiu is fairly substantial. Nonetheless, no open shoes of vegetal materials based on sewn sandals were registered.

The connection between basketry and sewing seems clear. Another basketry related technique seems to be related to the origin of the large and varied group of sandals called 'Sewn-Edge Plaited Sandals', some types of which were particularly common in the New Kingdom. The sole of these sandals consists of layers of vegetal materials that are plaited and then folded, after which the edge of the sole is sewn. According to Wendrich (2000: 259), "continuous plaiting seems to have developed from weaving during the Old Kingdom, but this technique is not widespread until the Greco-Roman period" and also was not used for basketry until then (rather basketry was coiled, see Wendrich, 2000: 257-260). In the production of matting, weaving was used from this early time onwards (Wendrich, 2000: 256-257), but still the majority of matting was made with other techniques, such as twining and binding. Thus it seems a possibility that the idea of plaited soles came from matting, but there is not much evidence to support this. Probably, there is no direct relationship between these two groups, but rather the use of plaited fabric as a sole is an invention in its own right. This scarce use of the plaiting technique might also be a reason why Plain Plaited sandals were not used in the Pharaonic period⁹⁷ (the earliest evidence from Qasr Ibrim dates to the Roman period⁹⁸).

As with Composite Sandals made of vegetal materials and Sewn Sandals, the edges in Sewn-Edge Plaited Sandals are reinforced with cores at either side and sewn together. No examples exist in which the layers are secured only by stitching through the layers except for one: ÄMPB AM 26545 in the Berlin collection shows a tightly sewn edge, but the sewing is done parallel to the edge and a sewn edge with cores still protects that edge. This is especially important for Sewn Sandals (in which the edges are made of cut-off transverse bundles of grass) and Composite Sandals (which consist of cut-off strips of palm leaf), but less so for the types of Sewn-Edge Plaited sandals in which the sole layers consists of folded, plaited fabric.⁹⁹ Thus, the sewn edge was developed to secure the sole layers and protect the edge, hence no sewing was done straight through the sole and parallel to the edge with, for example, a running stitch. It is tempting to suggest that the origin of this technique lies with the Sewn Sandals, since it is a sewing technique

⁹⁷ Nonetheless, the lack of Plain Plaited Sandals in these times is inexplicable considering that the technique was known from the popular Sewn-Edge Plaited sandals, unless there was a less rational reason for not wearing such coarse and inelegant sandals. Emotional/aesthetic reasons for not wearing certain footwear is not uncommon (it might also be the reason why Egyptians never wore sandals with a double front strap, toe band, or foot strap [the examples of the latter two from the tomb of Tutankhamun are notable exceptions]). A telling example was presented by Elizabeth Semmelhack (senior curator of the Bata Shoe Museum in Toronto [22 February 2017]: "the men who survived the Starving Time at the Jamestown settlement (the winter of 1609-1610) suffered incredible hardship and I was struck by John Smith's later description of how the men had to wear hats on their feet and sorely wanted for shoes. As I was sympathising with their plight, I began to wonder why they didn't make clogs for themselves, they were surrounded by wood. I contacted one of the lead archaeologists for Jamestown and she said that no evidence of clogs had been found, nor was there any evidence of moccasins. I then called Al Saguto, the shoemaker at Colonial Williamsburg and he said he felt sure that they hadn't turned to clogs as clogs were considered papist."

⁹⁸ Several were dated to Ptolemaic times, but this is not at all certain.

⁹⁹ Which equal the sole in Plain Plaited sandals, and which go without further reinforcement of the edges.

and, as mentioned, was necessary for these soles, but the earliest examples of sandals with a sewn edge from the archaeological record are actually Composite Sandals.¹⁰⁰

Footwear Made of Leather¹⁰¹

In Predynastic times, sandals were predominantly made of leather, which is hardly a surprise considering the society's focus on leather (Van Driel-Murray, 2000: 308-309). Perhaps one would expect fairly simple sandals, but the Naqada sandals in the Turin museum, as well as examples from Gebelein, suggest that this is not necessarily true - although this short-lived technique seems to have come from abroad. Despite the paucity of evidence from the archaeological record for the earliest of times, it has been suggested that leather decreased in importance as a material for sandals in the Old Kingdom – "perhaps in consequence of the increasing use of textile clothing at this period" (Van Driel-Murray, 2000: 308).¹⁰² The few extant depictions of sandal making show that the Eared Sandals (e.g. Petrie, 1898: pl. XIII) were already present in the 5th Dynasty, and several examples from the archaeological record confirms this (e.g. Veldmeijer, 2011c). A pair of sandals from Gebelein (S14043), however, does show one rather peculiar feature that is remarkably seen in only one other sandal: the sole is folded at the front, resulting in two sole layers. This is the only sandal with such a feature from Egyptian contexts but it has been recorded in Adindan (Williams, 1983; see Veldmeijer, 2016c: 22) and is dated to the C-Group. The feature is so peculiar that one cannot but wonder if there is a connection.¹⁰³

It is not clear when sandals with integrally cut ears (as seen in the typical Egyptian Eared sandals¹⁰⁴) appeared first. The oldest sandals studied by the AEFP are dated to Naqada I, and these have integrally cut pre-straps, which seem to have been the very first way of providing a system to keep sandals on the feet.¹⁰⁵ The fact that Nubians also used the integral system supports this conclusion (there are many examples from Kerma and C-Group periods).¹⁰⁶ Although swayed soles occurred from early times onwards (Personal Observation; Van Driel-Murray, 2000: 314), over time the shape began to be more pronounced, with highly shaped soles common in the New Kingdom. Due to a lack of leather sandals from

¹⁰⁰ However, as explained previously, it can be expected that Sewn Sandals were seen first in the Old Kingdom, but until well-dated examples are discovered, this remains uncertain.

¹⁰¹ Technological development of leatherwork in general should not be left out of this discussion, not in the least since the production of leather footwear seems to have been done in leatherwork shops where other objects, such as chariot leather, were also manufactured. In order to correct this omission, a detailed discussion of leatherwork technology is forthcoming.

¹⁰² One might bring the scenes of sandal production in Old Kingdom tombs (*e.g.* the tomb of Jntj and Jttj/Sdw; Schwarz, 2000: Katalog A, 3, 4; Kanawati & McFarlane, 1993) into the discussion, so as to suggest the opposite, but the production of sandals of vegetal material has never been depicted and thus imagery is not helpful. These scenes do, however, show that sandals were still made of leather.

¹⁰³ For instance, the sandals are Nubian made.

¹⁰⁴ The cutting pattern of Eared Sandals shown by Van Driel-Murray (2000: 314) and referred to as 'basic pattern of Egyptian footwear' is incorrect: an Eared Sandal does not have slits in the sole itself (unless it is secondary because the pre-straps broke off) and the pre-straps did not extend the entire circumference of the heel (this has been described only for one sandal, which is said to date to Middle Kingdom Meir and has its origin from abroad (Veldmeijer, 2013b) but see below on the date.

¹⁰⁵ The complicated cutting pattern of the Gebelein sandals, mentioned previously, stands far off from the simple Eared Sandals, see the discussion in Veldmeijer (2011c: 10-13).

¹⁰⁶ And there are no examples with other closure systems.

the Middle Kingdom, it is unclear when this shape started to be used. However, considering that footwear made of vegetal material became more distinctly shaped in the Middle Kingdom (see above), this might also have been the case for leather sandals.

In the New Kingdom, sandals were often fairly slender and pointed rather than delicately rounded, as seems to have been the case earlier. As with sandals of vegetal materials, the toes of leather Composite Sandals, which are clearly linked to Eared Sandals since they have the integrally cut pre-strap in common, increased in length during the later New Kingdom. Yet they never, unlike in sandals made from vegetal materials,¹⁰⁷ extended all the way back and attached to the back strap: none of the examples with extended toes showed any signs of attachment.¹⁰⁸ Nor did such a development of the toe occur in the single sole Eared Sandals. The toe of these could be rounded or, less frequently, pointed, but the pointed toe was far more common when more sole layers were added. In other words, this extended toe is a development found on the more fancy and expensive types of sandals (*i.e.* those with multiple sole layers), and therefore seems to be a fashion trend, just as the extension of the toe in sandals and shoes of vegetal material was.

The first step in the development of these fancier sandals just seems to have been the addition of sole layers, which were secured with stitching. At this stage, although the toes are pointed and began to increase slightly in length, they are still short, wide and bulky. Even though such sandals still occurred in the Ramesside period, more slender sandals started to appear over the course of the New Kingdom. The most popular were the leather Composite Sandals, which show, in addition to these features (slender, elongated, pointed toe), a 'new' technology: the sole layers were not joined with only stitching, but rather the sole layers were secured at the edge either by folding extra strips of leather over the edges, or by folding the edges of thin sole layers over the edges of the thicker subsequent sole layers. Moreover, for the first time, elaborate decoration, including the use of stained leather, is observed, also seen in the use of these strips and sole layers. However, there might be a much earlier precedent to this technique of securing the sole layers: in the Meir sandal, possibly dated to the Middle Kingdom, the sole layers include edge-strips too. Stitching in the fancy Composite Sandals is either done with flax or, more commonly, sinew. Leather thong is not used often in Pharaonic times, though the coarse Eared Sandals (Swayed Sole Type, Multi Sole Layer Variant) are an exception to this in sandals.¹⁰⁹

A sole construction can range from being relatively simple (with layers sewn along the edge and only including decorative strips, *e.g.* ÄM 20998 in the Ägyptisches Museum und Papyrussammlung, Berlin) to relatively complex (with a separate strip folded over the in- and midsole, an additional treadsole, stitching including appliqué strips, padding between the in- and midsole, *e.g.* ÄM 21680, also in the Ägyptisches Museum und Papyrussammlung, Berlin). Note that most of these sole constructions differ in detail, although general constructional features are often shared (especially the protection of the edge of the sole layers, either with

¹⁰⁷ This means that in imagery, if sandals are shown with an extended toe attached to the back strap, these are always the Sewn-Edge Plaited sandals (this, and which exact type and variant) will be discussed in the part of the AEFP focusing on the study of depictions.

¹⁰⁸ There is one exception: the Meir sandal, but this sandal has other unique features too (discussed below).

¹⁰⁹ It is also seen in the Pharaonic Stubbed-Toe Ankle shoes but these sole/upper constructions differ as well.

a separate strip or by folding the edge of the insole). Why the ancient Egyptians all of a sudden started to decorate some categories of sandals and shoes with appliqué and colour in the New Kingdom – although, seemingly, they did not do this before – is unclear. Yet overall, the increasing wealth of the society must have played an important role. In at least one example, EA 36200 in the British Museum, London, the cut out winged cobra of the straps suggests that adding imagery was not for aesthetics only. The fact that royal footwear is elaborately decorated with a plethora of techniques seems to support the suggestion af the aesthetics, but part of the decoration of the footwear that was found in the tomb of Tutankhamun may have had also a more symbolic meaning.¹¹⁰

The increased use of leather is, at least partially, due to foreign influences. The introduction of the chariot by the Hyksos in the Second Intermediate Period must have had a great stimulus on the Egyptian leather industry, since so much leather and rawhide is used in the production of these vehicles. Red may have been a much used colour for chariots,¹¹¹ likely conveying a sense of danger and aggression, and this might have been one reason why this colour became so popular in leather in general, but the ease of both the production of the red colour, as well as the ease of colouring leather red, seems to have been an important factor too.¹¹²

A remarkable development, also seen in footwear for the higher echelons of society, is the padding of the sole (typically between the insole and midsole) to enhance comfort. This padding could be done with vegetal material or hair and is identified in several Composite Sandals. It is also seen in the open shoes that we know from the tomb of Tutankhamun (Carter's Number 021f, g & 021k, l), which is a strong indication that these shoes, despite the gold sheet sole layers, were actually worn.

Shape

"The occurrence of open shoes outside Egypt, more specifically Asia Minor, [has] led to the suggestion that this type of footwear was introduced in Egypt by these foreign visitors, probably in the Middle Kingdom, as were so many other technologies and innovations.^[113] The Egyptians took over the idea of an open shoe but refused to take over the foreign layout of the straps and combined it with their own straps which they predominantly used in sandals: a front strap, attached to a back strap and no foot strap or toe band" (Veldmeijer, 2016a: 24). An additional argument is that the environmental circumstances in large parts of Egypt did not require the better protection of the feet provided by uppers

¹¹⁰ See chapter 'Symbolism and Status' below.

¹¹¹ The Tano chariot's leather is predominantly red. Since this leather might be a mass product, it is reasonable to assume many chariots were similarly coloured (Veldmeijer & Ikram, 2018).

¹¹² Such a theory is preliminary, and pending the results of the aforementioned research on skin processing, but red colour easily penetrates the leather; green, for example, did not and remained mainly stuck on top of the leather (Veldmeijer *et al.*, 2013: 264-265).

¹¹³ Van Driel-Murray (2000: 316) warns that "to link the arrival of shoes in Egypt with the pointed boots worn by their Hittite rivals in the late New Kingdom [...] would require considerably better dating the Egyptian finds, as well as comparative material from the Levant". If by 'Egyptian finds' she means the Curled-Toe Ankle Shoes, then dating is known for several of them, placing them in the later New Kingdom. Although a development from sandal to closed shoe is certainly a possibility, this does not mean, as is argued in the present work, that (other types) of shoes did not arrive with foreigners. Indeed, a development from sandal to Curled-Toe Ankle shoe, based on the Egyptian material, seems less likely if one looks at the complicated cutting pattern (although the sole/upper construction clearly has parallels in leather Composite Sandals).

(although conditions in the Delta region differed considerably from those in the southern regions). This is supported by the fact that sandals continued to be the most frequently worn type of footwear, which, arguably, would have not been the case if better protection had been required. Adopting the idea seems, therefore, to have been initiated by status or fashion rather than anything else.¹¹⁴

Footwear Made of Vegetal Materials (Figure 8)

The straight shape of the earliest Sewn Sandals compares well with the sole seen in Coiled Sewn Sandals. But of the many examples of this Sewn Sandal Type A, the shape could be much more pronounced, and true swayed soles are identified as well. Over time – and this change must have begun already in the Predynastic period or at least not later than early Dynastic times (judging by the swayed soles depicted on the Narmer Palette)¹¹⁵ – in general, the soles in sandals became more shaped. There is, however, no indication that there was any relation between straight and swayed soles as both were continued to be used. The shape of swayed soles, however, could differ, and it was not until the Middle Kingdom that highly swayed sandals became common (this shape was also often seen in the wooden tomb sandals from this time). Also within the Sewn Sandals, a swayed shape typical for the Middle Kingdom is noted.

Although there are indications that toes on sandals continued to extend in length from the early to late New Kingdom,¹¹⁶ the toes in Sewn Sandals never extended that far – they got a bit pointed at the most. Sewn sandals seem to have disappeared fairly suddenly in the late New Kingdom.¹¹⁷ In Sewn-Edge Plaited sandals (as well as the open shoes based on them), initially, during the later 18th or perhaps early 19th Dynasty, the toe grew fairly gradually in width and length, but in the later New Kingdom (although seen first in the 19th Dynasty) the toe extended as far back as the back straps. Probably in the 20th Dynasty the extension became consistent in its narrow width from the point at the sole where it started to the back strap, although initially it gradually tapered. This extension seems to be purely a fashion trend, thus raising the question: why did the toe in Sewn Sandals never extend in the same way?¹¹⁸ The answer should be sought in the importance of Sewn Sandals: Sewn Sandals of the C-Type were social markers and were only worn by a small segment of society (the royal family and high

¹¹⁴ This is also probably the reason why the ancient Egyptians did not invent a way to make skins water resistant (vegetable tanning): rubbing oil into the skin protected it sufficiently from deterioration – the oil would not have washed out in the rain, since there was nearly any rain.

¹¹⁵ Archaeologically much more difficult to prove due to the poor archaeological record, but the Gebelein sandal is swayed.

¹¹⁶ Eventually leading to the attachment of the toe to the back straps at the top of the foot all the way back to the ankle, see below.

¹¹⁷ Probably during the 20th Dynasty, at which times royals were still depicted wearing Sewn Sandals. Archaeologically, there seem to be no examples from later times. Moreover, where the golden sandals of Tutankhamun were imitations of Sewn Sandals, the sandals found in Tanis (Psusennes and Shoshenq) are imitations of other types of sandals. Note that Lilyquest (2003: 133) suggests that the sandals are 18th Dynasty heirlooms; the gold sandals are based on leather Composite Sandals (esp. identified by the straps) so that would be possible. The study of imagery, however, might provide more insight.

¹¹⁸ There is, however, one example with an extended toe (EA 4456, housed in the British Museum, London) but although the sole is sewn, it is only partially so, and the rest of the sole is made in a different technique (plaiting and weaving).



Figure 8. Development of shape in footwear made of vegetal materials. Images courtesy BM, MSA/CM/EgCa, MEgT, NMAL, SAIUH. Dashed lines indicate possible relationships.

officials who were personally awarded with them by the king), thereby perhaps rendering them less prone to fashion trends.

In Qasr Ibrim during Christian and Ottoman times, a common type of footwear was the Plain Plaited sandal, which is an interesting as well as puzzling style of very simple, but efficient sandal, and which, strangely enough, is not known from earlier times.¹¹⁹ Its origin is obscure but lies to the south of Egypt. This category of sandals is known from several other Nubian settlements (albeit in much smaller quantities) including Gebel Adda and Kulubnarti, but not from more northerly sites. It thus seems to be a sandal that was preferred by the Nubians, and other people from the African continent, rather than the Ottomans (since if this latter group did in fact preferred them, one would expect to find them elsewhere in Egypt). Moreover, we know that the southern neighbours of Egypt preferred the double front strap (as opposed to the Egyptians, who only had sandal with a single front strap) and Plain Plaited sandals (as well as the closely related Leather or String Reinforced Plaited sandals) are all equipped with such a double front strap. Over the years, Plain Plaited sandals do not seem to have changed in shape.

Vegetal open shoes with a partial upper (entirely closed shoes of vegetal material were not worn in ancient Egypt) might have been found in Egypt first during the Second Intermediate Period. The archaeological record has a fair number of undated examples, but the link with common types of sandals (open shoes with a partial upper are nothing more than sandals – of the Sewn-Edge Plaited style – onto which a low upper was secured along the edge) indicates such a date. This type of open shoe leaves the front part open, which is more or less closed by the slightly upturned tip of the toe. In due course, as seen with the sandals on which the shoes were based, the toe became longer, and during the late New Kingdom the tip reached the back straps. The upper, however, remained generally the same, although it could gain a bit in height. Why the upper in vegetal open shoes remained low, even in the later ones with a flexible upper, and never turned into an entirely closed upper, is unclear - the material itself would have been suitable to do so.¹²⁰ It is tempting to suggest that the open shoes with a full upper (Flexible Upper; in these, the front part is not left open but rather the upper continues around the entire perimeter of the sole), of which so many examples have been found in Qasr Ibrim, evolved from the older Full, Upright Upper type of open shoes (these also have an upper that continues around the entire perimeter of the sole), rather than from the Partial Upper type. The dating of these Full Upright Upper type of open shoes, however, is problematic, but those that have been dated are thought to be from the Ptolemaic or Roman times. Shoes with full flexible uppers are, by contrast, exceptionally well dated and do not occur before the 3rd c. AD. A more convincing argument to reject a direct relationship is that open shoes with Flexible Uppers have soles made with techniques that were used in sandals of post-Pharaonic date as well (woven string, plain plaited soles) or specially made plaited soles of unspun palm leaf sheath. The sole in the Upright Upper shoes, however, is clearly based on the Sewn-Edge sandals,¹²¹ and

¹¹⁹ See above with section 'Footwear Made of Vegetal Materials' in chapter 'Diachronic Change in Technology'.

¹²⁰ Examples from elsewhere are boots (Japan: S82.0118), shoes (China: P06-0027, p86-0252; Germany: S98-0019) and mules (Ainu: 82-0159) in the collection of the Bata Shoe Museum, Toronto. With thanks to Elizabeth Semmelhack.

¹²¹ But might have an additional woven treadsole.

thus fit much better in the Pharaonic tradition. However, the majority are based on Type D of the Sewn-Edge sandal – if dated, they are dated to the Late Period. The dating of the Full Upright Upper shoes to post-Pharaonic times, thus, can be challenged.

A minor difference between the shoes with a full flexible upper and those with a full upright upper is that the upper is bent at the dorsal surface of the insole and stitched on in the former. In the latter, the sturdy, stiff upper is sewn with its edge resting on the insole.¹²² This different way of attaching the upper is due to the (in) flexibility of the upper in the full upright upper shoes and possibly also because the thick reinforced sewn edge was too uncomfortable to be resting on the sole. The upper in the Flexible Upper variant of open shoes was meant to cover a larger part of the dorsal surface of the foot.

Footwear Made of Leather (Figure 9)

The development from sandal to shoe that is seen in sandals which are made of vegetal material is seen in leather footwear as well: an upper was added to the pointed types of Eared Sandals and to the fancy Composite Sandals. The number of examples of such leather footwear is far less than those of vegetal material. Moreover, the development of vegetal footwear, after the initial form was established, remained fairly stagnant until the 3rd c. AD, when the flexible upper was introduced - the only development over time, as explained above, was the extension of the toe. By contrast, the development of leather footwear shows more complexity, with various technological features (such as the pre-strap woven through the upper, and the use of drawstrings) as well as shape (including the extension of the upper) evolving over time. For example, the open shoe that is housed in the Egyptian Museum, Cairo (JE 48362/48363) is based on the pointed leather Eared Sandals: the pointed front and constricted waist combined with the rather sizeable width (as opposed to the pointed Composite Sandals, which are much narrower) are clearly recognisable features. On the other hand, the shoe in the collection of the British Museum, London (EA 4391, discussed in more detail below) is based on the, technologically more complicated, leather Composite Sandal, including an upwards-curled front tip.¹²³

An interesting feature of the leather open shoe is that the upper is so large that it could have (almost) covered the dorsal surface of the foot entirely. In the Cairo example, the sides are even held together over the foot (leaving only a small strip of the foot bare) by means of a unique closing system – exactly how this worked remains uncertain as it is damaged. Looking at the open shoes that were recovered from the tomb of Tutankhamun (Carter's Numbers 021f, g, 021k, l and 270a), the upper is much lower and is, in its extension, much more comparable to that seen in the open shoes made of vegetal material. These are the only examples of leather shoes¹²⁴ with such low uppers. If such low uppers ever existed in other leather open shoes, they must have been used much earlier and transformed quickly into

¹²² Also seen in the Partial Upper shoes.

¹²³ This distinction was not previously noted by the AEFP.

¹²⁴ The leather uppers have bead decoration on the outside (Carter's number 0201f, g and 021 k, l) or are elaborately enhanced with gold bosses (Carter's number 270a) – thus they consist not *only* of leather.



Figure 9. Development of shape in footwear made of leather. Images courtesy of ASH, BM, MSA/EgCa, DAI (Dra Abu el-Naga). Dashed lines indicate possible relationships.

those with larger uppers,¹²⁵ and finally into closed shoes. If this is what happened, the fancy open shoes from Tutankhamun's tomb go back to older models. On these shoes the uppers are secured over the foot with a closing system, keeping the uppers in place alongside the foot rather than pulling the upper itself over the foot (which was not possible due to their limited height). In case of Carter's Number 021k, l, an area of the foot was covered with semi-circular panels on either side, but the openwork character of these panels did not really protect the dorsal side of the foot and they should thus be seen to be a elaborate closing system instead (which, surely, was its primary function). A find from 27th Dynasty Elephantine (el-097b; Kuckertz, 2006: 124-125; Veldmeijer, 2016a: 112-113) is an exception to the rule that the upper had to be large. In this example, the upper is clearly the backpart of a leather open shoe; it is fairly short and (judging from the length of the strap that runs over the outer side of the upper and over the instep edge towards the front¹²⁶) would have covered little more than the heel of the foot proper.¹²⁷ This is not a model of open shoe known from anywhere else in Egypt. Thus, rather than starting with a short upper which would enclose only the heel (as in the Elephantine example), the ancient Egyptian open shoe always had an upper that ran far forward towards the tip of the shoe, possibly suggesting a different origin than the Persian shoe.

It might be assumed that closed shoes replaced open shoes, but this was not the case: open shoes remained the most popular category of shoes. Even in post-Pharaonic times open shoes were used.¹²⁸

Thus, the sole (and the way these were secured in case of the Composite Sandals) of the leather open shoes clearly link them to two types of leather sandals, but additional evidence that the origin of leather open shoes is based on sandals is the fact that they combine the sandal's straps, including the integrally cut prestrap, with the upper.¹²⁹ On open shoes made of vegetal material, the straps run from the attachment to the sole, over the outside of the upper, inwards over the upper's edge, and towards the front strap. A comparable construction is seen in the pair of leather open shoes in the Egyptian Museum, Cairo (JE 48362/48363). However, in this example, the back straps, which pass through the pre-strap that stands up straight against the outer side of the upper, are pulled through slits in the upper before the attachment to the front strap. In one type of Stubbed-Toe Ankle shoe (the Eared type), the integrally cut pre-strap is even woven through the upper, thus supporting it (this is possible since the pre-strap is fairly stiff due to the thickness of the sole layers). In some examples this interwoven pre-strap is combined with a drawstring laced through the upper (usually through a few slits close to the instep edge of the upper), but there are also Stubbed-Toe Low Ankle shoes without such a drawstring. In all cases the upper is entirely closed. Another type of the Stubbed-Toe Ankle Shoe (the Plain Type) has no pre-strap or drawstring - instead, the instep is closed by a short piece of what might be called 'lace'. Lastly, there are examples of closed shoes, dated to the 27th Dynasty and

¹²⁵ Judging by the dearth of them in the archaeological record from the New Kingdom onwards, when footwear became so much more common.

¹²⁶ Note the coil that is used as a spacer (discussed below).

¹²⁷ There are many examples in contemporary imagery (*e.g.* Kuckertz, 2006: 147-152) from outside Egypt.

¹²⁸ Made of vegetal materials. Although these are quite different in appearance, as they do not have partial uppers, but rather, as explained above, the upper runs around the entire perimeter of the sole.

¹²⁹ Even in the fancy, highly embellished shoes from the tomb of Tutankhamun.

seeming to have a Persian origin, that also have drawstrings, often used in pairs. These, however, are only added to enhance the appearance of the shoe, and they are not functional. These shoes are isolated finds and have no ostensible influence on the technology used for Egyptian footwear. A next step from sandal to closed shoe seems to be the abandonment of pre-straps altogether: in a rare example, which is housed in the British Museum, London (EA 4391), a drawstring runs around the upper, shortly below the instep edge but is still connected to a front strap. Although the upper is not entirely closed, it is already much higher and the shape is reminiscent of a Curled-Toe Ankle shoe (see below). The shape of EA 4391 and the closed Curled-Toe Ankle shoes are remarkably similar, and a link would not be unthinkable. However, the type of open shoe in the British Museum, London is the single representative of that type, which makes such a statement tentative at best. Moreover, the Curled-Toe Ankle shoe were fairly popular for a short period of time in the New Kingdom,¹³⁰ which was seemingly not the case of the type of open shoe represented by EA 4391. Finally, there are many more differences in technological features (curled toe, instep flap, sole/upper construction¹³¹).

There are also other examples of shoes without pre-straps – these do not have front straps either¹³² – but still a drawstring is pulled through the upper, shortly below its instep edge. Although at this point they are elements themselves, and not connected to pre- and/or front straps, they are not yet true laces¹³³: the drawstrings held the left and right part closed in only a fairly loose fashion. In several examples, however, these could be pulled tight and tied in front of the instep (*e.g.* EA 4415¹³⁴ in the British Museum, London¹³⁵), moving this system of closure a step closer to proper laces. Also on the technologically advanced leather Curled-Toe Ankle shoe, with its complicated cutting pattern and turnshoe technology (see below),¹³⁶ a drawstring is woven through the upper, which was simply secured with a knot pulled through a slit over the instep (toggle closure) to loosely keep the two sides together (with a triangular instep flap covering it). True laces are not seen in Egypt before recent times: even the Ottoman shoes from Qasr Ibrim are slip-on shoes. To the best of knowledge, the shoes that are referred to as 'Coptic' or 'Christian' were also slip-on.

A noteable exception to the slip-on shoes are the Ptolemaic shoes (116/117, 118, 119A & B) that were found in the temple of Amenhotep II in Luxor. These so-called Tailed-Toggle Ankle Shoes are closed by means of extensions on one side of the instep, which are pulled through slits in the opposite side of the instep; knots tied in the first extensions prevent them from slipping back through the

¹³⁰ See the update in chapter 'Description', 'Footwear Made of Leather', 'Shoes', Curled-Toe Ankle Shoes' for additional specimens.

¹³¹ The sole/upper construction seems at first sight fairly comparable, but the open shoe is not a turnshoe technique, whereas the Curled-Toe Ankle Shoe is, see above.

¹³² Plain Stubbed-Toe Ankle Shoes.

¹³³ But in this respect it differed from the earlier drawstring, which was still part of a sandal's strap complex (and which can thus still be seen as a sandal strap).

¹³⁴ As well as BM EA 4413 and 4414.

¹³⁵ Images of this are in the section 'Leather Open Shoes' in the chapter 'Description'; a second example, which matches the British Museum example so closely that together they might have been a pair, is housed in the Coptic Museum in Cairo, but since it has no number, it is not included in the system of the Museum and therefore, unfortunately, could not be included in the footwear catalogue of that Museum.

¹³⁶ The oldest example of this technique in the world.

slits.¹³⁷ Although the use of multiple toggles simultaneously to close the instep is unknown in ancient Egypt, toggle closures were already used years before, as indicated by finds from the tomb of Tutankhamun (Carter's Number 270a and 021k, l), which are the earliest examples of such closures in shoes.¹³⁸ The closing system in the open shoe in the collection of the Egyptian Museum in Cairo (JE 48362/48363), mentioned above, is incomplete and thus it remains uncertain whether or not this is a toggle closure. Yet the fact that the two stubs are directed towards each other at the right instep edge perhaps suggests that these were knotted, with the bulky knot (now lost) being pulled through the loop at the left side in order to close the sides over the foot. Finally, at least one example of the aforementioned Persian finds (el-097R) has a toggle closure to close the instep of this closed shoe. These examples suggest that the toggle closure was an acceptable way of closing shoes,¹³⁹ but never became popular in Pharaonic Egypt.

(Long) curled toes, made from the same piece of leather as the sole (in other words, they were extended fronts of the sole of the sandal or shoe), became very popular in later New Kingdom shoes. In Curled-Toe Ankle shoes, the curled toe was not integrally cut from the sole's leather, but instead a separate element that was sewn to the sole. This feature appears suddenly in the 18th Dynasty on a Curled-Toe Ankle Shoe from Deir el-Medinah: no predecessor has been recognised and so no intermediate constructions that would have led to the independent curled toe in the aforementioned shoe can be identified. However, one extraordinary sandal from Meir shows a separate curled-toe element that equals those in the Curled-Toe Ankle Shoe closely. According to the Journal d'Entrée, the sandal is dated to the 12th Dynasty, but this date has been questioned and, considering the well established dates of the shoes with the same kind of toe, it is more likely the sandal is of more recent date. The Meir sandal is not only unique in being the only example of a sandal with such an extended toe (which is attached the to back strap), but also because of the loosely hanging side flaps, which have no parallels in ancient Egypt.¹⁴⁰ This strongly suggests that the technique of the extended toe was brought in from elsewhere. In addition to these novel characteristics, the prestraps of the Meir sandal are cut from the heel's circumference. This technique is know from the earliest times of Egypt's history, the Predynastic period (Van Driel-Murray, 2000: 312), but it is not common even then, and certainly is not seen in later Pharaonic footwear. The cladding of these pre-straps and the construction of the sole layers compare well with other sandals from ancient Egypt, but since these features do not appear until the New Kingdom, they can be seen as an indication that the Meir sandal should not be dated to the 12th Dynasty, but rather to the early 18th Dynasty or late 17th Dynasty.¹⁴¹ The extended toe in Curled-Toe Ankle shoes can be seen as an enhancement but these shoes were embellished in various ways. An early example of the Curled-Toe Ankle shoe, the aforementioned 18th Dynasty shoe from Deir el-Medinah, has small tear-shaped appliqué on the side

¹³⁷ This is a more 'traditional' toggle closure in footwear, as is so often seen in Medieval European footwear (Goubitz *et al.*, 2001: various but esp. 201-208).

¹³⁸ Although toggles of various kind were already used in leatherwork (Veldmeijer & Ikram, 2018: 104-105) prior to the footwear from the tomb of Tutankhamun. However, the origin has yet to be established (see Veldmeijer, 2011e; 333; 2016a: 25-26; 2017b: 63-65).

¹³⁹ As also suggested by the finds from much later Medieval Europe (e.g. Goubitz et al., 2001).

¹⁴⁰ Which is seen in footwear from for example Pakistan (Personal Communication Salima Ikram 2017).

¹⁴¹ The early date due to the shoe in the Offenbach Museum, see chapter 'Description'.

and back, similar to the decoration on the shoe in the German Leather Museum in Offenbach (6.70.35), and the examples in the Vänersborgs Museum in Sweden (08053a and 08055). The provenance of all of these are, however, unknown and hence the question is unanswered as to why it is dated as it is; a date to the second half of the 18th Dynasty is perhaps more likely, given the similarity to the aforementioned Deir el-Medinah shoe. All Curled-Toe Ankle Shoes that are dated to the 21st Dynasty have much larger appliqués at the same spots, which are more rounded in shape and overlap the sole seam as well as the seam between the two parts that make up the upper.

The arrival of the Romans changed footwear distinctly and a clear break with earlier traditions can be seen. The Romans brought their own types of (military) shoes and sandals from Europe (see also *e.g.* Van Driel-Murray, 2009: 490; *cf.* Leguilloux, 2006; Veldmeijer & Ikram, 2014: 63-81),¹⁴² including the famous nailed-sole shoes. They also introduced new technologies to Egypt: vegetable tanning of skin¹⁴³ and the use of the independent pre-straps on sandals.¹⁴⁴ When the typical Roman military footwear disappeared, the traditional Pharaonic footwear did not return; instead, the leather sandals with independent pre-straps increased in importance, as did leather shoes in general. A curious development, however, is seen in Meroitic times: sandals were made with large integrally cut pre-straps at the heel's edge. It is likely that this custom came up from further south, but the lack of research on the archaeology of the more southern regions of Africa¹⁴⁵ in these and even earlier times prohibits any well-founded conclusion.¹⁴⁶

¹⁴² Some of the best examples of Roman footwear have, actually, been found in Egypt (*e.g.* Veldmeijer & Ikram, 2014: 63-81).

¹⁴³ However, the suggestion by Van Driel-Murray (2000: 304-305) is based on fairly meagre evidence, not the least because of the lack of chemical analyses (as mentioned by Van Driel-Murray first thing herself; see also above). Claims have been made that vegetable tanning was a technology already used in Pharaonic times (Elnaggar *et al.*, 2016) but although this is based on chemical analysis, problems have been noted (Veldmeijer & Skinner, In Press). Questions have been raised if the loincloths that were introduced by the Nubian people show their unique features due to vegetable tanning, but the tests on two loincloths in the British Museum, London were ambiguous.

¹⁴⁴ We can tell that the idea of an independent pre-strap was noted by the Egyptian people, since the integrally cut pre-strap in sandals (as seen in Pharaonic Egypt) was not used anymore and was replaced by the independent pre-strap. However, for whatever reason, it was not used in the same way as the Romans used it: instead of letting the pre-strap emerge from the edge of the sole, cuts were made in the insole through which the pre-strap was pulled (see Veldmeijer, 2011b: 38-39). Van Driel-Murray (2000: 315) mentions that "In the Roman period, pointed sandals again become fashionable" but these differ from Pharaonic examples in the type of leather (cured/leathered vs. tanned) and the cutting pattern (eared vs. independent pre-strap). As shown, pointed leather sandals were also known before the Romans.

¹⁴⁵ Personal Observation; Personal Communication Elizabeth Semmelhack 2017.

¹⁴⁶ Note that sandals with integrally cut pre-straps were still used in *e.g.* Ethiopia some years ago (and probably still are) (Epple, 2008).

Sandals and open shoes of vegetal material were still used in the Byzantine period, but leather became much more important, and in the Arab and Ottoman Periods it was the main material for footwear. The Byzantine and Arab periods¹⁴⁷ saw an increase in types of footwear, such as boots and low-cut shoes, and in the variety of techniques used to decorate footwear, including gilding, embroidery and elaborate designs of stamping and impressing.¹⁴⁸ Several types of Ottoman shoes (and some extraordinary sandals, as well as the wooden pattens), which we mainly know from Qasr Ibrim,¹⁴⁹ can be clearly separated from Egyptian footwear – not as much because of their technology, but rather because of their shapes.¹⁵⁰

¹⁴⁷ Extraordinary examples of sandals from Fustat are without parallels in the Egyptian archaeological record. These sandals, of which 9370/1 is the most complete one, "are extraordinary because of their shape [...], form of straps, as well as the elaborate decoration on the sole and decorative way of securing the sole layers. The shape of its heel is best described as semi-oval, after which, towards the front, there is a distinct constriction of width. This is followed, at either side, by a protruding, roughly triangular part that is, in turn, followed by again a distinct constriction of width. The front part of the sandal starts with an abrupt increase in width: it is nearly rectangular but the lateral edge curves more gently at the front as opposed to the medial edge, which continues nearly straight towards the big toe area. This results in a swayed sole that indicates for which foot the sandal was meant." (Veldmeijer, In Press b). The shape reminds one of the odd footwear from the Ashanti (Ghana, West Africa; Personal Observation Bata Shoe Museum 2017), which, among many other shapes, could also be made in the shape of a person. Although perhaps not as clearly recognisable, with a bit imagination, a stylized person could be seen in the Fustat sandals as well. However, it would extend the tradition of such extraordinarily-shaped sandals back by several centuries (9th/10th c. AD for Fustat [note that the publication is forthcoming, so exact dates are not possible to give yet] versus 20th c. AD) and a link seems unlikely.

¹⁴⁸ Smalley (2012) made an attempt to use decoration for dating, which was only partially successful. More work on this, as on post-Pharaonic footwear in general, is needed.

¹⁴⁹ Isolated finds are known from Gebel Adda and Dra Abu el-Naga (Veldmeijer, 2012b: 153-156; 2016c: 229-239; 2017a: 53-55, 116-118).

¹⁵⁰ Although the emphasis of the present work is on Pharaonic footwear, the opportunity is taken here to mention that the extraordinary multi-layer sandal on stilts (Veldmeijer, 2012b: 64) is possibly of Nubian origin rather than an Ottoman leather alternative to the wooden bath clog: several extreme multi-layer sandals in the collection of the Bata Shoe Museum, Toronto compare well with the examples published from Qasr Ibrim, despite the large difference in shape (Personal Observation 2017).

Distribution

Vegetal:

Leather or String Reinforced Plaited Sandals: 2009h: 111. Plain Plaited Sandals: 2009i: 131. Sewn Sandals: 2009d: 569-570; 2010f: 19-34. Coiled Sandals: 2009g: 109-110; 2011a: 126; 2007a: 71-73. Composite Sandals: 2013c: 98-99. Sewn-Edge Plaited Sandals: 2010d: 89. Fibre Open Shoes: 2010b: 303-305; 2009f: 107-108.

Leather:

Eared Sandals: 2011c: 13-14. Composite Sandals: 2009a: 21-22. Side-Covering Sandals: 2013b: 57-58. Open Shoes: 2009j: 6. Curled-Toe Ankle Shoes: 2009c: 16-17. Stubbed-Toe Ankle Shoes: 2013a: 69-71. Tailed-Toggle Shoes: 2011e: 333-334.

Wood: Pattens: 2008: 151-152.

Objects from museum collections, save the exceptions mentioned previously, are not really helpful in comparing footwear from different areas of Egypt.¹⁵¹ Finds by excavations, although not without problems (the Amarna material from the German excavations is a good example), are generally much more helpful. However, utilitarian footwear is usually made of organic materials, which do not preserve well in large parts of the country and thus there is a bias against the sites from, for example, the Delta (due to its high humidity levels). Surely, the inhabitants of Qantir and Buto, to name but two, wore sandals and shoes, but the archaeological record does not show it.¹⁵² Still, several categories of footwear – based on the few specimens in collections with reliable provenance, as well as the material that was studied at site (Amarna [New Kingdom], Qasr Ibrim [Ottoman], and Fustat [Islamic Period]) give us a glimpse into the distribution.

The footwear finds from settlement sites show that they are, to a certain extent, unique for each site (but note that, in order to know how specific this distinctiveness of style was, more material from contemporary layers from other settlement sites would be needed to compare with the finds we have thus far). Still, there are indications that some categories of footwear was worn throughout the country. Sewn Sandals are known from Thebes, Nubia (although thus far only from pictorial evidence, Wendrich, 2000: 266) and the Fayum. Composite sandals are known from the Fayum, Thebes and Kharga, and a pair found *in situ* comes from Gebelein. Finds of Sewn-Edge Plaited sandals are known from Qasr Ibrim, Thebes, Asyut, Amarna, Fayum and Saqqara – but it should be noted that this category of sandals is quite varied and that some types are clearly New Kingdom and others Late Period. The post-Pharaonic Plain-Plaited Sandals, as well as the Leather-Reinforced Plaited Sandals, are mainly known from sites far south, such as Qasr Ibrim and Gebel Adda. The few provenanced open shoes

¹⁵¹ See above on the problems of museum collections.

¹⁵² Evidence of leatherworking industry, mainly ceramic tools, in Qantir (Raedler, 2007) is linked to chariotry, but imagery of leatherworking suggests that the craftsmen responsible for chariot related leather, might also have manufactured sandals (Raedler, 2007: esp. 51-53; see *e.g.* Davies, 1943: LII-LIV).

also show a wide distribution, and the types with a partial upper are known from Thebes and the Fayum. The Full, Upright Upper examples of vegetal open shoes are known from Elephantine and Saqqara. The post-Pharaonic Full, Flexible Upper shoes, however, are mainly known from Qasr Ibrim and from several finds in the Kharga and Dahkla Oases. Leather Eared Sandals are registered from as far south as Qustul, Adindan and Qasr Ibrim,¹⁵³ while finds from places north of Thebes (with Amarna as a notable exception) are few.¹⁵⁴

Amarna is a good example of a site where sandals have been found that are nearly unique to a specific place. The sandals from Amarna that have an overall, inward curvature are known from other sites, but are not common at any site aside from Amarna. An even better example of sandals that seem to have been common in Amarna but rare outside are the Leather Eared Sandals with multiple sole layers and without any decoration.¹⁵⁵ Amarna also demonstrates once again how biased the archaeological record can be and the pitfalls this can cause in interpretation: the condition for preservation of organic material is fairly good, judging by the relatively large quantities of, for example, basketry (Wendrich, 1989; 1999).¹⁵⁶ However, only three vegetal sandals are known to date from here,¹⁵⁷ contrasting with the much larger number of preserved leather footwear objects. This suggests that vegetal footwear was not common: how can we explain the difference otherwise? That this distribution reflects the reality of use, however, seems unlikely since Tutankhamun as well as Yuya and Tjuiu had substantial numbers of vegetal footwear stored in their tombs (Sewn Sandals). Moreover just to make one exception to the rule of not looking at imagery here - Akhnaton and his family, as well as numerous officials, can been seen wearing Sewn Sandals, suggesting they were just as common in Amarna as elsewhere.¹⁵⁸

Fancy Leather Composite Sandals, except one from Gurob, are exclusive to the Theban area, which can be explained by the fact that they, as far as we know, have only been excavated from tombs of the elites. Some small fragments from Amarna, however, suggest that these sandals were worn there too.

It is not possible to say anything about the distribution of leather open shoes, with the exception of the examples from the tomb of Tutankhamun, since the described examples are unprovenanced. This contrasts distinctly with what we know about the distribution of the closed shoes, especially the Curled-Toe Ankle Shoes. All provenanced examples, except for one shoe from Abydos, come from Thebes, and they are exclusively found in tombs. Stubbed-Toe Ankle shoes are known from Thebes but possibly also from Akhmim and one example from Elephantine was registered.

¹⁵³ These are almost exclusively Nubian Eared Sandals.

¹⁵⁴ But note the remarks by Veldmeijer (2011c) on the scanty archaeological record of particularly these sandals.

¹⁵⁵ See Veldmeijer (2011c: 12) for the updated typology.

¹⁵⁶ Conditions were less favourable for textiles (Kemp & Vogelsang-Eastwood, 2001) and leather (Veldmeijer, 2010e; 2010g), but still a fair amount has been left for the archaeologists to study.

¹⁵⁷ Only one (Petrie Museum of Egyptian Archaeology UCL) of which has been studied; the pair in the Rosicrucian Museum remained inaccessible.

¹⁵⁸ The small fragment from the tomb of Horemheb supports such a conclusion (Veldmeijer, In Press a).

Production¹⁵⁹

Vegetal: Leather or String Reinforced Plaited Sandals: 2009h: 110-111 Sewn Sandals: 2009d: 567-568 Coiled Sandals: 2009g: 88 Fibre Open Shoes: 2010b: 303; 2009f: 104

Leather: Composite Sandals: 2009a: 20 Side-Covering Sandals: 2013b: 55-56 Open Shoes: 2009b: 239. Curled-Toe Ankle Shoes: 2009c: 14-16

Various: Tutankhamun: 2010f (45-47); Ogden, 2010: 151-164 (specifically the metal parts) Deir el-Bachit: 2011d: 16-38

The manufacture of footwear in general cannot possibly be summarized here, as the processes of crafting different types of footwear are just too varied. The reader should, therefore, consult the descriptions of the different categories for their technological specifics and interpretations. Here, the focus is on workshops, tools and craftsmen.¹⁶⁰

Tanneries, Workshops and Craftsmen

The study of the artefacts, *i.e.* sandals, shoes and other footwear, produces only very little information about tanneries, workshops, the tools that were used,¹⁶¹ the craftsmen themselves, or the organisation of the work; rather, imagery and texts seem to be the main source of information. However, even these records can be of limited use, as the production of vegetal footwear is not shown in two- or three-dimensional art – although sandals made of vegetal materials are shown in leather workshops (shoes, neither open nor closed, are depicted at all).¹⁶² One area of production that we do have evidence for in the archaeological record is skin processing. This is suggested at Qantir by the large number of pottery tools (made of recycled sherds) that could have been used in leatherworking (Raedler, 2007),¹⁶³ as well as meat-jars, which might have contained oil for curing/leathering. Large quantities of leather would have been needed for chariotry,¹⁶⁴ and this site seems

¹⁵⁹ The construction, which is described in the chapter 'Description' is, of course, the result of the production. However, provided here is more specific information, which informs on the work of the craftsman, such as the sequence of putting the objects together.

¹⁶⁰ As throughout the entire work, focus lies on the archaeological evidence; imagery and texts will be dealt with in the future. Schwarz's (2000) excellent work is the best and most complete source to consult, in particular because she also includes artefacts in her discussion.

¹⁶¹ There are rare examples where a certain type of tool can be identified from the leather, such as a beveller.

¹⁶² Remarkably, in Meroitic times, open shoes, which are not unlike the ones known from the tomb of Tutankhamun, are depicted (for an example, see Pyke, 2007: 49-50).

¹⁶³ However, Readler (2007: 46) does not rule out other applications.

¹⁶⁴ It has been estimated that at any given time in the New Kingdom, no less than a few thousand chariots were present (Sandor, 2004: 158), all of which needed leather but also had to be maintained with new leather when the used parts were worn down or broken. Therefore, a relatively large leather industry can be assumed for Amarna as well, judging by the role chariotry played in Akhenaton's time.

to have been the place where skins were processed into leather.¹⁶⁵ It does seem to have been used for skin processing only: the absence of tools for the production of objects of leather suggests that this was done elsewhere.

Gebelein has been identified as a predynastic tannery because of the goatskins and the large quantity of acacia pods found there. However, Van Driel-Murray (2000: 305-306) explains that "although such pods are still used today in local tanning industries, acacia also has many other uses (see Germer 1985), so the presence of pods and leaves alone does not automatically indicate that vegetable tanning was being practiced."¹⁶⁶ Moreover, that acacia pods are still being used nowadays does not necessarily mean that they were used for tanning in ancient times – their use for this purpose can only be confidently asserted if the tannins from these pods are identified in tanned leather and/or if they are found in containers together with the skins. Such evidence, however, has not (yet?) been mentioned in any literature. Another reason to be careful with overly hasty conclusions is that various parts of the acacia were used for a variety of purposes (such as the use of the flowers in garlands and the wood for building; *e.g.* Gale *et al.*, 2000: 335-336; Newman & Serpico, 2000: 476-477) and the pods might just have been discarded as byproducts of these other uses.

A comparable problem is noted for Akoris, when Hanasaka (2004: 9-10) writes that "The vegetable remains were seeds and seed hulls, which were from the tree, 'sunt' [...]" which is "a genus of Acacia [...] and seems to be one of the many varieties of 'Acacia nilotic (L.) Del.' by the botanical name. The 'sunt' is rich in tannin used for vegetable tanning." It should be noted here that the author adds that the identification as a leather workshop is tentative as "tools for sewing and large containers for soaking skins have not been found" and that "the workshop is located on the hillside slope, away from the water source down below, therefore making it difficult to believe such a water-consuming activity actually took place there". This location is an argument against tanning, but is one in favour of the Pharaonic technique of making skins durable: oil curing/leathering. Tanning leather and making skin durable by rubbing in oil are two distinctly different processes. The first, indeed, would need water but the second surely not: if the oil soaked skins were washed in water, the oil would have washed out and thus turn the cured skin back into ordinary skin – which would start rotting immediately.

Another problem should be noted with the identification of a leather industry in Akoris.¹⁶⁷ Hanasaka explains that "The archaeological remains indicate that this leather workshop might have served two functions: a sewing factory and a tannery. The presence of a sewing factory for leather products can be testified by more than one hundred unfinished pieces. Hence, it is reasonable to suppose that a leather sandal factory was in operation here." The nature of the 'unfinished pieces' has not been specified, leaving many questions – it is, for example, not so simple as one would think to recognise the sole of a sandal which had only one layer as unfinished. Moreover, one would expect to find large quantities of waste

¹⁶⁵ See Prell (2014) for an overview.

¹⁶⁶ She also explains how this identification became generally accepted (including the dating of the sites).

¹⁶⁷ If vegetable tanning was introduced as late as in the (Greco-)Roman period, the processing of the skins into more durable skins would have been very different from the procedure in earlier times. Moreover, it is hard to believe that all leather would, with the introduction of vegetable tanning, have been tanned this way. On the contrary, in Qasr Ibrim for example, there is evidence that knowledge of this technique disappeared altogether (Van Driel-Murray, 2008: 492).

and offcuts in a workshop. Such pieces have not been mentioned by Hanasaka, which indicates they were not found (or recognised?). The lack of waste and offcuts, as was suggested by Veldmeijer (2012b: 166) for Qasr Ibrim, where also almost none of this material was found, "suggests that no production took place [...] but instead, the footwear [was made elsewhere and that] large quantities of hide, wool and hair [could] by absence of waste and offcuts [...] be interpreted as remnants of butchering."¹⁶⁸ Although oil curing/leathering and the production of objects of leather are sometimes depicted together in imagery, it is difficult to be certain that these two were actually done in the same space. Such a separation of tasks might be indicated by the aforementioned evidence at Qantir, where tools for oil curing/leathering were more or less convincingly identified, but tools for the production of leather objects were lacking.

Tools

Tools, with some exceptions, are difficult to identify as specific for leather manufacturing: needles and knifes are the most clear examples of tools that were used for a multitude of purposes and it is often, therefore, not possible to identify a more specific use than cutting and sewing.¹⁶⁹ Another example is the pots that were used for dipping the skins to treat them with oil: only with residue analysis can the content of these pots be established beyond a doubt, and even if the content was oil, it is still not definite evidence that this oil was used for making the skins durable.¹⁷⁰ There are some tools that are more specific to the craftsmen working with leather. Perhaps the most iconic is the half-moon knife (Petrie, 1917: 50-51, pl. LXII; Schwarz, 2000: 88-94). This type of knife has been found fairly regularly and from contexts as early as the 1st Dynasty (Petrie, 1917: 51); models have also been found, such as those from the tomb of Tutankhamun (Figure 10). There are other tools that are perhaps less well known to the archaeologist as being used by leatherworkers. A good example is the bone creaser "a simple tool with a tapering, pointed end and a rounded opposite end, mostly made of bone, [which] is usually identified as a 'pinbeater' [...] but might (also) have been used as a 'folder' or 'creaser' (Darke, 2006: 104-105)" (Veldmeijer, 2010g: 34). The point of this tool can also be used to emphasize decorative cuts - the evidence of such a practice is fairly common in the decoration of post-Pharaonic sandals. Other equipment used by leatherworkers is not likely to have ended up in the archaeological record: the wooden frames used to span a skin when depilating it, the pieces of furniture used to stake the skin, and the stools and flat (or slightly tilted) work tables were not likely placed with the deceased in their tombs (and even if they were, how could an archaeologist recognise them as a pieces of furniture used explicitly by a leatherworker or sandal maker?) - indeed, all of these might very well have ended up in a nice warm fire after worn beyond repair.

¹⁶⁸ An interesting comparison, though arguably of limited use, is the archaeology of the European leather industry (Thomson & Mould, 2011; relevant for offcuts and waste esp. Mould, 2011 and Stevens, 2011).

¹⁶⁹ See Schwarz (2000: 79-123) for a detailed account of the tool kit of the ancient Egyptian leatherworker, including the furniture used in workshops.

¹⁷⁰ See note 44.



Figure 10. Examples of model half-moon knifes from the tomb of Tutankhamun. Photograph by H. Burton. Courtesy of the Griffith Institute, Oxford.

Use, Wear and Repair

Vegetal:

Leather or String Reinforced Plaited Sandals: 2009h: 111. Plain Plaited Sandals: 2009i: 131-132. Sewn Sandals: 2009d: 569-570; 2010f: 19-34. Coiled Sandals: 2009g: 88-89; 2011a: 65; 2007a: 71-73. Composite Sandals: 2013c: 97-98. Sewn-Edge Plaited Sandals: 2010d: 88-90. Fibre Open Shoes: 2010b: 303; 2009f: 105-107.

Leather:

Eared Sandals: 2011c: 13. Composite Sandals: 2009a: 21. Open Shoes: 2009b: 239-240. Curled-Toe Ankle Shoes: 2009b: 16. Stubbed-Toe Ankle Shoes: 2013a: 68-69. Tailed-Toggle Shoes: 2011e: 325-326, 330.

Various:

Tutankhamun: 2010f (throughout descriptions), esp. 139-142. Deir el-Bachit: 2011d: (throughout descriptions), esp. 48. Qasr Ibrim Ottoman footwear: 2012b: (throughout descriptions), esp. 147-150. Gebel Adda: 2016c (throughout descriptions, not dealt with separately).

Signs of Use

Within all studied categories of sandals¹⁷¹ there are (often many) examples of worn footwear, suggesting that the majority were made to use; the extent of use is, however, not as easy to trace. The surface of the ground (such as sand, stone slabs, mud) would have had different effects on the footwear, and not only on the soles (*e.g.* if one is walking over difficult terrain, there will be more stress exerted on certain parts of the shoe, such as the straps, than there would be over less challenging terrain). Moreover, the wear pattern is influenced by the choice of material (leather vs. vegetal material¹⁷²), the material's preparation (unprocessed [rawhide] vs. cured/leather and tanned), the construction of the footwear itself (such as the absence/presence of a rope or leather reinforcement sole),¹⁷³ the construction of the sole, the way the owner walked and his physical constitution, and why the sandals were worn (for work, processions, etc.). Further evidence that footwear were actually worn, and of a rather personal nature, is reflected in sweat patterns – there are known examples with discolouration of the dorsal surface of the sole due to the owners feet.¹⁷⁴

¹⁷¹ Except for the wooden tomb sandals and the *cartonnage* footwear: these were made specifically for burial, see below.

¹⁷² But also the type of skin (e.g. cow or hippopotamus vs. goat) and vegetal material (e.g. palm leaf sheath vs. grass).

¹⁷³ Reinforcement by means of a leather sole is seen in, for example, Composite Sandals made of vegetal materials, which usually do not have such a treadsole (*e.g.* ASH 1888.805 in the Ashmolean Museum, Oxford). Heavy cordage reinforcement soles are seen, for example, in Sewn-Edge Plaited Sandals, which usually also go without such an additional sole layer (such as TR 14 1 26 3 in the Egyptian Museum, Cairo). In the case of the former, this might be due to the specific constitution of the ground (muddy), for which the smooth leather sole layer protected the sandal's vegetal layers from attracting dirt. In case of the latter, the large sandal, clearly meant for a man, suggests that the owner intended to use it intensively and possibly (mainly) on hard surfaces, prompting the desire to protect the original sole layers with an extra, sturdy and tough layer of the leaf sheath of a palm tree.

¹⁷⁴ In the footwear from the tomb of Tutankhamun, for example (Veldmeijer, 2010f: 71, 80, 141).

Wear

Each category of footwear has, to a certain extent, its own specific wear, yet there is also wear that is universal. In addition to the obvious wear on the ventral surface of the treadsole, caused by walking, and on the dorsal surface of the insole, caused by the owner's foot, often heels are worn from dragging, and straps are broken (off). In sandals of vegetal material usually the back and/or the front straps have broken off at the attachment to the sole. In both cases, a stub is often the only remnant left. Wear on open shoes of vegetal material is sometimes visible too, but there seems to be a greater number of examples of ostensibly unused (or very lightly used) specimens. Leather sandals similarly show wear, and here too the most vulnerable parts are the strap attachments. The small integrally cut prestraps on Egyptian and Nubian Eared Sandals are broken off fairly often (this same kind of breakage is even common in the large integrally cut pre-straps on Classic Nubian Sandals). Wear on leather Composite Sandals, in addition to the broken integrally cut pre-straps just mentioned, can be seen in worn stitching at the treadsole's ventral surface and, if padding is (or was) present, the tearing of the insole covering it.

Wear patterns on closed shoes differ depending on the type of shoe. The leather Curled-Toe Ankle Shoes do not show much, if any, wear.¹⁷⁵ In Stubbed-Toe Ankle Shoes, wear has been recognised, including worn treadsoles.

Evidence of Repair

Repairs are not always recognisable and major repairs, such as replacing an entire heel, are not often seen in Pharaonic footwear.¹⁷⁶ One rare example was reported by Montembault (2009a: 22), where a sandal from Deir el-Medinah has a new heel part added.¹⁷⁷ This lack of repairs suggests that people preferred to replace broken footwear rather than fix them. A good example of repair from Ptolemaic times is a shoe that was excavated from the temple of Amenhotep II, which, since the new construction (*i.e.* the repair) uses a technology seen in earlier shoes, suggests that the original technology was unknown by the person who repaired it. Smaller repairs are visible on straps, and occasionally also on the sole of sandals of vegetal material.¹⁷⁸ Post-Pharaonic footwear, especially from Fustat and Qasr Ibrim, shows extensive wear, and often this footwear is repaired multiple times. One of the reasons for the variation in the use of extensive repairs is likely the relative wealth of the people, those who were wealthier presumably would have been able to purchase a new pair, rather than having to repair their old ones. There also could have been a geographic reason: the Ottoman inhabitants of Qasr Ibrim were by no means poor, but their remoteness would have made the supply of new materials difficult.

¹⁷⁵ But there is only one well preserved pair known – others are either fragmented or so fragile that no study of the sole could be done.

¹⁷⁶ But repair of leather footwear became default in post-Pharaonic times.

¹⁷⁷ A comparable construction was recorded by Junker (1925: 20, Blatt 1, Abb. 4) but is an original design (Veldmeijer, 2016c: 22).

¹⁷⁸ Surprisingly often suggested for the footwear from Tutankhamun's tomb (Veldmeijer, 2010f: 51, 55, 60, 63, 68, 83), but also for Yuya and Tjuiu's footwear (Veldmeijer, 2010f: 172, 174, 230).

Utility Footwear vs. Footwear for the Afterlife

Vegetal: Composite Sandals: 2013c: 97-98, esp. 98-99

The reported evidence of wear and repair in ancient Egyptian footwear suggests that most of the footwear that was found as part of burial equipment was initially made to be used in an active way in daily life. Wooden sandals, however, are an exception: the way they were constructed¹⁷⁹ did not allow them to ever be used walking in them. Although there is an example of a pair of wooden sandals from the tomb of Tutankhamun (Carter's Number 397),¹⁸⁰ it has been argued that these were not worn while the king was walking, but possibly while he was being carried around, or, even more likely, the sandals themselves were carried around by a servant, in order to display the highly symbolic scene on the dorsal surface of bound captives.¹⁸¹ Similarly, *cartonnage* encasings of the feet often were painted on the underside with the soles of sandals that showed representations of the enemies of Egypt, symbolically keeping them 'underfoot', and equating the deceased with a deity (or even the king), who would trample Egypt's enemies and keep the country safe. Simple sandal-shaped cartonnage soles (rather than encasings), either decorated with the enemies or a geometrical design, were another possible component of mummy coverings.¹⁸²

In addition to the wooden tomb sandals, Composite sandals made of vegetal material are also traditionally referred to as tomb sandals and one extraordinary burial from Gebelein was reported with such sandals *in situ* in the mummy wrappings (Fiore Marochetti *et al.*, 2003). However, on a large number of these sandals wear is reported, as well as dirt adhering to the ventral surface, suggesting that at least part of the corpus of this type of sandal was used in daily life.

A last category of footwear specificially made for the afterlife is metal sheet footwear. But there are also examples of footwear with metal insoles from the tomb of Tutankhamun (Carter's Number 021f, g and 021 k, l) that seem to have been used – at least, this is suggested by the construction of the gold insole and the leather midsole, the latter of which was tooled to fit the relief of the insole, and the padded central part.¹⁸³

Royal vs. Commoners

Contrary to popular belief, footwear was worn by people in many levels of society, at least during the New Kingdom, although it was more common among the elite. The fancier styles of sandals, such as the nicely coloured and decorated Leather Composite Sandals and the elegant Curled-Toe Ankle Shoes, were likely meant exclusively for these elites. Such footwear must have been fairly expensive, suggested by the elaborate decoration, the quality of material and its processing

¹⁷⁹ Especially the strap complex, which was not fixed properly. In the Hereafter, such footwear would have been made usable through spells and magic.

¹⁸⁰ The famous marquetry veneer sandals (Veldmeijer, 2010f: 87-95). The Egyptian Museum in Cairo has a pair that seems to have been made of cork, but which is dated to the Greco-Roman Period, according to the museum archive (JE 3984; the sole is covered with gesso and a leather insole). See above.

¹⁸¹ Veldmeijer (2010f: 142). A less elaborately decorated example with comparable symbolism is the wooden sandal with nine bows of Pepy I (Imhotep Museum Saqqara; SQ.FAMS.637).

¹⁸² Since emphasis is on utility footwear, these *cartonnage* objects are only mentioned in passing. For an example, see Veldmeijer (2014: 66-69).

¹⁸³ Wear could not be identified beyond reasonable doubt due to the poor condition of the objects.
(including colouring),¹⁸⁴ as well as extraordinary additions, such as padding to increase comfort. What is therefore surprising is that Sewn Sandals Type C of vegetal material were also clearly made for the elite, and were even used by the royal family and those officials who were personally awarded by the king. The reason why these Sewn Sandals were so important is unclear. The royal footwear of vegetal material, based mainly on the sandals that were found in the tomb of Tutankhamun,¹⁸⁵ differs from non-royal footwear in shape¹⁸⁶ (the royal Sewn Sandals are pointed, with the toe part slightly curled upwards, and have thin soles) and refinement of craftsmanship (the sewing on these sandals is distinctly finer and more regular).¹⁸⁷

The only example of a royal leather sandal we know from ancient Egypt (Carter's Number 021h, i from the tomb of Tutankhamun) is an imitation of the Sewn Sandal, which is not seen in non-royal leather sandals. This leather sandal is further distinguished from non-royal leather sandals as it is enhanced with gold bosses and gold strips woven through slits in the leather. Possibly, the leather was stained (probably red and/or green), but the colour is not recognisable anymore due to the poor condition. Openwork, as seen on its straps, although very delicate, is not unique to royal footwear: this decoration technique is also seen in Composite Sandals, Eared Sandals, and Curled-Toe Ankle Shoes. Another unique type of sandal is the pair from the king's tomb that is made of bead fabric as insole and a leather treadsole. Meant for a child, there are no parallels, royal or non-royal, and thus this pair seems to have been unique to Tutankhamun, but note the absence of undisturbed royal tombs to compare.

The open shoes that were found in the tomb of Tutankhamun (Carter's Number 021f, g; 021k, l; 270a)¹⁸⁸ are comparable in overall shape to the common open shoes that were made of vegetal material: a sole, with a low upper that goes around the heel, runs towards the front but stops well before the tip of the sole. As previously discussed in detail, this differs from the examples of leather open shoes we know from other provenances, where the upper is much higher and almost entirely covers the foot from the dorsal view. Other features that separate the open shoes found in Tutankhamun's tomb from non-royal open shoes include the use of expensive materials (gold, semi-precious stones, glass paste), the elaborate decoration, and the high level of craftsmanship and technology, which suggests that various craftsmen must have worked on the shoes – thereby suggesting that a fairly high level of organisation must have been involved in their making.

A final feature that seems to separate royal from non-royal footwear should be mentioned here: the closure systems that were found on some of Tutankhamun's open shoes. These toggle closures and system with foot straps and toe bands have no parallels in non-royal footwear, but of course without other royal footwear

- 187 Note that the Sewn Sandal found in the tomb of Nefertari suggests that there was no distinction between footwear for royal men or women, discussed below.
- 188 Discussed here as a group, ignoring the many differences in detail.

¹⁸⁴ Some leathers are identified as gazelle (Schwarz, 2000: Cat. C., no. 16 [no page numbers]) but this should be viewed with caution, as explained previously.

¹⁸⁵ Note that, despite the large number of footwear that was recorded by Carter and his team, this was not the original number that was deposited and thus we cannot be entirely sure that there were not other types of footwear buried initially (see Veldmeijer, 2010f: 230, including the discussion of robbery related to this topic).

¹⁸⁶ The footwear from the tomb of Yuya and Tjuiu is thus left out, as they are not royals. The difference between their Sewn Sandals and those from the tomb of Tutankhamun is noticeable (see Veldmeijer, 2010f: 169-184).

we cannot possibly be certain that they were unique to Tutankhamun. Although it has been suggested that these systems might have been an adaptation to the possible malformation of Tutankhamun's feet, the fact that this only occurs in two open shoes (Carter's Number 021k, l; 270a) and not in the other pair (Carter's Number 021f, g), nor in the sandals, seems to rule out such a reasoning. Whether or not the panel with toggle closure in 021k, l (Carter's Number) would have had parallels in other royal footwear, the technology to make it was certainly available in ancient Egypt.¹⁸⁹ This is different than for the closure system in 270a (Carter's Number), which was (more) common on footwear in Asia Minor.¹⁹⁰

The only example of royal footwear from Tutankhamun's tomb that has other clear royal parallels is the pair of golden sandals that was found on the feet of Tutankhamun's mummy. Golden sandals were also found in other royal tombs (see section 'Metal' in chapter 'Materials Used in Footwear'). However, the example on the feet of Tjuiu, strictly speaking a non-royal person, shows that also this kind of tomb footwear was not a prerogative only for the king and his family.¹⁹¹

Gender in Footwear

Footwear was worn by women, men and children alike, although the number of children's sandals and shoes is, not surprisingly, relatively low. The scarce evidence available suggests all types of sandals were worn by men and women, including such types as Sewn-Edge Plaited sandals, and Composite sandals (both in leather and vegetal material). Another example that indicates the lack of distinction between what men and women wore is the pair of Sewn Sandals, which were found in the tomb of Nefertari (Veldmeijer, 2010f: 184-186), and which is equivalent to those from the tomb of Tutankhamun. Also the tomb of Yuya and Tjuiu contained sandals for both of them, based on the sizes, but showing no distinct differences except for size (Veldmeijer, 2009d; 2010f: 169-182). The remnants of sandals with golden soles and gilded straps on Tjuiu's mummified feet suggest that more extraordinary (tomb) footwear was also made for both men and women. Footwear appears to have been made for children in a range of forms, including Sewn Sandals, Sewn-Edge Plaited Sandals, leather Composite and Eared Sandals and also with Stubbed-Toe Ankle Shoes.

The suggestion has been made that some types of footwear were worn first by women (Van Driel-Murray, 2000: 315) but no explanation follows this statement – on the contrary, Van Driel-Murray adds that "depictions from the Twenty-second Dynasty also show men with [such sandals]." Closed shoes, however, appear to be mainly made in relatively small sizes, which led the same scholar (Van Driel-Murray, 2000: 315) to suggest that "from the size [...] all belonged to women and girls." The find of a relatively small shoe from a late 18th or early 19th Dynasty grave from Abydos, where a girl, no more than 14 years of age (Ayrton *et al.*, 1904: 49-50), was buried, seems to confirm this interpretation. Also the examples from the Valley of the Queens and Deir el-Medinah are small in size. A comparable situation can be mentioned for the Stubbed-Toe Ankle shoes, which are as small in size as the aforementioned type, and are, thus, difficult to attribute

¹⁸⁹ See Ogden (2010). As well as toggle closures (also seen in 270a).

¹⁹⁰ See also Veldmeijer (2010f: 229-230).

¹⁹¹ Although not strictly royal, you could argue that Tjuiu was provided with a burial similar to that of a royal.

to adult men. Although the available evidence from the provenance of the Curled-Toe Ankle shoes seems to point to (young) women, we cannot entirely rule out the possibility that other closed shoes were (also?) worn by young men. Some finds from the cachette of the priests of Amon in Deir el-Bahari and those in the proximity of the burial of the architects of Ramesses III (Montembault, 2000: 193-194) are the best examples of these shoes belonging to young men.

Symbolism and Status

Vegetal:

Sewn Sandals: 2009d: 571-572; Gräzer, 2010: 213-221; 230-231. Sewn-Edge Plaited Sandals: 2010d: 90. Fibre Open Shoes: 2009f: 107.

Leather: Eared Sandals: 2011c: 14; 2016c (esp. 27-28).

Various: Tutankhamun: 2010f: 84-138, 230-231

Footwear was used, as it still is nowadays, to indicate social position and status. Rich people wore more fancy and expensive footwear (e.g. the leather Composite Sandals) or even specific styles of footwear (suggested by the leather Curled-Toe Ankle Shoes). The archaeological record suggests, with the tomb of Tutankhamun being the main source, that at least some of the footwear for royals was elaborately decorated with gold, semi-precious stones, beads and bosses, etc. While at first glance this may seem to be largely decorative, by looking a bit closer, one is able to recognise other meanings in the decoration. The lotus¹⁹² and papyrus plants are well known symbols for Upper and Lower Egypt and are often featured on the footwear from Tutankhamun's tomb (bead sandals, Carter's Number 085a/147a; leather sandal, Carter's Number 021 h, i; open shoe, Carter's Number 021f, g and leather open shoe 270a). The tying of these two plants, as seen on the dorsal sole of a sewn sandal (Carter's Number 620(119)), symbolises the unification of Upper and Lower Egypt. Ducks or geese are added to open shoes 021f, g (with the heads protruding from the straps) and 021h, i (functioning as toggles in the closure system), not unlike how they are sometimes seen in chariots, above the horizontal median spoke.¹⁹³ As explained by Calvert (2012: 51) "geese are closely related to the god Amun-Re and are notoriously aggressive birds [...]. The goose was also viewed as the "Great Cackler", a primeval bird that laid the world egg and initiated cosmos, adding a regenerative connotation to the depiction of this waterfowl [...]". Exactly what this means for the shoes and whether or not there was, therefore, a specific use for the pair is difficult to say, although it has been argued that, perhaps, these highly embellished shoes were worn with the ceremonial chariots. However, this cannot be proven, and imagery and text are not helpful to elucidate, unfortunately.¹⁹⁴

¹⁹² The gold flowers that adores the straps in shoes 021f, g are refered to as 'daisy', following the tomb cards by Carter and his team (Veldmeijer, 2010f: 120 [n. 35]. These are, however, white lotuses seen from above.

¹⁹³ A connection between the discussed open shoes and the 'procession chariots' has been suggested; duck or goose heads, however, have not been mentioned for the chariots from Tutankhamun's tomb.

¹⁹⁴ The original position of the footwear in the tomb of Tutankhamun could possibly have given an indication, but the tomb was disturbed several times and hastily cleaned up by the necropolis officials (Veldmeijer, 2010f: 34). But note that "the tomb itself was probably not made for royalty. Thus the positioning of objects therein could not follow any royal or religious protocol. This means that the precise find spots of objects are of little help to interpret specific functions (Veldmeijer, 2010f: 19).

Another motif, which is seen on many objects from the tomb of Tutankhamun,¹⁹⁵ is a group of nine bows, representing the nine enemies of Egypt, and/or bound captives, which have the same meaning. By depicting these figures on the soles of one's footwear, one is both literally and figuratively crushing their enemies under their feet. Although this is only seen on the insole of his Sewn Sandal (Carter's Number 690 (119)) and his marquetry veneer sandals (Carter's Number 397), its use on the wooden sole belonging to Pepy I in the Imhotep Museum in Saggara¹⁹⁶ suggests a long tradition of this symbolism. In later times, enemies are often shown on *cartonnage* footwear – thus the symbolism, which seems at first to have been restricted to use by the king, became more permissible for general use. There is another interesting example of the meaningful enhancement of footwear, which depicts the winged uraeus in openwork technique, representing the goddess Wadjet. Unfortunately, this sandal is unprovenanced,¹⁹⁷ but since the uraeus has always been a royal symbol it might suggest that the sandals were meant for a royal person. Although symbolism such as that mentioned above is relatively clear, other examples are more challenging to recognise, emphasizing the importance of combining archaeology, the study of imagery and the interpretation of texts.¹⁹⁸ Powerful imagery on footwear is, in Pharaonic times, largely restricted to the royal family. Non-royal footwear seems, if enhanced at all, to be decorated with geometric figures and lines in overlapping appliqué. In post-Pharaonic times, decoration became far more often symbolic, including the use of Coptic crosses in so-called Coptic footwear (as well as in Nubian Meroitic sandals, which sometimes show the Christian cross) but also, as seen in Nubian sandals, the use of symbols of regeneration, such as frogs. Nonetheless, most of the decoration even in these later times was still simply geometric designs.¹⁹⁹

¹⁹⁵ Such as the chariots and footstools.

¹⁹⁶ See above [incl. n. 83, 181].

¹⁹⁷ It is unfortunate that the right sandal is lost (a small fragment of the front strap, however, is identified, see 'Composite Sandals' in chapter 'Description'), as it would be interesting to see if it had the same imagery or, perhaps depicted Nekhbet.

¹⁹⁸ The best example of which is the significance of Sewn Sandals, explained previously (see section 'Shape - Footwear Made of Vegetal Material' in chapter 'Diachronic Change' and section 'Royal vs. Commoners' in chapter 'Use, Wear and Repair'). Another example is the meaning of white or silver sandals, see Schwarz (1996; 2000: 230-231).

¹⁹⁹ An 'nch, flanked by was-scepters, in a Meroitic sandal is seen only once (Veldmeijer, 2016c: 140-141).

Foreign Footwear and Influences in Egypt

Vegetal:

Leather or String Reinforced Plaited Sandals: 2009h: 111-112. Plain Plaited Sandals: 2009i: 33. Sewn Sandals: 2009d: 570; 2010f: 142, 234 [n. 7]. Coiled Sandals: 2011a: 126; 2007a: 71-73. Sewn-Edge Plaited Sandals: 2010d: 89. Fibre Open Shoes: 2010b: 304-305.

Leather:

Eared Sandals: 2011c: 6-10, 13-14; 2016c (esp. 55). Side-Covering Sandals: 2013b: 55-399. Open Shoes: 2009j: 6. Stubbed-Toe Ankle Shoes: 2013a: 70-72. Tailed-Toggle Shoes: 2011e: 330-334. Persian Finds from Elephantine: 2016a: 23-28, 103-138.

Various:

Tutankhamun related to open shoes: 2010f: 13, 143, 150, 227, 229-230, 243 [n. 1]. Qasr Ibrim Ottoman footwear: 2012b. Gebel Adda (incl. Eared Sandals): 2016c.

The evidence of foreign²⁰⁰ footwear or of the influence of foreign traditions in ancient Egypt differs considerably through time.²⁰¹ The idea of open shoes might have come from abroad, probably Asia Minor, in the Middle Kingdom or Second Intermediate Period. It is not so much of a surprise that shoes, open or closed, were not invented in Egypt, where there was no need to protect one's feet against a wet and/or cold environment, as was the case in Europe or even parts of Asia Minor. However, another reason that open shoes became so popular, besides stauts (see above) might be that it protected the feet from the hot desert sand, but simultaneously gave enough cooling by being open dorsally. For the same reason that closed shoes were not a necessity due to the favorable weather conditions, there would not really have been a necessity for the ancient Egyptians to invent a process to make hide more durable against wet conditions. Thus vegetable tanning was only introduced in the Greco-Roman or Roman times,²⁰² since the experiences of the Greeks and Romans in Europe, with all the rain, snow and other weather conditions unfriendly to skin, forced them to invent or adopt a way to fight rotting.²⁰³ Such a clear development is not always observable, and

²⁰⁰ The term 'foreign' is used lightly: not only did the borders of ancient Egypt differ through time, but also our understanding of Egypt as a country differs through time. The AEFP regards Nubia as foreign too.

²⁰¹ The different types of closure systems seen in some of Tutankhamun's footwear and their possible foreign origins have been discussed previously.

²⁰² See above with section 'Shape - Footwear Made of Leather' in chapter 'Diachronic Change'.

²⁰³ The introduction of vegetable tanning in Egypt by the (Greco-)Romans does not mean they invented the technique.

some fairly advanced technological features in the footwear seem to have made an appearance rather suddenly, without a more simple predecessor,²⁰⁴ or even a tradition in shape.²⁰⁵

Both Nubia and Persia had interactions with Egypt at different times, and although we have evidence of footwear from these regions, they do not appear to have had a significant impact on the local technology. Already by Pharaonic times, Nubian settlers in Egypt had their own types of sandals, which can be distinguished from Egyptian footwear. In Meroitic times,²⁰⁶ these differences became more pronounced, resulting in a double front strap and large integrally cut pre-straps at the heel. The Egyptians never adopted these features and such sandals have not been registered from any sites in Egypt proper.

The so-called Persian footwear, which was found in Elephantine (Kuckertz, 2006; Veldmeijer, 2016a: 23-28, 102-138) clearly differs from Egyptian footwear in technology as well as decoration, which supports the interpretation that it had Persian origins. There are no indications that elements seen in this type of footwear were used in typically Egyptian, contemporary footwear.

The most significant change in Egypt due to foreign influences was clearly the arrival of the Romans. They brought their own types of shoes and sandals from Europe, and with them introduced new technologies; even after the Roman military footwear disappeared, the traditional Pharaonic footwear did not return.²⁰⁷ Fustat shows, besides some known types (including new variants of these), also types of shoes that are not known from elsewhere (Veldmeijer, 2013e; In Press b). Comparative, contemporaneous material is lacking, however, so it is not clear (yet²⁰⁸) whether this is a development in time (based on known techniques) or introduced from abroad. The presence of the Ottomans is reflected in footwear as well, especially in shoes, even though this is based mainly on the finds from Qasr Ibrim. However, the influence on Egyptian footwear seems to have been fairly limited.

²⁰⁴ Rather than technology. In the case of the Meir sandals, if we allow for a date to the Middle Kingdom as suggested by the Museum's archive, the long extension of the toe has no predecessor: such a feature develops during the New Kingdom. This, therefore, questions the dating to the Middle Kingdom (see chapter 'Diachronic Change', 'Shape', 'Footwear Made of Leather'), unless this feature did come from abroad, which would explain its sudden appearance. Still, as explained in the paper discussing this sandal, this would mean a gap of many hundreds of years, which seems even for an ancient society too long a period of time.

²⁰⁵ In the case of the separate toe extension, for example a tradition of curled toe integrally cut from the sole's leather. Such a development in shape is not, if the Meir sandal dates to the Middle Kingdom, a predecessor of the separate extension.

²⁰⁶ Based mainly of the finds from Gebel Adda. Remarkably, the excavations at Qasr Ibrim did not yield much Meroitic footwear at all (Veldmeijer, In Preparation b).

²⁰⁷ See above.

²⁰⁸ The analysis is in progress.

Conclusions

Vegetal:

Leather or String Reinforced Plaited Sandals: 2009h: 111-112. Plain Plaited Sandals: 2009i: 132. Sewn Sandals: 2009d: 570-572. Coiled Sandals: 2009g: 89-90; 2011a: 126-128; 2007a: 71-74. Composite Sandals: 2013c: 98-99. Sewn-Edge Plaited Sandals: 2010d: 89-90. Fibre Open Shoes: 2010b: 303-305; 2009f: 106-108.

Leather:

Eared Sandals: 2011c: 13-14. Composite Sandals: 2009a: 22. Side-Covering Sandals: 2013b: 56-58. Open Shoes: 2009j: 5-6; 2009b: 240-245. Curled-Toe Ankle Shoes: 2009c: 16-17. Stubbed-Toe Ankle Shoes: 2013a: 464-467; 2017a: 51-53. Tailed-Toggle Shoes: 2011e: 333-334.

Wood: Pattens: 2008: 151-152.

Various: Tutankhamun: 2010f: 225-231. Qasr Ibrim Ottoman: 2012b: 165-168. Gebel Adda (incl. Eared Sandals): 2016c: 55.

It is not possible to answer all the questions that were presented by the AEFP based on the study of archaeological objects alone, and a more complete picture will emerge only when studies of the footwear-related texts and imagery are finished and combined with the results of the research published here. The present work provides a foundation for such additional research, as it enables us to identify more accurately the footwear categories found in imagery, and possibly also in texts.

Obviously, this archaeological analysis can also serve as a basis for the further study of other topics related to footwear, that will help to refine dating, identify the origin/inspiration for different categories of footwear and technology, and identify distribution patterns. Moreover, it allows us to begin the process of creating modern reproductions of sandals and shoes, which will help to better understand how individual parts were assembled into a single piece of footwear (and can act as a way to check the observations made about the often incompletely preserved examples). For the Egyptologist, the current work also provides a 'handbook' to identify the kind of sandal, shoe or other piece of footwear (and elements thereof) that might have been unearthed in their excavations. The detailed study and descriptions of the archaeological examples have already led to the more precise dating of several categories of footwear (such as the Stubbed-Toe Ankle Shoes). Furthermore, the project has led to the identification of footwear elements and of the possible provenances of footwear from various museum collections (for example the piece of front strap found in TT 65 that is identical to the front strap of a unique sandal in the British Museum, London). Finally, the research has provided insight into the variety of extant footwear (from different times and places) with a greater degree of detail than was hitherto possible.

Arguably, the most important contribution from this study of archaeological heritage to our understanding of footwear in ancient Egypt is an increased knowledge about technological development. This is especially true for the leather footwear: the nature of this material made new and technologically more advanced products possible, such as Composite Sandals and open (and, in time, closed) shoes. Such development went hand in hand with an overall increase in skills and professionalism in leatherwork in the New Kingdom. The origin of this increase, however, is older and the scarce evidence available to us suggests a time as early as the late Middle Kingdom/Second Intermediate Period. Most likely, it coincides with the arrival of the chariot, which undoubtedly influenced the Egyptian leather industry, since leather is such an integral part of these vehicles, albeit still poorly understood by present-day archaeologists. The rise in demand for chariots, and the consequent increase in demand for leather products, had a positive effect on footwear too: the expanding knowledge about the material not only helped to economize the production of objects, but also improved the ways of assembling them from multiple parts (ultimately resulting in Curled-Toe Ankle Shoes, which were constructed of no less than 19 parts).

Despite the small number of archaeological examples of provenanced and dated leather footwear, an increasing knowledge of the material can be seen in the (clearly) fairly rapid development from sandals to closed shoes (including the development from sandal straps to 'laces') via open shoes. Examples of this progress include the use of folding edges and/or separate strips to reinforce the seams to secure sole layers on sandals (which might even be a precursor of the rand, used in turnshoes in much later times), the first turnshoe construction of footwear in the world, and the more efficient use of materials in the Tano chariot, relative to earlier leatherwork.

In addition to the features that evolved from the experiences and practical observations of the leatherworkers (such as changing the method to apply decoration on one of Tutankhamun's 'marquetry veneer' sandals, or the pre-fabrication of layered appliqué), other new ideas developed, often as solutions to new problems. Surely, the ancient Egyptians were as capable of such developments as anyone else, but innovations were also brought in with foreign people. Innovations are usually initiated by a specific need. A good example is the invention of vegetable tanning by the (Greco?-)Romans in order to produce leather that could withstand the wet environment in Europe. Since the climate in Egypt does not demand this, it was never adopted by the Egyptians. Thus, even if a new (foreign) element was introduced, it seems to have been accepted mostly if there was already a need for it (of course there were other reasons for adopting new styles that are less obvious, such as personal taste, fashion trends or marker for social status). However, these innovations in footwear remained specific, to a certain extent, to a geographic region (both settlements as well as countries) and some features, even if functional, were never adopted in Egypt (such as the Nubian double front strap).

Footwear made of vegetal material, although seen at least as early as the Old Kingdom, remained fairly simple and unchanged throughout time, with almost no innovations in technology. For example, nearly all sandals (as well as open shoes) have similar sewn edges. The main reason for this is probably the nature of the material, which is less versatile than leather and relatively friable. It is tempting to conclude that leather sandals showed such a distinct development because these were made by professional leatherworkers (or sandal makers) and the production of footwear from vegetal material was, like basketry, a household activity, but there is no evidence to support this. On the contrary, some categories of sandals that were made of vegetal materials are shown iconographically in leather workshops, perhaps hinting that these were made in the workshop too (but possibly by someone other than the leatherworker).

The arrival of the Romans (or perhaps even the conquest by Alexander the Great) marked a clear break with the Pharaonic footwear tradition and very little of the ancient Egyptian technological features seem to have survived. For example, although integrally cut pre-straps were still used in leather footwear, they were no longer small 'ears,' but rather large extensions at the back. These once common sandals seem to have been replaced by sandals with individual prestraps inserted through slits in the insole. At this time, the traditional types of footwear made from vegetal materials, such as Sewn Sandals, largely disappeared and were supplanted by different categories of vegetal footwear, some of which were also made with a different technology. Other interesting developments include the use of the turnshoe technique, which became the predominant construction technique in Ottoman shoes - although it was used as early as the New Kingdom, it disappeared for a few centuries and appeared again only in the (early?) Byzantine Period. Another development was the transformation of straps into drawstrings (eventually leading to lace-like elements), which stopped when proper laces were introduced with the Roman footwear. The types of footwear we often refer to as Coptic or Byzantine, were simple slip-on shoes, which do not need laces and although sometimes strings were used in the most popular types of slip-on Ottoman footwear to keep the sides roughly in place, they cannot be regarded as laces. Laces seem to be a West-European invention.

The clear break with the Pharaonic footwear in Roman times was rather dramatic and unprecedented. But footwear has always changed. Footwear, already worn in the Predynastic Period, evolved over time and (many) different types appeared (sandals, open shoes, closed shoes, etc.) - the variety within these groups increased especially during the New Kingdom. This considerable breadth of variation in footwear would likely never have been realised without archaeological research, since imagery and text are not specific nor detailed enough to clearly show all the variations. Furthermore, such a variety provides useful information about broader aspects of culture in ancient Egypt, especially people's socio-economic standing. Aside from the practical purpose of protection, footwear was used in ancient Egypt, as it is today, as a marker of social status, a trend that increased in the New Kingdom. As well as footwear indicating relative wealth (and thus affiliation with a specific part of the society), some footwear had added importance as a social marker. Sewn Sandals are the clearest example of this, as they were worn only by the royal family and those high officials who were personally rewarded by the king. Why such a fairly simple (but extremely well-made) category of sandals, that was constructed from cheap vegetal materials (halfa grass, palm leaf and papyrus), was such an important marker has not yet been revealed, but perhaps the information needed to elucidate this will be uncovered by future studies. The suggestion that these Sewn Sandals were just too expensive for non-royals does not seem to make sense: despite the distinct difference in refinement, the materials are the same as the other far more common types of Sewn Sandals. Moreover, they were not worn by those who were not rewarded by the king, even if they had elite status.

In addition to the technological development of footwear and its social implications, one of the questions addressed in this work was: where was footwear made? Regretfully, the archaeological record is unfavourable for identifying workshops that produced footwear. This is due to a variety of factors, but one of the most significant is that pieces of the toolkit, including furniture, are not specific to the craft. It has been suggested that the production of leather occurred at Qantir, but it is likely that this was mainly (or only?) for chariots and their related products, such as quivers and bow-cases. Here, we have to rely on imagery and texts rather than the archaeological record.

Another important piece of information uncovered in the AEFP's research was on the use of vegetal materials: not a single piece of the footwear that was sampled, be it a sandal or an open shoe, was made of only one type of plant. There were always different materials used and thus such descriptions as 'papyrus sandals', or 'sandals made of palm leaf' are likely incomplete. Probably, the choice of different materials was partially intentional (such as the use of specific materials for straps and sole layers), but the selection of the raw materials seems to have been done without much precision, and 'contamination' with materials other than the ones intended seems to have been normal. Additionally, although distinctions between different types of plants were certainly made by the ancient craftspeople, it is unlikely to have been to the same degree as modern-day archaeobotanists. Furthermore, the exact meaning of several ancient Egyptian terms for vegetal materials remains uncertain, and the translation for the hieroglyphic word for 'papyrus' in footwear has been questioned in various cases.

It is important to take the opportunity here to make one comment on Egyptology as a science. Archaeometry has received a lot of attention lately (sometimes in a fashion that seems to erroneously suggest that it is a new development), but it is not always easy or even possible to conduct the kind of in-depth research that requires specialised equipment (which might not even be available in Egypt), know-how, money and additional permits. Moreover, and this seems to be forgotten more and more, the basis of such research should be first a proper examination and evaluation of the object under study – this should result in detailed and illustrated descriptions, so as to allow future generations to check, use, and re-interpret the work. After this admittedly time-consuming and perhaps less popular but indispensable scientific work has been completed, the indepth research can be done. Finally, such in-depth research should be considered carefully and should not be conducted just because one can; it should add information which cannot be obtained by less expensive and/or intrusive means.

A serious examination of footwear has long been overdue, and unfortunately the lack of scientific interest in this part of material culture is by no means the exception – there are many similar 'daily-life' topics that remain to be investigated. But it is only when all facets of the rich material culture of ancient Egypt are properly studied, and this information is compared and contrasted, that we are able to paint as complete a picture of the Egyptian society as possible. The AEFP's next focus will be, therefore, a detailed and exhaustive study of footwear in twoand three-dimensional art and in texts. This is not to suggest that archaeological work stops here. On the contrary, further archaeological work and accompanying analyses are still imperative to fill in the gaps in our knowledge on the use of materials (especially leather) and their processing.

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The Ancient Egyptian Footwear Project (AEFP) is a multidisciplinary, ongoing research of footwear in ancient Egypt from the Predynastic through the Ottoman Periods. It consists of the study of actual examples of footwear, augmented by pictorial and textual evidence.

This volume evaluates, summarises and discusses the results of the study of footwear carried out by the AEFP for the last 10 years (which includes the objects in the major collections in the world, such as the Egyptian Museum in Cairo, the British Museum in London and the Metropolitan Museum in New York, as well as from various excavations, such as Amarna, Elephantine and Dra Abu el-Naga). All published material is depicted and some previously unpublished material is added here.

The work on physical examples of footwear has brought to light exciting new insights into ancient Egyptian technology and craftsmanship (including its development but also in the relationships of various footwear categories and their origin), establishing and refining the dating of technologies and styles of footwear, the diversity of footwear, provided a means of identification of provenance for unprovenanced examples, and the relationship between footwear and socio-economic status. The archaeometrical research has lead to the reinterpretation of ancient Egyptian words for various vegetal materials, such as papyrus.

