

How was the coffin of Heta-User made?

The coffin as received into the Fitzwilliam in 1903 consists of only the four sides of the box (Figure 1). The base boards and the lid are absent. 26 wood samples were taken from the planks, surviving dowels, patches and inserts. Cedar of Lebanon was identified in all cases.¹ In addition to physical loss of parts of the object, the wood has been water damaged to varying degrees and has suffered from rot and from insect infestation – principally tunnelling by termites. The back panel in particular is extremely fragile. Owing to the poor condition of the wood, it has not been possible to examine the interior surface of either of the long sides of the coffin.

There are two distinct sets of features on the object; firstly, those that belong to its current existence as a coffin and from which it is possible to pull together a basic description of its construction characteristics; and, secondly, those features which appear to belong to a former life as a completely different object.

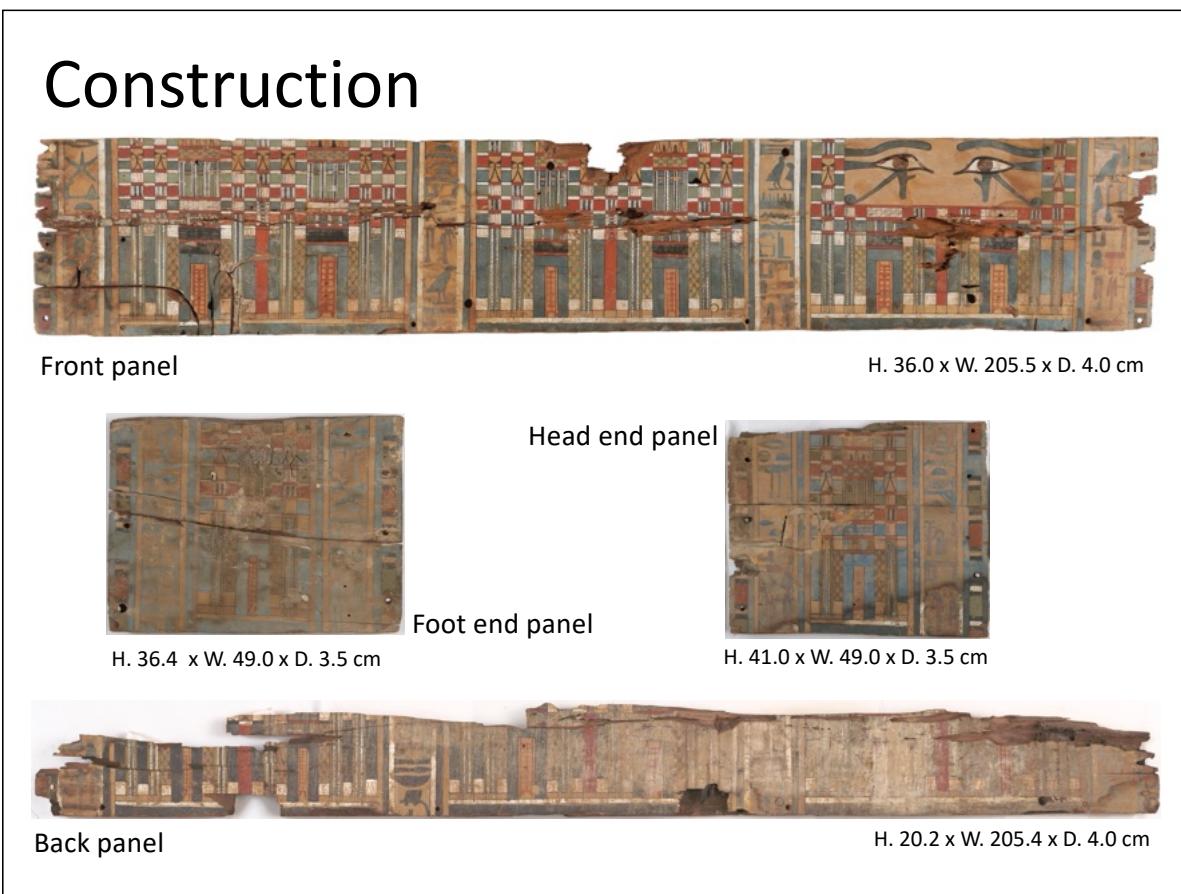


Figure 1: The four surviving panels of Heta-User's coffin

¹ Identification of the samples (see <https://egyptiancoffins.org/resources/glossary#WoodID>) was carried out by Dr Caroline Cartwright, Senior Scientist, British Museum.

Current construction as a box coffin

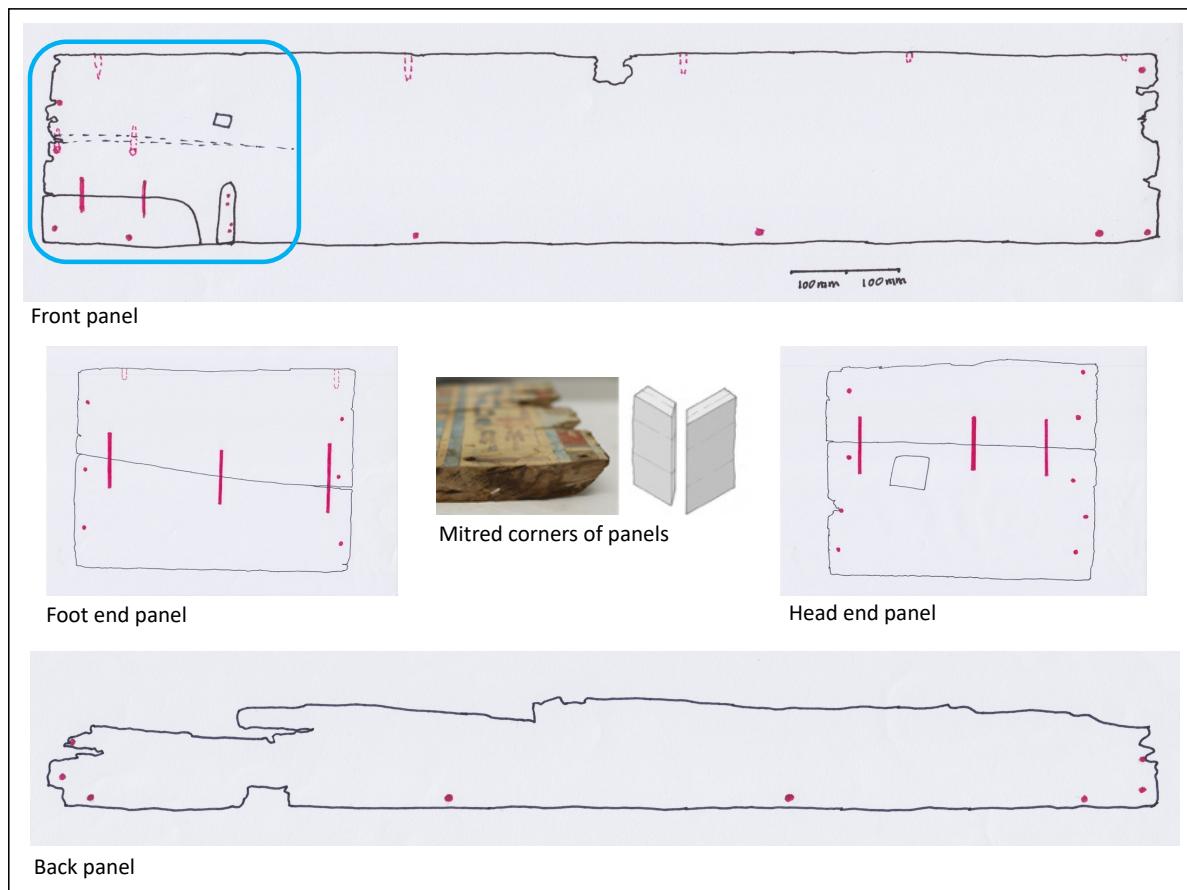


Figure 2. Diagrams showing only the features of the current construction as a coffin. Dowels and dowel holes are indicated in pink. The area in the blue rectangle is shown in greater detail in Figure 3.

The foot end and head end panels are each made of two horizontal planks, joined by three long dowels. The top part of each upper plank has been lost to termite damage. An additional plank above, where the horizontal text bands would have been placed, is missing from both ends of the coffin. On the foot end panel, however, there are remnants of two dowel holes from the edge-to-edge joint that would have held the additional plank in place.

The front of the coffin is one full-length plank. An additional plank above is missing, but is indicated by the presence of five dowel holes for the edge-to-edge joint. The back of the coffin survives also as one full length plank, but here only the lower half remains.

The corners of each panel are mitred, but there is not sufficient surviving height to show whether these had butt or half-dovetail joints at the tops, both of which were common on Middle Kingdom box coffins (see <https://egyptiancoffins.org/resources/glossary#Joints>: butt-joint surmounting long plain mitre and half-dovetail surmounting long plain mitre. See also the top corners of the coffin end panel shown in Figure 16, which are cut to receive half-dovetails). The corners were fixed together with dowels across the mitres.

The row of four dowel holes along the bottom edge of the front panel and of the back panel indicate that the floor of the coffin was held inside the coffin with a simple butt joint. It may then have been further supported by battens across the width of the underside, but there are no dowel holes on the lower edges of the planks to indicate that this was the case.

A few features within the wood of the front panel plank created problems for the carpenters. The principal area is indicated by the blue rectangle on Figure 2 and shown here in Figure 3.

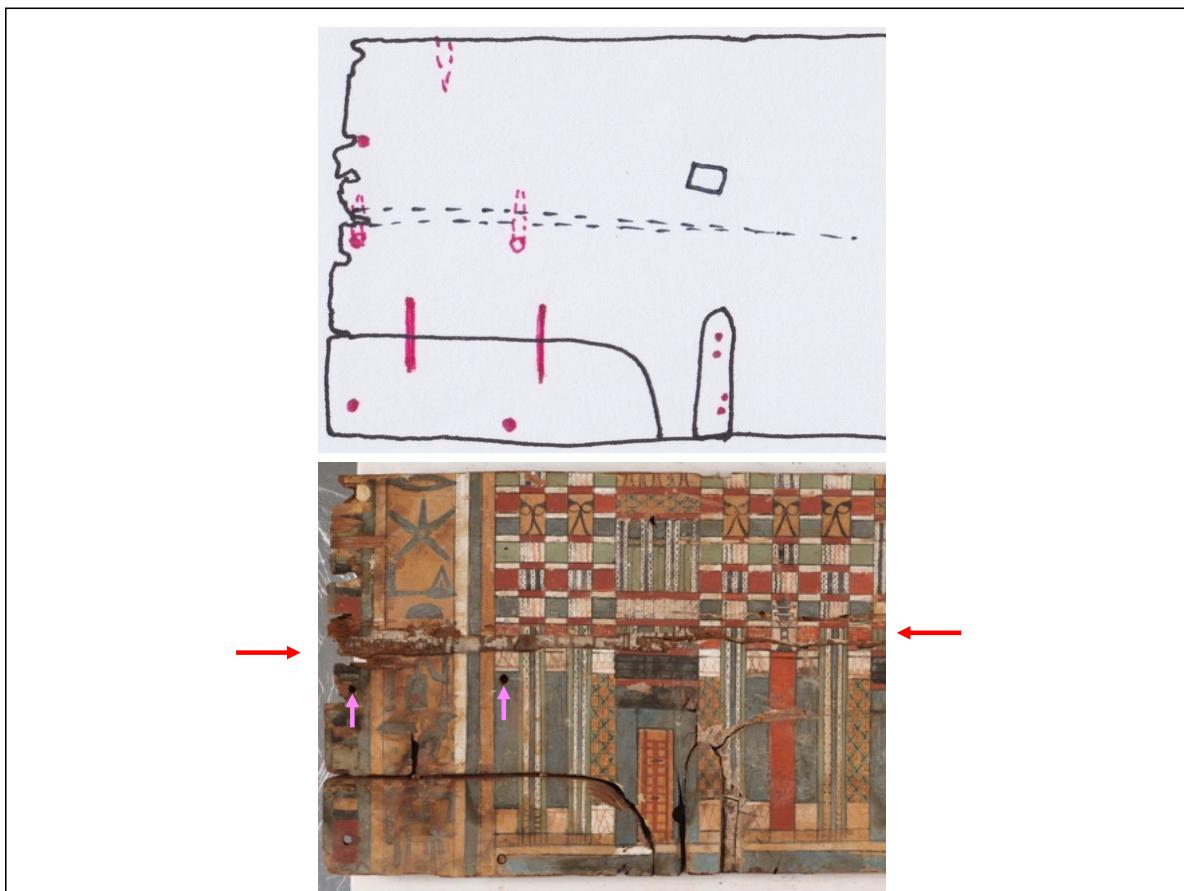


Figure 3. Foot end of the front panel. Red arrows indicate a split in the panel, pink arrows indicate the positions of pinning dowels across the spilt.

At the foot end of the plank, a split that travels along the entire length of the plank, had opened into a gap that had to be pinned together with dowels (now lost) from the front of the board.

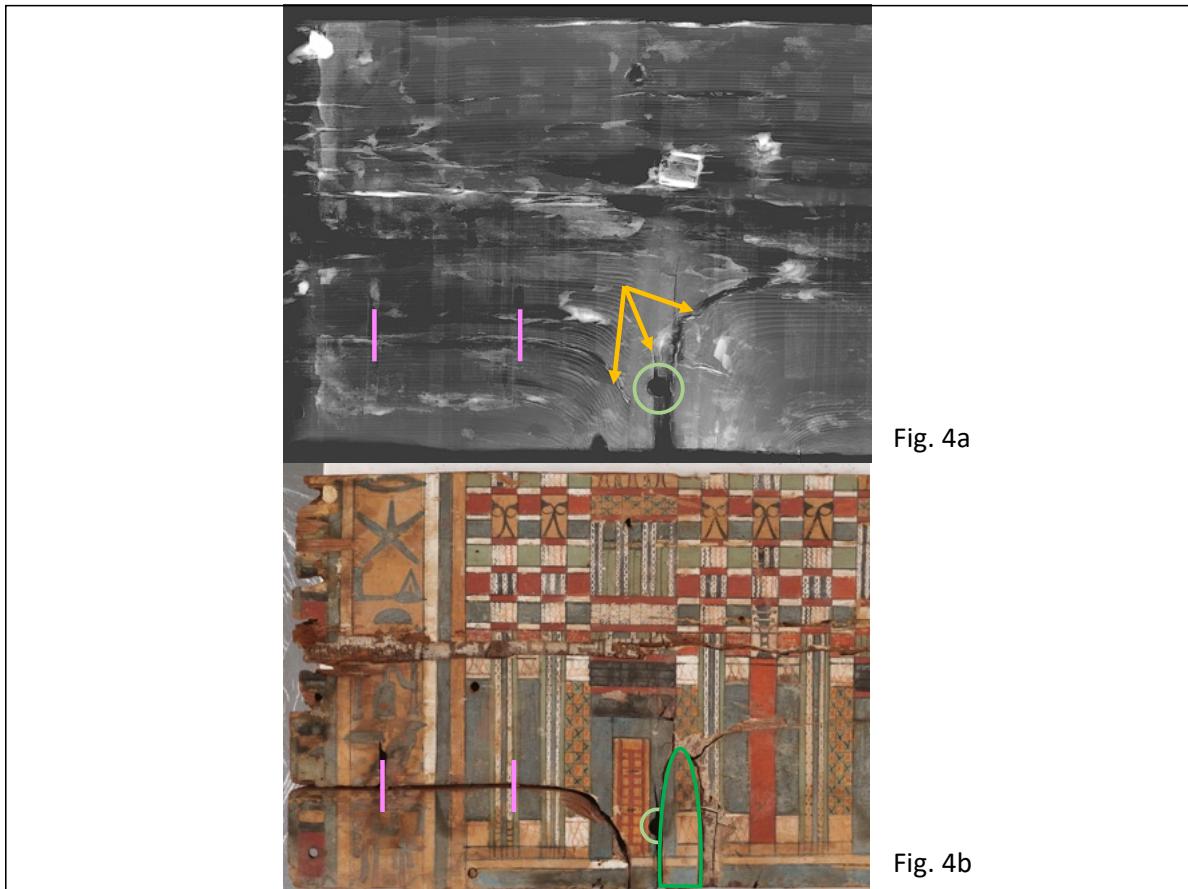


Figure 4. Foot end of the front panel.

Figure 4a, an X-radiograph (see <https://egyptiancoffins.org/resources/glossary#Xradiography>) of this end of the plank highlights further problems in the same area.

A large dowel hole (circled in light green on the radiograph) had been drilled out through the depth of the plank. This dowel hole is part of the earlier life of the coffin plank, which is discussed below in the next section, **Evidence of recycled wood used in the construction of the coffin**. The drilling and subsequent insertion of a dowel (now lost) had most likely exacerbated weakness caused by the irregular grain pattern in this area (visible on the radiograph) and led to splitting of the panel at the places indicated by the orange arrows. This meant that the coffin makers had to insert a patch (outlined in bright green on the photograph Figure 4b). It partly covers the large dowel hole. They also needed to secure with dowels (marked in pink on the radiograph Figure 4a and the photograph Figure 4b) a piece of plank which was detaching along the curve of the grain.

Evidence of recycled wood used in the construction of the coffin

In some of the Fitzwilliam's Beni Hasan coffins, there are construction details that may suggest repurposing of parts of other coffins; see, for example, [E.216.1903 planks from the coffin of Nahkt \(male\)](#) or [E.68.1903 coffin of Nahkt \(female\)](#). However, on the coffin of Heta-user, there are distinctive features that suggest a quite different sort of object as the original source of the wood.

These features are, principally, large redundant dowels and blocked off dowel holes, patches and, in some places, squared off cavities sometimes filled with pieces of wood.



Figure 5 The nine large dowel holes that penetrate the front panel of the coffin are circled in green.

Across the four surviving sections of the coffin, there are 17 large dowel holes penetrating the boards. All of these have a diameter of 1.6–1.9 cm, in contrast to the dowel holes of the current construction, which all have a diameter of around 0.8–1.0 cm. These large holes variously retain wooden plugs, the surfaces of which were painted as part of the coffin decoration, or are filled with a coarse white paste or are now empty. On the front panel there are nine of them, six of which are situated in a distinct and regular pattern. This pattern appears to be disrupted at the foot end of the panel – a feature that may be related to the weakness inherent in the plank here, caused by the grain irregularities noted above.

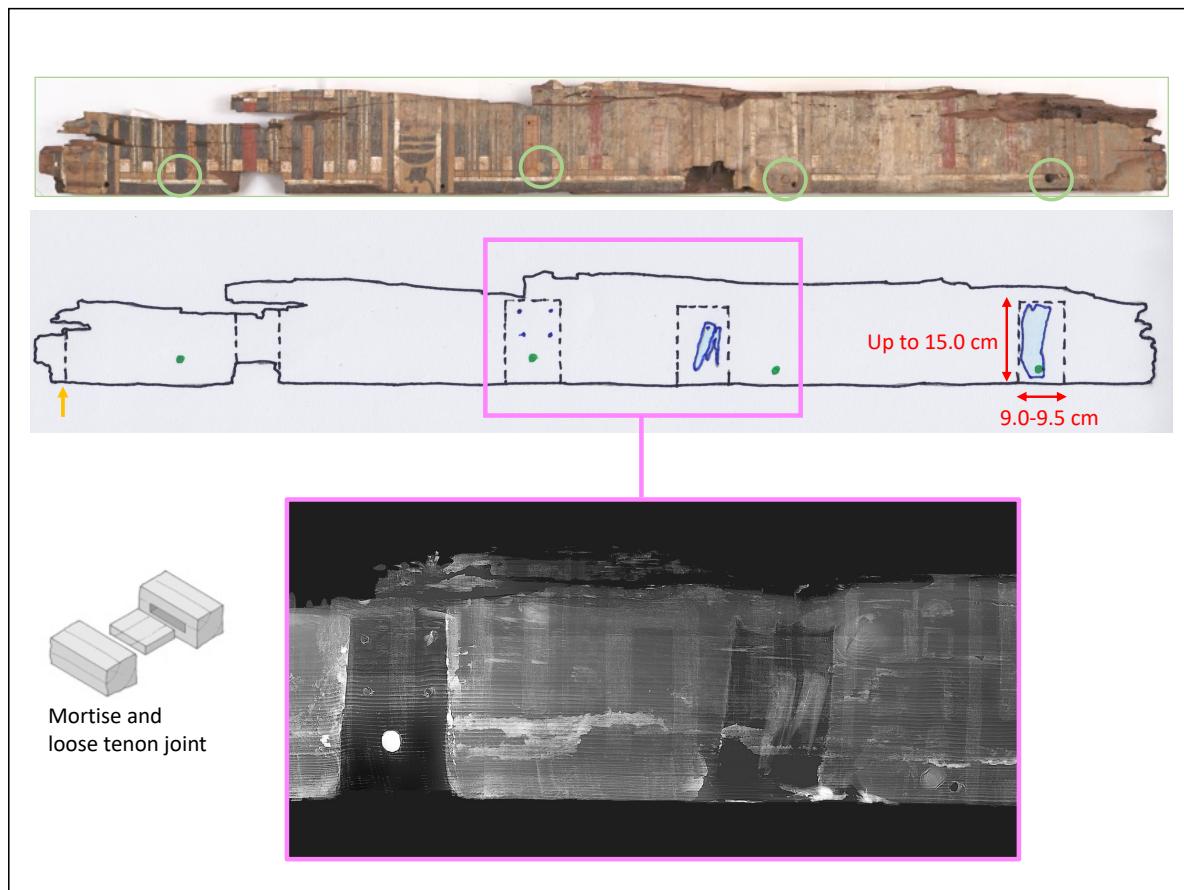


Figure 6 The four large dowel holes that penetrate the lower part of the back panel of the coffin are circled in green. On the diagram, four large cavities are marked out. The orange arrow indicates a fifth cavity, cut-through by the corner mitre at the head end of the panel. The shapes coloured blue on the diagram indicate wood pieces inside cavities and the drawing of a mortise and loose tenon joint represents the type of construction that may once have been present here. The X-radiograph shows the area within the pink rectangle on the diagram.

On the surviving part of the back panel there are four large dowel holes, two of which have painted wooden plugs and one painted paste. The fourth is empty. The back panel also contains four rectangular cavities which, from the tool marks, appear to have been excavated by a combination of bow drill and chisel (<https://player.vimeo.com/video/305722898>)^d. They are 9.0 – 9.5 cm wide and up to 15.0 cm deep. A fifth one (indicated on Figure 6 by an orange arrow) is cut through by the mitred end of the board.

In two of these enormous cavities there are remains of wood fill pieces. The wood grain of these is perpendicular to that of the panel, so it seems likely that these features are the remnants of old mortise and loose tenon joints (see <https://egyptiancoffins.org/resources/glossary#Joints>: mortise and tenon joints) that held two planks together in an earlier structure.²

² In order to give strength to the joint, the wood grain of a tenon is always perpendicular to the grain of the piece of wood in which it sits. The grain of a piece of wood used just to block a hole might be in any orientation.

It has been possible to inspect the reverse of the head and foot end panels, so these pieces of the coffin provide the best opportunities to examine the large dowel holes and further examples of cut-through mortise and tenon joints.

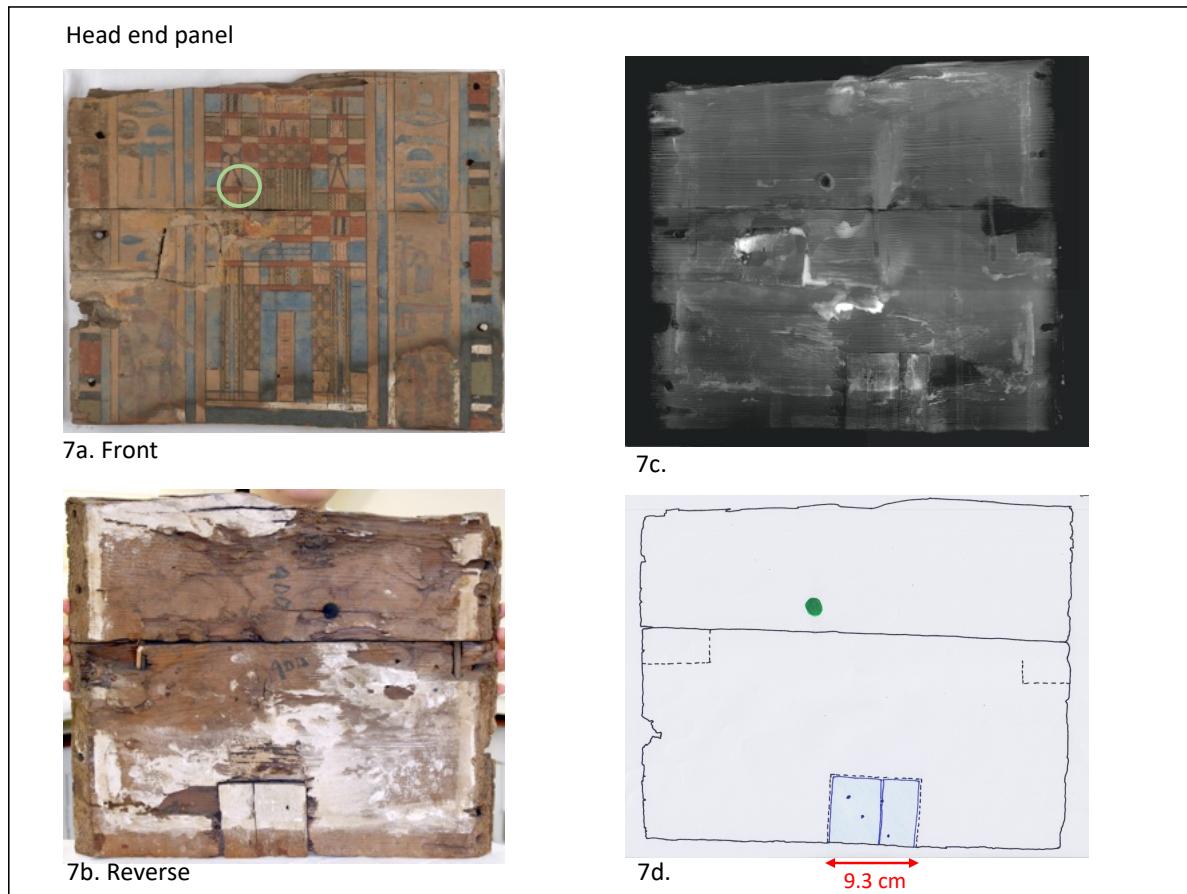


Figure 7 The head end panel

On the head end panel (Figure 7) there is one large dowel hole (circled in green on Figure 7a), filled with a thin plug of wood and painted over. The cut-through mortise and tenon at the lower edge is of similar width to those on the back panel. Two shapes at the top corners of the lower plank, defined in Figure 7d with dotted lines, each appear to be what was left of a big mortise when the plank was sawn across the top and down the side – so, a quarter of a big mortise hole in each case. The cut edges are clear when the object is examined, but difficult to discern on the photograph of the reverse of the board and on the radiograph because of the many broken areas along the sides of each cavity.

On the front of the lower plank, a shallow, painted-over patch has been inserted. There is no specific evidence that this is part of the earlier use of the wood. It may just be where damaged material had to be cut out and the cavity left then needed to be filled.

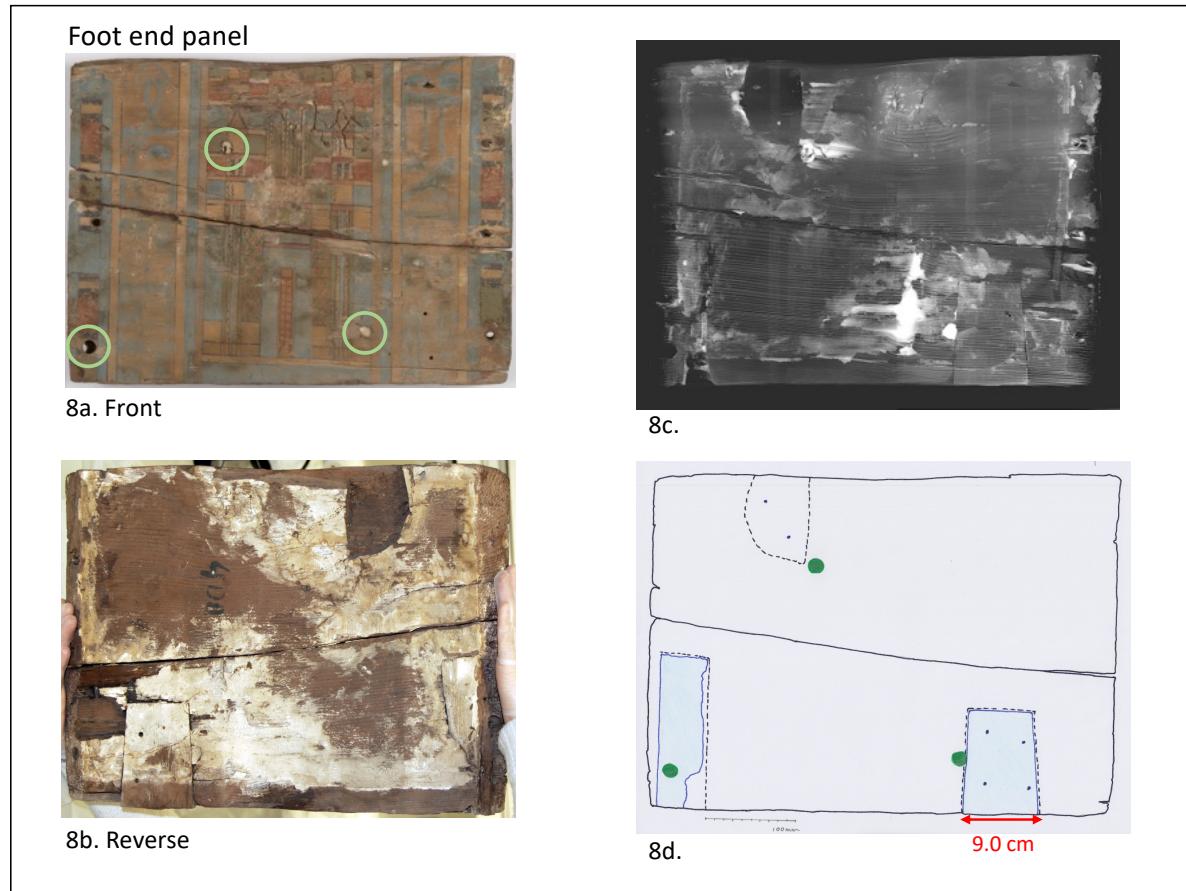


Figure 8 The foot end panel

The foot end panel, shown in Figure 8, presents three more of the large dowel holes (circled in green) on the decorated surface, two filled with paste, one empty. There is another big mortise (with tenon inside) cut through longitudinally at the mitred edge of the panel and two further cavities: the one at the lower edge is filled with a piece of wood and, at 9.0 cm wide, is similar to the mortises on the back panel. The one at the top edge of the panel is a slightly strange shape and relatively small. It may simply have held a patch where a particularly deteriorated piece of wood had to be cut out.

The reverse sides of these end panels, bear the remains of a coarse white paste that was applied to the interior of the coffin walls. In Figures 7 and 8, the thicker application in the corners of the box can be seen and the line of paste, a few centimetres up from the lower edge, marks the position of the base board of the coffin inside the walls.

The original thick boards of the earlier object must have been thinned considerably when the coffin was made, cutting partly or completely through one side of the mortises in some places as seen on Figures 9 and 10 which show the foot end panel. On the long back panel of the coffin, this effect is observed on both faces of the board in different places and further work is needed to understand the variety of positions of the mortises in the original thick plank.

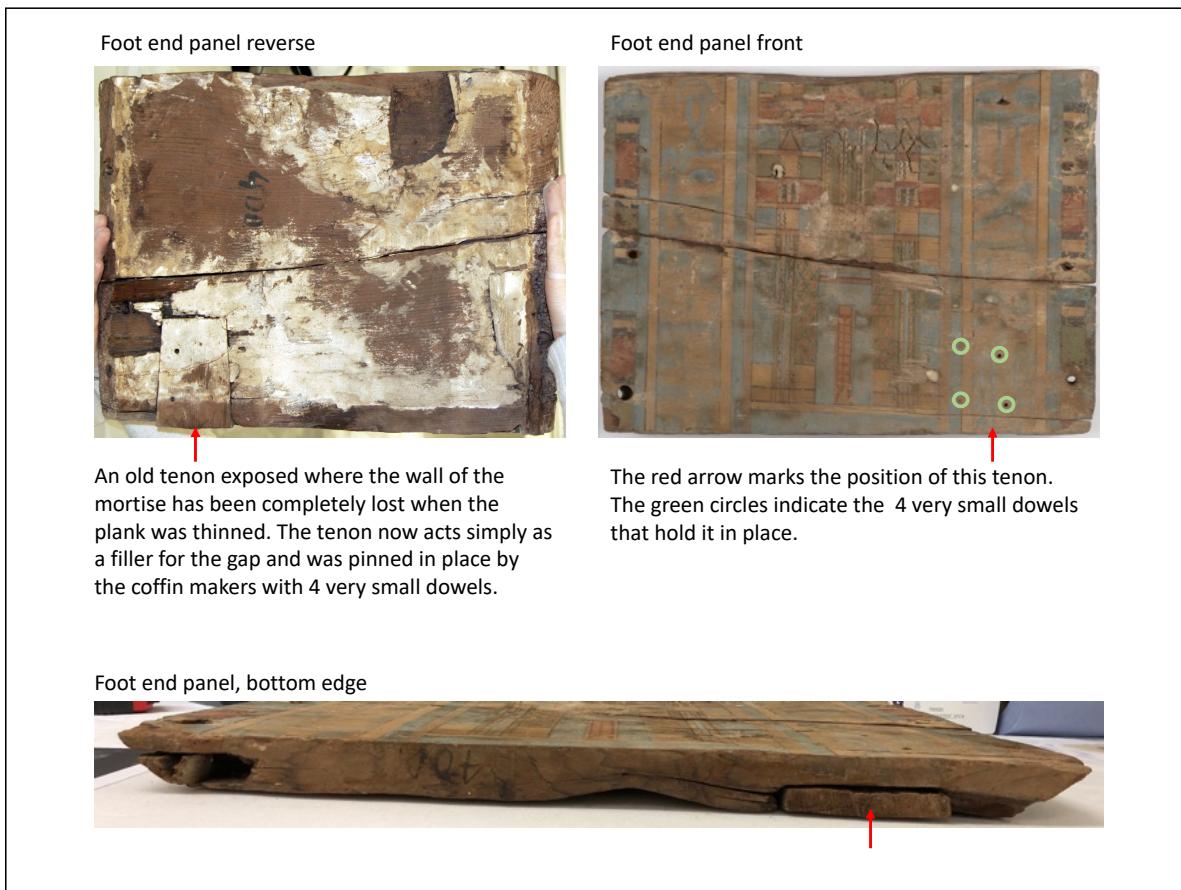


Figure 9. Foot end panel showing an example of how the thick board of the earlier object had been thinned when it was used to create the coffin planks.

Foot end panel front



The blue rectangle marks the position of another old mortise and tenon.



This detail of the bottom edge of the panel shows how the entire depth of the old mortise and tenon joint has been sawn through to form the mitred edge of the coffin board.

Foot end panel reverse



In this case the back surface of the old mortise has been only partially lost in the thinning process, exposing just a part of the tenon.



Figure 10. Foot end panel showing an example of how the thick board of the earlier object had been thinned when it was used to create the coffin planks.

What might be deduced about recycling from the physical evidence?

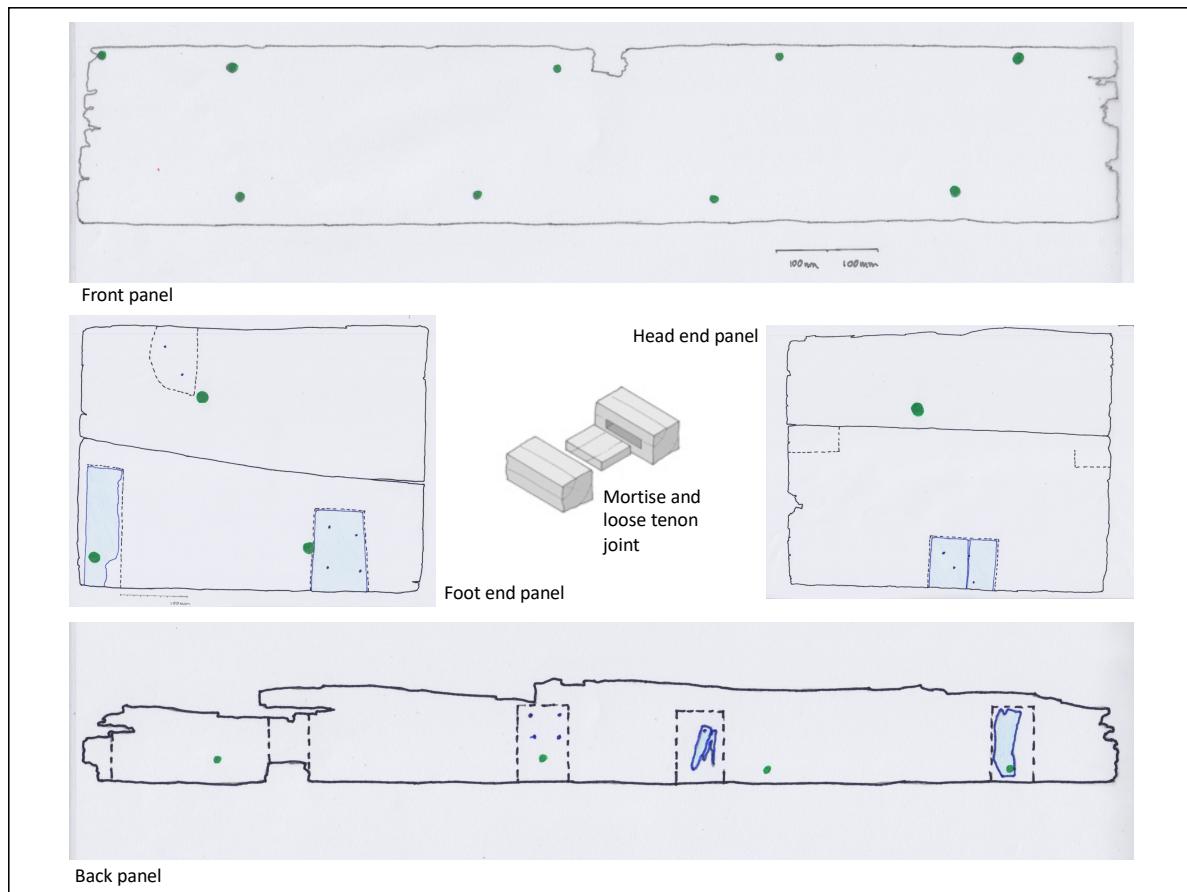


Figure 11. Diagrams of all panels showing only the features of an earlier construction.

It has not been possible to detect cut-through mortises that join to each other or to follow patterns or wood grain matching that might indicate that any of the sections came from the same piece of original object. However, it is possible to propose a relationship between the presence of the big dowel holes and the size and position of the big mortises.

The spacing of the mortises on the back panel and the fact that the mitre edge at the head end of this panel cuts through one of these mortises, suggest that the board from which the panel was cut was originally longer than the current 205 cm. In addition, the partial mortise and tenon joints, clearly, would have been quite substantial in size when complete. Therefore, all the indications are that the original planks were long, wide and thick: one conjecture is that a very large door may have been a source for the coffin wood.

Evidence supporting the proposal that the coffin could have been made from a large door

There are only a few early Egyptian doors known and even fewer that have detailed published information about their technology.

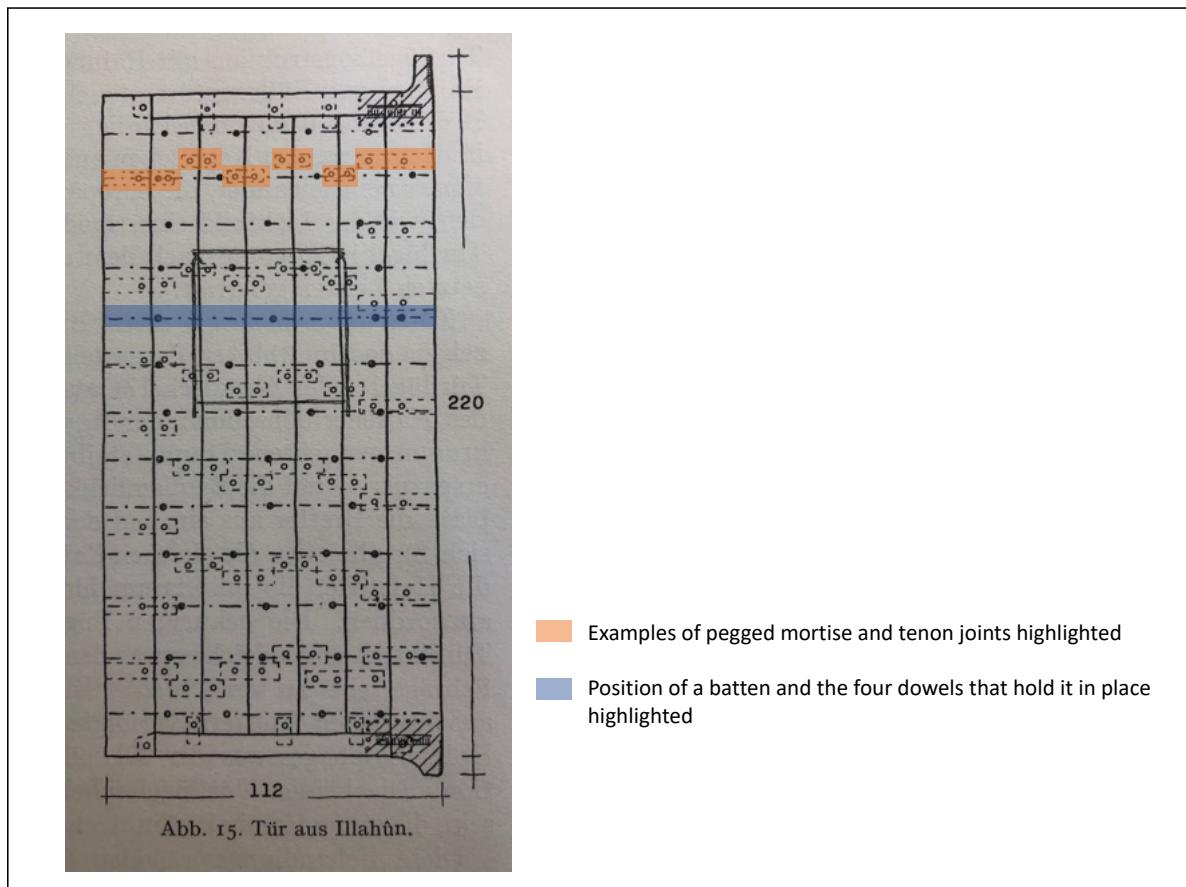


Figure 12. Fig. 15 from Otto Koenigsberger, *Die Konstruktion der ägyptischen Tür*. 1936. Glückstadt: J.J. Augustin
Door from Lahun. At the time of the publication, its Egyptian Museum Cairo accession number was 20/5/24/4.
The door is described by Koenigsberger as having five inner verticals framed by upper and lower cross-pieces, so it looks as if it has vertical 'filler' pieces. The outer sections are made of a 'harder' wood. The horizontal battens do not survive, but are evidenced by dowel holes.³

Figure 12 shows a door excavated at Lahun. The drawing details a structure of vertical planks joined to each other with pegged mortise and tenon joints and then braced with horizontal battens fixed in place with dowels. In the 'pegged' joint there is one fixing dowel in the tenon to each side of the joint. Picking out some of the joints between the planks (in orange) and the position of one of the battens (in blue) clarifies the construction features on Figure 12.

The whole door construction is then held together within framing pieces top and bottom. Wainwright commented on this door that, although there was no firm information about its date, it marked a half-way point between 'the ordinary Pharaonic door of planks set side by side and the Romano-Egyptian door made of a grooved framework enclosing panels'.⁴

³ Koenigsberger, 1936, 17

⁴ Wainwright, G.A. (1925), 'Addendum', *Annales du Service des Antiquités de l'Egypte*, 25 (2), 111

The door from the tomb of Khonsuhotep (Figure 13) is an example of the earlier type.⁵



Figure 13. Sycomore fig (*Ficus sycomorus*) wood door with incised panel containing hieroglyphic text and scene of Khonsuhotep before Osiris and Hathor. Early Dynasty 19. Tomb of Khonsuhotep, Thebes. H. 266 x W. 160 x D. 5.5 cm. Purchased through Henry Salt in 1823. British Museum EA 705

The red arrow indicates the only original horizontal cross batten on the door. The others are modern supports.

Images: Front of door ©The Trustees of the British Museum; Back of door © Geoffrey Killen

⁵ We are grateful to John Taylor, former Curator, Department of Ancient Egypt and Sudan, British Museum for drawing our attention to the door.

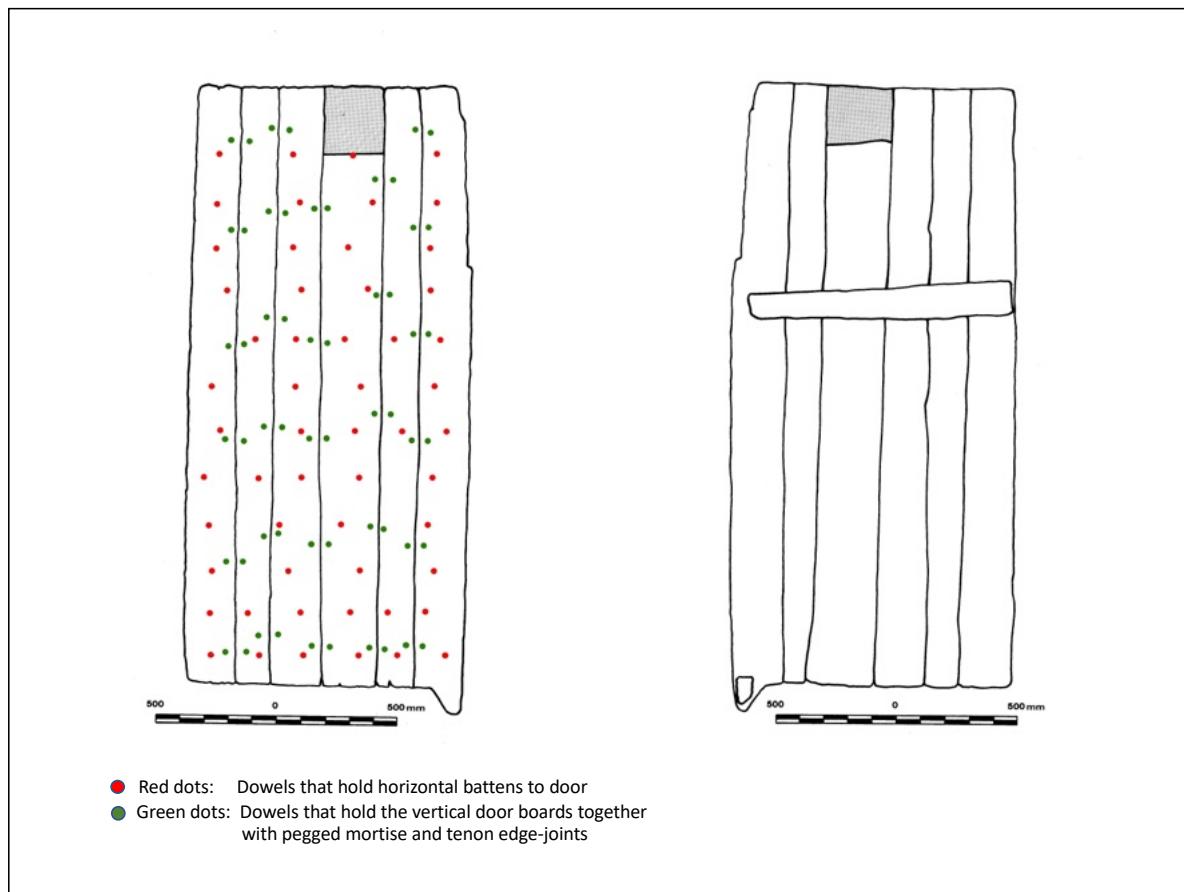


Figure 14. Construction of the door from the tomb of Khonsuhotep (British Museum EA 705). Drawing by Geoffrey Killen. © Geoffrey Killen

Killen's examination of this door revealed that the 6 side-by-side vertical planks were held together with pegged mortise and tenon joints and that there were originally 12 battens fixed across the back of the door held in place by dowels inserted from the front of the door.⁶ Of the bracing battens shown on the photograph of the reverse (Figure 13), only the one pointed out there by the red arrow is original.

⁶ Killen, G. (2012) *Ramesside Woodworking*, vol 1, 143–144. PhD Thesis. University of Liverpool.
<https://livrepository.liverpool.ac.uk/id/eprint/3173948>

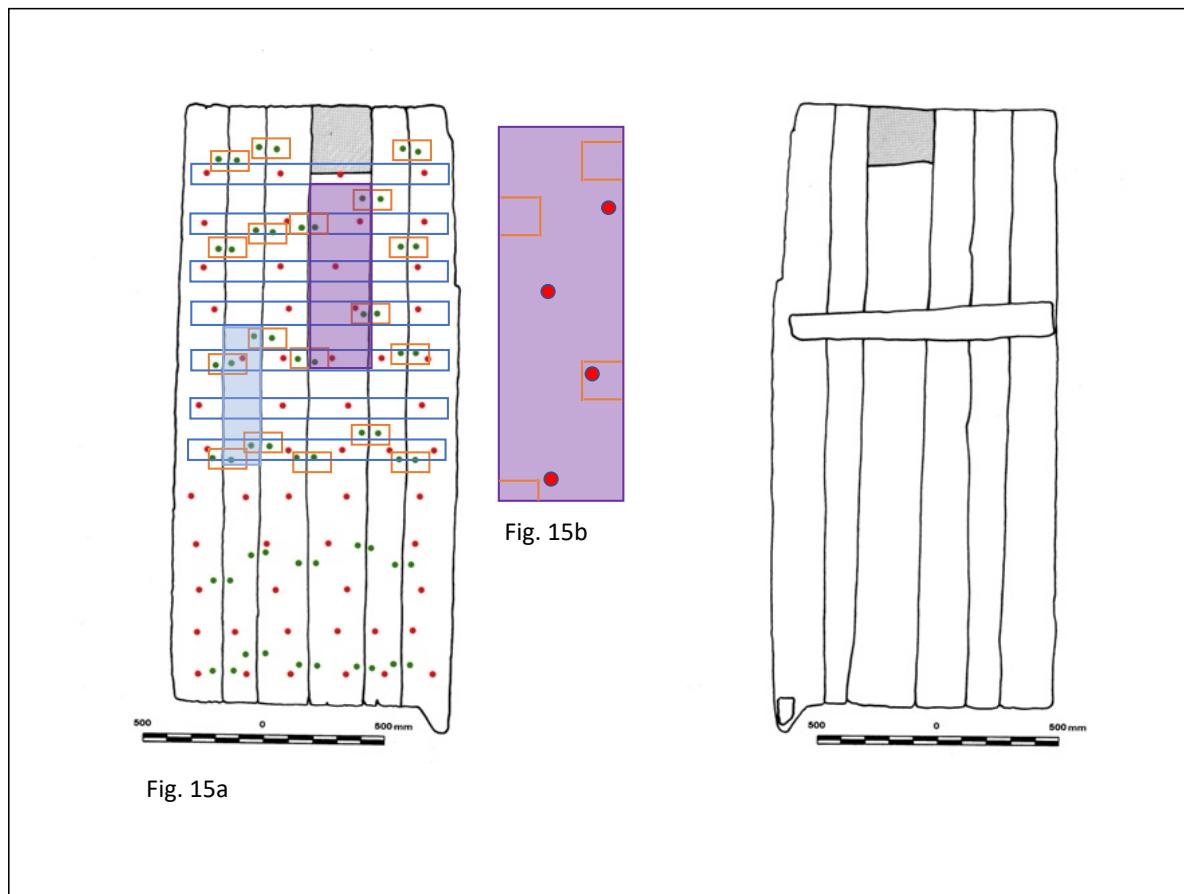


Figure 15. Killen's construction drawing of the door from the tomb of Khonsuhotep (British Museum EA 705) annotated to show the resemblance to the panels from Heta-User's coffin.

In Figure 15a, a few of the green dowel pairs that indicate the mortise and pegged tenon construction have been isolated in orange rectangles. Blue rectangles define some of the groups of red dowels that show the position of horizontal battens. The two coloured sections (one in blue, one in purple) show how a board cut out of a plank could end up with a selection of slightly random looking parts of mortise and tenon joints inside the board and big dowel holes or dowel holes on the surface.

If one of these blocks is extracted (Figure 14b), it is possible to see a pattern of features similar to those found on the panels of Heta-User's coffin.

There is no indication that the tenons in the original structure from which the Heta-User coffin was made were pegged, as they are on the doors from Lahun and from the Tomb of Khonsuhotep. The large dowel holes relate only to the fixing of the battens, which secured the construction. However, in four of the mortises, there are three or four very small dowels holding the wooden tenons in place (see Figures 9 and 11). It seems likely that this is just part of the securing mechanism for these exposed and vulnerable fill pieces in the current construction as a coffin.

Conclusions so far:

Door constructions give promising indications for the origins of the wood of Heta-User's coffin. This is especially the case for the two end panels and the back panel. The front panel of the coffin is problematic. The spacing and pattern of the big dowel holes could suggest the fixing of horizontal bracing battens, but it is perplexing that there are no large mortises on such a wide plank. The cavity at the top edge of the plank could possibly be the remains of a mortise, but the edges are too damaged to provide sufficient evidence.

Further mapping, measuring, imaging and research into other large wooden structures are required. So far in this study, one piece of wood bearing similar features and also excavated by Garstang at Beni Hasan, has been identified. Figures 16 and 17 show the top section of an end panel from a box coffin. On the back there are two cavities which echo those on the planks of Heta-User's coffin. Penetrating the front surface, there is also a dowel hole of larger diameter than all the others found on the plank.⁷ There appears to be the cut-through remnant of another large dowel hole on the damaged mitred corner of the plank.



Figure 16. Top section of an end board of a box coffin, from Garstang's excavations at Beni Hasan.
H. 10.5 x W. 40.3 x D. 1.5–2.5 cm. Garstang Museum, University of Liverpool, E7105
Image: © Julie Dawson

⁷ This could be part of a locking device for the coffin lid, sometimes seen on Middle Kingdom coffins. However, such systems normally have two holes side by side.



Figure 17. Back of Garstang Museum, University of Liverpool, E7105, showing the two cavities which resemble those on the panels of Heta-User's coffin. Image: © Julie Dawson