



Short reports and correspondence

Following in the footsteps of the pharaohs

Sir,

We were fascinated to read the article by Arnstein and Davison 'If the shoe fits', describing the manufacture of a prosthetic toe for a Nigerian lady, which was designed to fit onto a sandal.¹

This modern prosthesis is remarkable for its similarity to one of the earliest working prostheses to have been identified from the Ancient World.² In 1881, the British Museum acquired a group of miscellaneous antiquities from the Rev. Greville Chester, collected during his travels in Egypt. One was initially catalogued as 'Leather artificial toe for the right foot, nail wanting, from a mummy. 5 in. From Thebes' (Figs 1 and 2).

In fact, the material of this toe is not leather, but cartonnage—a composite material of linen impregnated by animal glue and gesso (for binding and setting). The overall appearance is similar to a modern day prosthesis; it has a smooth and tan-coloured coating which obscures the texture of the underlying fabric. X-ray diffraction analysis of the coating suggests

that it is composed of a mixture of calcite, dolomite, halite and quartz. Scanning electron microscope findings suggest that this material is crushed, dolomitic limestone, probably with a small proportion of ochre added to give the tan colour.

On the inner surface, a more red-coloured coating covers the cartonnage. Analysis by Fourier-transform infrared spectroscopy identifies this coating as a gum resin, possibly Dragon's blood gum. This is a dark red exudation from a palm and was widely used in the Ancient World as a red varnish. It has also been held in esteem for its medicinal qualities (which may or may not have been relevant in this particular case).

The toenail is lost, and the depth of the recess suggests that it was made of an artificial material such as faience, held in place by an animal glue.

The longer free edge of the toe, distorted by use, is pierced by a set of eight holes. It follows the line of a typical Y-thong sandal strap, which would have concealed it when in place. The shorter free edge of the toe is also pierced by four holes, which had been filled as funeral preparation, but in life, these would have been used for attachment as well—either by lacing around the foot itself, or by stitching directly to the sandal. This method of attachment would have allowed a certain amount of



Fig. 1—Cartonnage toe prosthesis for the right foot—view of the dorsum.



Fig. 2—Plantar view of the prosthesis.

flexibility when walking; the toe could move upwards when it came into contact with the ground but the prosthesis would then revert to its original position when this ground pressure was removed.

The coating on the toe is mostly well preserved, but on the outer top surface and the exposed upper right edge and along the inner surface, the coating is thin, showing evidence of wear. These findings suggest that this was a working prosthesis, and not just a cosmetic restoration by an embalmer to make the mummy whole for the afterlife. Nevertheless, its primary function would have been cosmetic. The size and colour suggests that the owner was male, and a person of considerable rank and influence, who desired, and could afford to achieve, physical perfection.

The actual circumstances of the find of the toe are uncertain, but it does appear to have been in position on a mummy. The type of 'single' yarn used on it, can date the toe to before 600 BC. It could conceivably, be earlier than this ceiling date by several centuries.

Nerlich has also reported the existence of a functional Egyptian prosthetic big toe dating from circa 1065–740 BC.³ This toe was wooden, and affixed by laces to the wearer's forefoot.

Arnstein and Davison's toe is constructed from modern materials—brass and silastic, but their design is astonishing in its similarity to the prosthesis we have described. This Thebes toe represents rare and early evidence for the use of artificial limbs, and predates other finds from Greek and Roman times. Significantly, like so much else in ancient medical science, limb prosthetics can now be shown to trace their origins back to Egypt.

Yours faithfully,

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References

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