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UNDER THE POTTER'S TREE

Studies on Ancient Egypt
Presented to Janine Bourriau
on the Occasion of her 70th Birthday

edited by

DAVID ASTON, BETTINA BADER, CARLA GALLORINI,
PAUL NICHOLSON and SARAH BUCKINGHAM

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ARTICLES IN HONOUR OF JANINE BOURRIAU

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Paul T. NICHOLSON

Introduction

I have very many reasons to be grateful to Janine Bourriau. It was at Janine's insistence that I gave my first conference papers, it was she who asked that I join the Memphis Project and she was one of those who helped to secure my first job — working on Egyptian pottery as part of a Leverhulme funded post. I have learned a great deal from working with Janine and I have thoroughly enjoyed the experience — she is a natural teacher and has done a huge amount to encourage research into ancient Egypt and particularly into Egyptian ceramics. Not for nothing are her pottery teams so popular with those who have worked for her.

In thinking what best to write for a volume dedicated to someone who is a world authority on Egyptian ceramics I decided that I should try to look at the technology of a class of pottery which both Janine and I agreed was "difficult."[1] This group comprises the saggars from my excavation at Kom Helul, Memphis.

Saggars

Saggars (also known as 'saggers') are a type of industrial pottery often, but not exclusively, cylindrical in shape and used to contain other pots or faience items during firing. They serve to allow complicated shaped pieces of ware to be fired in large numbers without touching against one another and so becoming damaged and they allow glazed items to be fired without the glaze becoming speckled with ash. The word "saggar" is believed to have entered into English in the 17th century AD and to be a contraction of "safeguard" which well describes their function.[2]

[1] I had by this time excluded the notorious 'Fine Green Ware'.

[2] The OXFORD ENGLISH DICTIONARY; 2nd Edition (Oxford, 1989) XIV:367 notes that it first enters English in 1696 as *schrager* perhaps an "etymological association with Ger-

Petrie found fragments of these saggar vessels in his excavations at Kom Helul, Memphis,[3] where they had been used for firing faience vessels. It was his thinking on these vessels, fragments of which he had first seen lying around on the surface at Memphis in the 1880s, which led him to mis-interpret similar cylindrical vessels at Amarna during his excavations there in 1891-2.[4] At Amarna he believed the cylindrical vessels he found were used as stands rather than saggars whereas more recent research suggests that they were usually in fact crucibles or moulds for casting glass ingots.[5] Had Petrie better understood the manufacture of these vessels rather than relying only on their shape he might not have made this mistake. The Amarna vessels are wheel thrown and show clear finger grooves on the inside of the base whilst the Memphis vessels are handmade. It is this difference in manufacturing process which inspired the research behind the present paper.

The Kom Helul (Memphis) Saggars

Petrie describes the Memphis saggars as "cylinder jars 10 inches wide and 7½ inches high. The body was of coarse brown and yellow pottery fusing to a dirty yellow green".[6] He further states that "The pottery to be glazed was stacked in saggars of cylindrical form. Two were found unused, 8 and 8½ inches wide, 5½ and 6 inches high. The largest sizes among the fragments of used saggars are 30 inches across and 8 high, another 19 inches across. The height was almost the same, whatever the diameter might be, because its limit was the height of the internal stack of glazed dishes…".[7] Note that the size of saggar recorded by Petrie varies between these two accounts and that as well as the small saggars in

man *schragen* to prop up; perhaps it may have been invented by the German workmen employed in the Staffordshire potteries."

[3] W.M.F. PETRIE, *Memphis I*, British School of Archaeology in Egypt 15 (London, 1909), 14; W.M.F. PETRIE, 'The Pottery Kilns at Memphis', in: E.B. KNOBEL, W.W. MIDGELEY, J.G. MILNE, M.A. MURRAY and W.M.F. PETRIE, *Historical Studies I* (London, 1911), 34-37; 35.

[4] W.M.F. PETRIE, *Tell el-Amarna,* (London, 1894) 26, W.M.F. PETRIE, *Memphis I*, 14-15.

[5] P.T. NICHOLSON, C.M. JACKSON and K.M. TROTT, 'The Ulu Burun Glass Ingots, Cylindrical Vessels and Egyptian Glass', *Journal of Egyptian Archaeology* (1997), 83, 143-153; P.T. NICHOLSON, *Brilliant Things for Akhenaten: the Production of Glass, Vitreous Materials and Pottery at Amarna Site O45.1*, Egypt Exploration Society Excavation Memoir 80 (London, 2007), 91.

[6] W.M.F. PETRIE, *Memphis I*, 14.

[7] W.M.F. PETRIE, The Pottery Kilns at Memphis, 35.

the 8-10 inch (20-25 cm) bracket there are others in the range 19-30 inches (48-76 cm). One of the unused saggars[8] is now in the Petrie Museum, London and has helped to contribute to the view that the saggars were generally of a smaller rather than a larger size.

My recent work,[9] on behalf of the E.E.S. at Kom Helul, has shown that there are in fact several saggar types but that they can be broken down into two broad divisions. A smaller type which, for convenience, is here referred to as type 3 and a larger one, type 12.

Type 3 has an average base diameter of 26.33 cm (10.36 inches) and an average height of 13.33 cm (5.25 inches).

Type 12 has an average base diameter of 55.79 cm (21.96 inches) and an average height of 26.12 cm (10.28 inches).

At first sight these measurements broadly confirm Petrie's observations. However, they also mask some important information. The smaller saggars tend to be made in a marl clay or a marl-silt mixture, they generally fire to a yellowish colour and are usually glazed on the inside and on their underside. The larger saggars are made from silt clay, often coarsely tempered and frequently have a thin whitish lining and up to 2.5 cm of powdered lime inside them. This is not the place to discuss their possible differing functions in detail but to examine their common feature: both groups are handmade.

Saggar Makers

In examining saggars from Memphis a range of questions come to mind: why are they handmade? How does this handmaking technique operate? Is Petrie correct in his view that their height is governed by the maximum height of the vessel stack inside them and that this is itself governed by the strength of the faience vessels when heated?

In an ideal world one would ask the makers of saggars how they went about their work and why they made the technological decisions they did. Whilst this is clearly impossible for the 1st century A.D. it is well known that saggars were still being used in the pottery industry in Britain well into the 20th century and the possibility for some (near) contemporary ethno-archaeology seemed to exist. With this in mind an attempt was made to locate saggar makers in Stoke-on-Trent, centre of the British

[8] W.M.F. PETRIE, The Pottery Kilns at Memphis, pl. xix:239.

[9] P.T. NICHOLSON, *Roman Faience Production at Kom Helul, Memphis* (London, forthcoming) (Provisional title).

ceramic industry. The author is grateful to the *Stoke Sentinel* for its help in attempting to find these individuals.

Only one saggar maker, Mr. Glover, was located. He had worked in this trade until 2000 and the trade itself continues to the present at *Dyson Ceramic Industries*. However, the method by which Mr. Glover produced saggars was "dry pressing" in which a mechanised press is used to compact ceramic powder to form the saggar. This gives a completely uniform, mass-produced, product. Such saggars are used today in the production of electrical insulators and for the making of kiln furniture.

Because of the move to cleaner fuels following the Clean Air Act of 1956[10] the need for saggars, which helped to protect the ware from smoke and dirt, was largely removed. The great "Bottle Kilns" of Stoke which once existed in their hundreds have now mostly been demolished. With the passing of the coal-fired kilns the traditional saggar making industry died out and the last of the makers of traditional saggars died in the last decades of the 20th century.

Fortunately there still remain individuals who worked alongside saggar makers or whose family were involved in the trade. There is also a remarkable 16 mm film *Mau'ing the Saggar* made in 1981 by Mr. Gerald Mee of *Stoke Amateur Cine Society* which records most of the process. The author was fortunate enough to have access to this film and to the much longer sound recordings which were later edited for the film's soundtrack and along with reminiscences from those who recalled saggar makers this information forms the basis for the reconstruction given below.

Hand-Making Saggars

One of the most interesting (and saddening) aspects of the current study is the realisation of how much knowledge has been lost of an industry which was still fully operational only 60 years ago. The account given below has been compiled from reminiscences and from archive film as well as published accounts, but these sources are sometimes at variance with one another and whilst this sometimes reflects differing practices between workshops it also indicates details of practices which are now lost to the historical and archaeological record.

[10] Her Majesty's Stationary Office; Clean Air Act 1956 (London, 1956).

Clay

The clay used to produce saggars was known in Stoke as "Saggar Marl" and was mixed with grog. To archaeologists grog usually means ground, fired pottery but in the pottery industry it can mean any aplastic material. In the case of saggar marl the grog often comprised pieces of brick, old saggar fragments and sand.[11] The proportion of grog to clay varied according to clay type but could be as high as three parts grog to two parts clay.[12] In recent times the clay was usually imported and according to Mr. Baggott who worked for *Wedgwood* it was imported to Stoke from many areas of Britain. However, he noted that in the 1770s one William Adams of Tunstall was fined for digging saggar clay from the road outside his factory. Local sources were confirmed by Mr. Glover who noted that marl was originally dug from a pit near *Hewitt's* works at Fenton but when this was exhausted it was bought in from outside.

According to the unused parts of the soundtrack recorded by Mr. Mee in August 1981 and spoken by the late Mr. Ralph Wheeldon,[13] the saggar marl was delivered to the factory six or seven tons at a time, usually as lumps of 56 lbs each[14] (25.40 kg). It was of two distinct compositions "side marl" which was used for the walls of the saggar and "bottom marl" used for the bases. Bottom marl had more grog mixed into it and the grog was of larger size than for the side marl. The six ton delivery would be divided into three tons of side and three of bottom marl.

The two types of marl were dumped on the workshop floor and each would then be "knocked with the mau'"[15] until it stood about waist high. At this stage most of the air would have been knocked out of the clay and the individual blocks would have been amalgamated into a single pile of side marl and another of bottom marl.

However, in times before pre-mixed clay was brought to the factory, the mixing of grog with clay was done on site. A layer of grog was spread on the floor, and on top of it a layer of ground clay, another of

[11] E.A. SANDEMAN, *Notes on the Manufacture of Earthenware*, 2nd edition (London, 1921), 202.

[12] E.A. SANDEMAN, *Notes*, 205.

[13] Mr. Wheeldon described himself in the film as one of the last four remaining saggar makers.

[14] Mr. Glover, a former maker of saggars by mechanical means, noted that pugs of clay were sent from the factory he worked in to others for saggar making in weights between 52 and 64 lbs (23.58 – 29.03 kg.). This refers to the period after which Mr. Wheeldon would have retired.

[15] Mau' is the local word for maul.

grog and so on "till the pile is 1 ft. 6 in. [45 cm] to 2 ft high [60 cm]".[16] It would then be "dug over" and sprinkled with water before being run twice through the pug mill.[17] Sandeman recommends that as little water as possible be used with the result that "it means harder work in making, but it also means better saggers".[18]

Making the saggar

Once the clay was prepared the first task was to work it on a bench. The bench was flat and had a metal frame which could be dropped over it (fig. 1). The bench was first wetted using a sponge and then sprinkled with sawdust until completely covered. Earlier in the 20th century, and before, sand had been used to sprinkle on the bench but health and safety considerations had led to the use of sawdust as it gave rise to less dust and so reduced silicosis.[19]

Individual slices of clay were now cut from the side marl pile, or "dump", using a tool known as a "grafter". This is a spade-like tool with a flat D-shaped blade, the curve of the D being uppermost and attached to the handle (or "stale"). These slices were cut to be only slightly thicker than the depth of the frame on the bench top. The slices were placed into the frame each running from the back toward the worker and each slightly overlapping the other by 1-1½ inches (2.54 – 3.81 cm). The grafter was used to trim off excess thickness in a process known as "fettling off" and then the slices (or "bats"[20]) were hammered down using the flat blade of the grafter such that the overlapped edges became compressed together and the whole sheet of clay was reduced to the thickness of the frame (fig. 2). The frame usually had only 3 sides, that nearest to the worker being open. It was not always necessary to fill the whole frame and the saggar maker used the grafter to trim the edges square where the frame was not completely filled as well as to trim the edge nearest to him. The normal depth of a frame was ¾ of an inch (1.90 cm). Sandeman recommended the same thickness though noting that it should be thicker for very large examples.[21]

[16] E.A. SANDEMAN, *Notes*, 205.

[17] A pug mill is a mechanical device for mixing clay. It produces a homogeneous mixture free of air. E.A. SANDEMAN, *Notes*, 205.

[18] E.A. SANDEMAN, *Notes*, 205.

[19] Mr. Simcock, personal communication.

[20] Note that this is a different use of the term "bat" than is common in ceramics manufacture where the bat is a disc of fired clay or plaster on which vessels are formed or moved.

[21] E.A. SANDEMAN, *Notes*, 206.

With this done, the edge nearest the saggar maker was thickened slightly with the fingers and the whole clay sheet again sprinkled with sawdust. A mau' was then used to strike along the clay, working across it horizontally, gradually moving in rows from back to front. The mau' itself was shaped like a warming pan and comprised a cylindrical head made from heavy oak through which the shaft or stale passes (fig. 3). The flat ends of the cylinder were used to hammer the marl. The mau' was kept in a bucket of water to keep the oak head damp and to keep the wood expanded so that the stale did not come off. This practice of soaking the mau' led to handles becoming rotted and causing accidents when they broke. By the time saggar making ended as a practice the wooden handles had been replaced by metal ones. The wetting of the mau' also meant that the clay and sawdust did not stick to it when used to hammer them down into the frame.

Mr. Wheeldon describes the action of "mau'ing in" as striking the clay and pulling sideways and forwards, in other words drawing the clay to the side of the frame and toward him. Each blow overlapped the previous one to its left or right (depending on the direction of mau'ing) and one or more of those above it. The marks from each strike were very clear (as visible in the film) and it was obvious to the worker where the next strike was to be.

Once the frame was filled the saggar maker took his measuring stick and marked the clay ready to cut into strips of the desired height for the wall. A rule, actually a wooden straight edge, was then aligned with the measured marks and struck so that it adhered to the clay whilst a blade was drawn through it to cut it into strips. The cutting was done with a tool known as a "splice". In recent times this tended to be an old hacksaw blade which had been bound with tape or otherwise given a handle (fig. 4). Mr. Wheeldon estimated that it took eight minutes to fill the frame, mau' it in and then cut out the sides.

The individual strips, still laying in the frame, were once again dusted with sawdust. A blade, known as a "running under stick" was drawn underneath the first strip of clay, that nearest the saggar maker, to loosen it from the bench and it was then rolled around a wooden drum (fig. 5). These wooden drums had a circular, oval or other shaped cross-section with solid top and base (save for a hand-hole). Their walls were built up from laths to give the overall shape. The drum is placed onto the clay and rolled along the strip rolling the clay strip around it.

Whilst this process was going on another worker, the "bottom knocker",[22] working at a separate bench would be using the bottom marl to prepare the base of the saggar. He too used a metal frame but this time it comprised the complete shape of the base (fig. 3). He used a single piece of clay somewhat thicker than the frame ring and hammered it to the correct thickness using the mau'. The film shows that the thickness of the base could be slightly greater than that of its frame.

The frame was then used to help to slide the finished bottom from the workbench onto a perforated metal plate known as a "shord".[23] Once on the metal plate the frame is removed and the plate carried over to the "wheelie",[24] a turntable on which the saggar will be completed (figs. 1 and 6). It took approximately three minutes to knock a bottom.

The drum with clay wall wrapped around it was now carried over to the wheelie and placed on top of the prepared bottom which was of slightly larger circumference than the drum and the wall ("side") wrapped onto it. The wall is now cut where the two ends met and moistened before being beaten back together. This was to ensure a strong join in the wall.

A small plank of wood about a foot or so long and soaked in water was used as a paddle to beat the walls of the saggar, helping the join, and further evening out the wall thickness. The wheelie was revolved during this process serving as spinning anvil in what was clearly a modern version of paddle and anvil work. The rim and walls were then moistened and the walls pressed against the bottom. The excess circumference of the bottom was then trimmed off using a piece of wood called a "peg" and the walls scraped upward using a "plucker" from the bottom so that they were fully joined. No distortion of the walls occurs because the wooden drum is still in place. A piece of wetted oak, a "rib" is then used to wet smooth the exterior of the walls before the drum was finally pulled upwards and out of the saggar. A "cant tool" is used to bevel the edges of the base.

A "topping stick" comprising a piece of board tapered to a handle at one end was used to tap across and around the rim to compact it and to

[22] Although less well paid than the saggar maker, the "saggar maker's bottom knocker" became immortalised for the British Public by a now famous episode of the quiz show "What's My Line?" (1951-1962), hosted by Gilbert Harding.

[23] It is tempting to see the etymology of this word as "sherd" and perhaps referring to a time when large fragments of saggar, perhaps discarded bases, were used as bats on which to form new vessels. Given that the local term for a pile of sherds, including saggars, is a "shordruck" such an origin is not impossible.

[24] E.A. SANDEMAN, *Notes*, 207 refers to these as "whirlers".

make sure that it was of the same height all around (fig. 7). A piece of strong tin,[25] a "topping tool" is also used in this smoothing process. The join between the walls and base inside the vessel has not hitherto been touched but was now scraped with a tool as the vessel revolved and wet smoothed.

Mr. Wheeldon explicitly pointed out that each saggar maker made many of his own tools from scraps of wood or metal. This helps to explain why it is so difficult to identify many craft tools in archaeological contexts — many of the tools were not standardised even if the processes for which they were used were.

The saggar was now almost complete. However, a final test was necessary. A flat board or "banner" was placed across the saggar and lifted off. The damp rim of the vessel left a ring on the board. If the ring was complete then the height of the walls was even and the job had been correctly done. A gap would mean a low spot on the wall. To ensure that the walls were even the board was given a slight tap as it was put in place. It took 6 minutes to fit a saggar together so the whole process would take 16-17 minutes to complete. However, since the bottom knocker worked alongside the saggar maker the total time would be reduced to 14-15 minutes and if frame fillers were employed (below) a further 6 minutes could be removed from this time giving 8-9 minutes to produce a completed saggar.[26]

The now completed saggar, still on its shord, was then carried into the "hot house"[27] to dry. After drying they would be taken to the "placers" who would put the new saggars at the top of a stack of filled saggars so that they could be fired. For this first firing they would be empty but could be used in subsequent firings.

At the height of the industry the saggar maker would have been accompanied by a frame filler who would prepare a frame for the maker whilst the bottom knocker produced bottoms keeping six or so ahead of

[25] Mr. Wheeldon used an old piece of metal from a *Coleman's Mustard* advertising sign.

[26] Mr. Wheeldon states on one of Mr. Mee's tapes that a full team (saggar maker, frame filler and bottom knocker) could make 100 saggars in a day. Allowing eight minutes per saggar this would be 800 minutes or 13.3 hours, longer than the normal working day in the post-war period. However, since each frame could produce enough sides for several saggars (six in the film) the actual mau'ing process might have to be carried out only once per half dozen saggars which would substantially reduce production time. At five minutes per saggar 100 could be produced in 8.33 hours. Working alone and making all parts of the saggar, as sometimes happened toward the end of the industry, a man could produce 30 saggars which at 16 minutes per saggar would add up to an eight hour day.

[27] Also known as a "Green House" because the vessels placed there were green-hard.

the saggar maker. Often there would be two frames ("double end frame filling") so that one would be being filled whilst the other was being mau'ed, cut and rolled onto drums. The reason for the bottom knocker having to keep so far ahead is that each frame could produce several sets of sides and a delay in producing the correct number of bottoms would interrupt the work. Since workers in the potteries tended to be paid a piece rate such delays were very unpopular with the saggar makers. In the case of saggar makers the piece was a score (i.e. 20) of vessels.

The above account is based largely on recollections by Mr. Wheeldon in the film and the unused soundtrack recordings made for it. However, what emerges from conversations with others is that there are areas about which even those who worked in the industry are unclear and which could have been clearly recalled only by those who were actually saggar makers. Amongst these was the question of why the saggars should be hand built. Explanations ranged from convenience, through size, to shape. The most probable explanation is that the saggars are not always cylindrical; indeed many used in the Stoke industry were ovoid and could not have been wheel formed. Similarly, their great thickness and the quantity of grog would have made them difficult to wheel throw, particularly as the base is made with a coarser clay than the walls. Whilst such joins between clay pastes are not unknown the combination of shape, size and coarseness all tend to favour hand building as does the weight of the vessels. Interestingly Sandeman[28] noted that "There have been many appliances tried for making saggers completely by machinery, but up till the present [i.e. 1921] they have not given sufficiently satisfactory results…and by far the greater number of saggers are still made solely by hand."

The reason for the height of the saggar is also difficult to determine. It seems that the base circumference is the most important factor as this determines the number of items which can be placed in the saggar. Deep, narrow saggars would have been difficult to fill and to empty, and unsteady to carry. Their weight would also have been very great. It therefore made more sense to produce vessels with a large footprint but with walls no more than about twelve inches (30.48 cm) high.

The question of what happened to completed saggars was also problematic. Several informants thought that they were dried in the hothouse and then used straight away, whilst others thought that they might have been fired empty before use — as was in fact the case. The reason why

[28] E.A. SANDEMAN, *Notes*, 207-208.

an empty firing was not thought possible by some informants was that they believed that the saggar could be used only once because after a firing the clay had become so densified that it might vitrify and collapse if further used. In fact it seems that saggars were usually used several times before becoming damaged[29] at which point they would be discarded on a "shordruck" — pile of thrown away sherds from saggars and of pottery which had been broken in manufacture. Such shordrucks were a feature of the potteries until recent times. Sandeman[30] estimated that in his time a 7% loss of saggars in biscuit firing and 6% loss in glost firing was normal.

Comparison with the Memphis Saggars

Both main types of saggar found at Memphis are hand made. The larger ones, normally type 12 in the recording system, clearly had their bases and walls made separately (fig. 8). There does seem to be some evidence to suggest that the bases are often more coarsely tempered than the walls but this feature was not noted in initial recording and the difference between the two, where it exists, seems relatively slight.

The process seems to have been to make a disc of clay — the Memphis examples are almost invariably round — though this may not have been done in a frame. Many fragments of base are thicker toward the centre than around the edges, suggesting that they were scraped downward from the centre. They were worked on a flat surface which was dusted with chaff or other plant material rather than with sawdust, but the effect was the same, it prevented the clay from sticking. The impressions of the chaff material are clearly visible on the undersides of the vessels.

Just inside the circumference of the disc a shallow groove may have been made into which to seat the wall of the vessel. The impression of the groove is accentuated on many actual fragments because the clay from the interior of the base and the part of the disc protruding outside the wall have been drawn up, as in the modern examples, to help fix the base to the walls. This may in fact entirely account for the groove but on some vessels it seems to be so marked as to have been deliberately made. The joining of bases to walls seems to have been less well done on the ancient examples than on the modern ones since there are many examples where the wall has broken cleanly away from the base.

[29] E.A. SANDEMAN, *Notes*, 204.
[30] E.A. SANDEMAN, *Notes*, 211.

The making of the walls themselves may follow the same kind of procedure as that employed in Stoke. The exterior of the vessels excavated is often clay covered and vitrified, but where it is not there are traces of chaff impressions where the clay has been rolled out on a bench dusted with chaff to prevent sticking. The interior of the vessels is usually much better preserved and can be very smooth save for chaff impressions. It was initially believed that this smoothness came from pressing the clay between boards but it is much more likely that it derives from wrapping the clay walls around a wooden drum, as in the Stoke industry. Whilst no examples of such drums have yet been found their existence seems highly probable.

One difference between ancient and modern practice seems to be the joining of the walls to the base. The practice in Stoke was to cut away the excess circumference of the base to leave a join which was virtually right-angular on both outside and in. However, at Memphis it seems that the clay was scraped up the walls outside and perhaps only a small excess removed so that the bottom of the wall, where it meets the base, can be quite thick. The join on the inside is sometimes a right-angle but on other occasions slopes somewhat toward the outside.

Whilst the interior walls of most of the Memphis type 12 saggars are very smooth some have traces of faceting. These facets suggest that either the drum used on these examples did not have a very smooth profile or — perhaps more likely — the smoothing of the base into the walls was continued up the walls to leave corrugated facets (fig. 9).

The finishing of the walls of the Memphis saggars also differs from their modern cousins in that although attempts have clearly been made to ensure that the wall height is equal all round the circumference, it does not seem to have been tested using a banner. There are two reasons for this observation, first that the wall heights are somewhat uneven and second that the rim of the vessel has a groove around it which would be deformed if it were struck with a banner board. It may be objected that the rims may have become uneven as a result of deformation during use, and this is certainly true — some have become hugely deformed — but it is unlikely that noticeable yet minor deformity would occur on so many. I would suggest that the height was determined simply by cutting the strip of clay for the walls carefully and then by roughly checking it with a stick.

The groove running around the top of the walls is also significant and may help to confirm that the wall heights were not so carefully monitored as at Stoke. The groove is apparently made by running a finger

around the top. The grooves can be very marked or barely visible and must depend upon how soft the clay was when this, probably the last stage in the process, was carried out.

The groove around the rim seems to have been made to receive a strip of wet clay put onto the top of the saggar before it was used and which served to seal it to the saggar placed above it. This strip of wet clay — which we have called a "saggar joiner" would ensure that there was a good seal between the saggars and so prevent ash entering them and would also serve to remove the effect of any slight irregularities in wall height around the circumference of the vessel. This may be further evidence to support the view that a banner was not used. According to Sandeman[31] this strip of clay is known as a "wad" and was widely used in Europe both in firing biscuit ware and glost ware. The edges of the saggars were brushed with "calcined bone slip"[32] to prevent them sticking together when the wads were in place. In Britain wads were not widely used and noticeably not for biscuit firing; instead handfuls of sand were rubbed around the join between saggars. Sandeman noted however that "If the two systems are dispassionately discussed, the advantage will be found to be all on the side of the foreign system".[33]

The completed saggar was presumably moved from its place of manufacture, which may have been the ground rather than a bench, to dry. Many of the vessels found have a slightly domed underside, the outer circumference sitting well on a flat surface but the middle being raised somewhat. This is the opposite to what one might expect were it an effect of use — the heating and weight in the saggar would, if anything, tend to cause the base to slump slightly making the underside convex rather than concave. It might therefore be suggested either that for manufacture the bases were set on wooden discs or boards which were slightly convex or that they were placed to dry on ground which had been formed into slight mounds.

The suggestion of a mounded drying ground does not at first seem likely. However, given that saggar making would have been a large scale and daily task it is certain that drying areas for the workshops must have existed. Sandeman[34] stated that "it is very necessary to have a large stock of saggers in order to always have suitable sizes…". All those potters observed in Egypt today dry their wares on the ground, sometimes set-

[31] E.A. SANDEMAN, *Notes*, 219-220.
[32] E.A. SANDEMAN, *Notes*, 221.
[33] E.A. SANDEMAN, *Notes*, 220.
[34] E.A. SANDEMAN, *Notes*, 203.

ting round-based vessels in pre-prepared depressions to stop them rolling away. The vessels observed are mostly fairly small and easily picked up by the rim or handles to be carried but type 12 saggars are very large and have no handles. They are also heavy. Based on calculations from a saggar of 70 cm diameter (the base disc of which alone weighs 21.8 kg) and with wall height of 28.5 cm the weight of such a vessel would be 53.3 kg. A perfectly flattened drying area would soon become uneven as workers tried to pick up saggars by pushing their fingers underneath them or sliding a board beneath. Perhaps better then to have an area of very slight mounds on which the vessels could sit and from which they might more easily be removed?

Conclusion

It is apparent that a great deal can be learned from the comparison of relatively recent industrial practice with that employed in ancient times. It is sobering to realise that in less than a century, knowledge of traditional industrial practices has already started to be lost, and aspects of it may never satisfactorily be recorded. It is incumbent upon those interested in traditional crafts to record them in as much detail as possible wherever they exist — including among factory workers in their own countries. Not all ethno-archaeology need be exotic to have value.

Acknowledgements

I am grateful to the *Stoke Sentinel* for carrying a piece on my request for information on saggar making in their issue of October 7th, 2009 and putting it on their website. This resulted in calls from several people in Stoke who were kind enough to share their experience of saggar making and use. I am particularly grateful to Mr. Baggott, Mr. Berks, Mr. Boardman, Mr. Boulton, Mr. Glover and Mrs. Fiona Purcell.

Mr. Gerald Mee was kind enough not only to provide me with a copy of his excellent film *Mau'ing the Saggar* (1981) but to let me hear the several hours of audio tape prepared for the sound track but not used in their entirety. These contained valuable information in addition to the film. Mr. Gordon Simcock was generous enough to loan me several books on the ceramic industry which have proved very useful. Mr. Boulton showed a series of pictures of his father at work which had been taken by Mr. Donald Morris. Mr. Morris kindly provided high resolution scans of some of his photographs of saggar maker Fred Boulton at the

Burgess and Leigh potbank, Middleport in 1964 and has allowed their reproduction here. I am also grateful to the Gladstone Pottery Museum for allowing me to reproduce figure 1 here.

In Egypt I am grateful to my excavation team, particularly to Hendrikje Nouwens and Joanne Hodges both of whom helped to process the large quantity of saggar sherds. Hendrikje also helped with the data entry for this. My partner Cerian Whitehurst helped with the database for the ceramics and ran the preliminary queries on which parts of this paper are based. Dr. David Jeffreys assisted with many aspects of the work at Memphis and first introduced me to the site at Kom Helul with the suggestion that I should eventually excavate it. To Janine I owe the opportunity to have worked at Memphis and try to understand something of its pottery.

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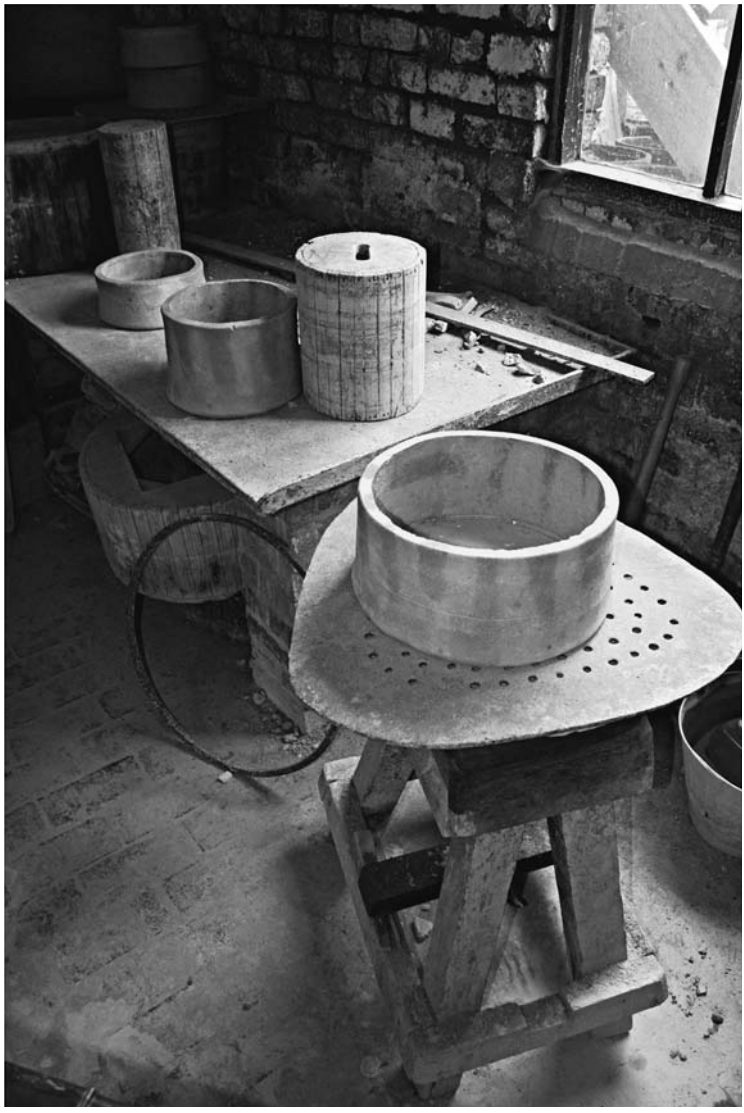

Fig. 1. The saggar maker's workshop at the *Gladstone Pottery Museum* Stoke-on-Trent (formerly the *Gladstone Pottery*). In the background is the saggar maker's bench, a metal frame runs around the back and two sides of it. In this exhibit a "saggar drum" and two finished saggars stand within the frame. A circular frame used for making saggar bases leans against the leg of the bench. The "wheelie" is in the foreground and has the perforated metal plate ("shord") used to lift saggars on top of it. A completed saggar stands on the plate. (Photo: P.T. Nicholson, Reproduced by courtesy of the *Gladstone Pottery Museum*).

Fig. 2. Mr. Fred Boulton using the "grafter" to flatten down individual stips of side-marl into the frame. It would then be beaten using the mau'. Photographed at the *Burgess and Leigh* Factory, Middleport 1964. (Photo by and reproduced courtesy of Mr. Donald Morris).

Fig. 3. Mr. Fred Boulton using the wooden "mau'" to flatten bottom-marl into a circular metal frame used for making the saggar base. The mau' is also used to flatten side-marl. Photographed at the *Burgess and Leigh* Factory, Middleport 1964. (Photo by and reproduced courtesy of Mr. Donald Morris).

Fig. 4. Mr. Fred Boulton using a wooden straight edge — "rule" — and blade to cut strips of side-marl to the appropriate width ready to be rolled onto a wooden drum. Photographed at the *Burgess and Leigh* Factory, Middleport 1964. (Photo by and reproduced courtesy of Mr. Donald Morris).

Fig. 5. Mr. Fred Boulton rolling a strip of side-marl onto a wooden drum. Photographed at the *Burgess and Leigh* Factory, Middleport 1964. (Photo by and reproduced courtesy of Mr. Donald Morris).

Fig. 6. Mr. Fred Boulton has placed the drum covered in side-marl onto a ready knocked bottom on the "wheelie". The hand-hole in the top of the drum is clearly visible. Photographed at the *Burgess and Leigh* Factory, Middleport 1964. (Photo by and reproduced courtesy of Mr. Donald Morris).

Fig. 7. Mr. Fred Boulton using a topping stick to finish the rim of the saggar. The vessel is still on the "wheelie". Photographed at the *Burgess and Leigh* Factory, Middleport 1964. (Photo by and reproduced courtesy of Mr. Donald Morris).

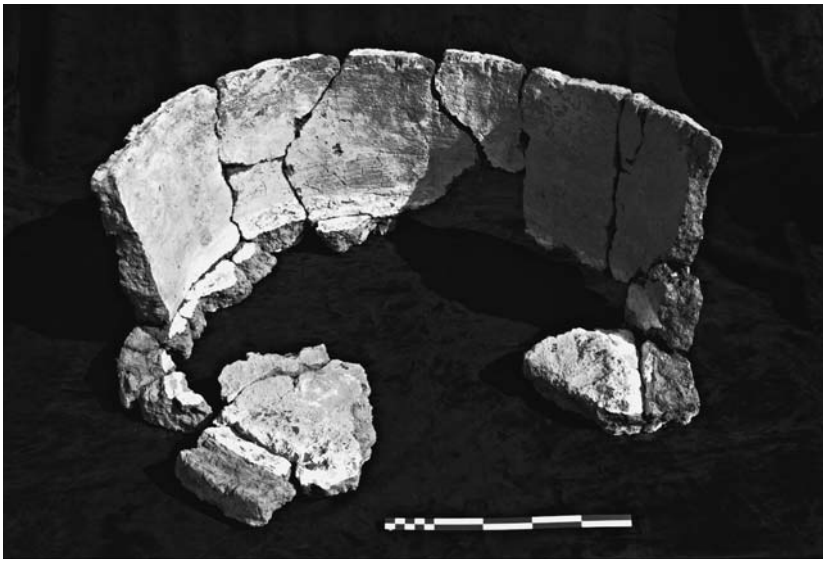

Fig. 8. Saggar IM-144 from Kom Helul Memphis.
(Photo: P.T. Nicholson. Reproduced by courtesy of the E.E.S.).

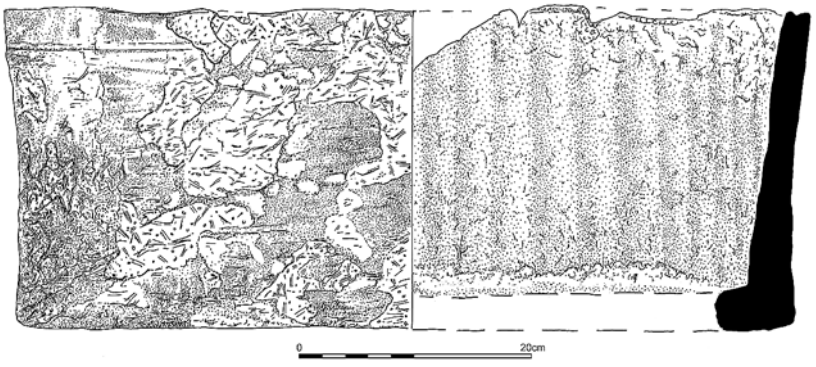

Fig. 9. Saggar IM-220 from Kom Helul Memphis.
The facets on the interior are clearly visible.
(Drawing: Emily Stewart. Reproduced by courtesy of the E.E.S.).