

CHAPTER 1

REPORT ON THE 1986 EXCAVATIONS WORK INSIDE THE WALLED VILLAGE (1): SOUTH-WEST CORNER

Site supervisor: Ibrahim M. el-Saidi

During the previous season, of 1985, excavation was resumed within the Walled Village, with great success. The basic intention had been to enlarge the sample of material for better comparisons with material from outside, but the two areas chosen had provided unexpected results. Gate Street 8 had proved to be much better preserved than expected, whilst the site of West Street 1, in the south-west corner of the Village, had revealed a departure from the anticipated plan of repeated houses of identical size. It was therefore decided for 1986 to devote half of the excavation resources to the interior of the Village to follow up both of these results. The neighbouring house to Gate Street 8 was selected, house no. 9, in the hope primarily of adding to the structural evidence; in the south-west corner the priority was to determine the extent of the variation in the expected plan.

1.1 The south-west corner of the Village: general layout

By the end of the 1985 season a rectangular area had been cleared down to the top of the ancient deposits and a detailed plan made (AR III: 30, Figure 1.16). This showed that the south-west corner had been left as an open space measuring about 5.50 metres north-south, except for a row of small rooms or courts built against the face of the southern wall. The area had slowly filled with dusty rubbish, and before abandonment the two westernmost rooms had been demolished. It was hoped to remove the various filling deposits, and a start was actually made in Area i. However, this was not accorded a high priority, since both the plan and history of this general area had been already established. By the end of the season little progress had been made, so that the plan already made and published remains the final excavation plan for this part.

The first priority was to explore the ground northwards, to establish why the principal east-west wall found in 1985 did not lie on the line of an expected house division. The northern half of the "West Street 2" plot was therefore opened up. As the excavation revealed that this was a possible annexe to a house lying yet further to the north, the next plot, West Street 3, was also included within the scope of the work. The excavation of these buildings took until almost the end of the season, by which time the general layout had been satisfactorily clarified. West Street no. 3 is a house of standard size, but also possessed half as much ground again on the south side, in the form of a narrow annexe. The north wall of West Street 3 falls on an expected dividing line between houses, and it is clear from looking at the disturbed surface of the ground that beyond it to the north lie the five houses of normal plan that are required to fill the gap between our own excavations and those of the 1920s.

With such time and resources as remained the next priority was to examine the ground eastwards, paying particular attention to the second gateway in the Village Enclosure Wall which Peet and Woolley located in this sector. In the event a 6.5-metre length of the Enclosure Wall which took in the gateway was re-cleared and planned in detail. But for the surrounding area it was possible to make only a limited exploratory trench and to clear sand from around the upper level of the stone wall. The results were planned at a small scale (Figure 1.1).

The detail plan of the length of Enclosure Wall cleared is given in Figure 1.2. It runs in from the east [2751] with a width of 71 cms., and then originally turned a corner to continue northwards [2703] at the same width. As had been noticed in the first excavation (Woolley 1922: 50, 60; COA I: 53), the western sector of the town was an addition to the initial rectangular village of four streets. The plan of the brickwork (Figure 1.2) reveals this, and also that the Enclosure Wall, when subsequently continued westwards, was done so at the slightly greater thickness of 87 cms. It was in this new part that the second gateway was constructed. The gap in the brickwork measures 1.18 metres across, compared to 1.75 for the main gateway. The main gateway had been paved with a stone threshold which had been left in place along with an area of paving made from natural boulders (cf. COA I: 67, Plates XVI, XVII.2; AR I: 12, Figure 1.4).

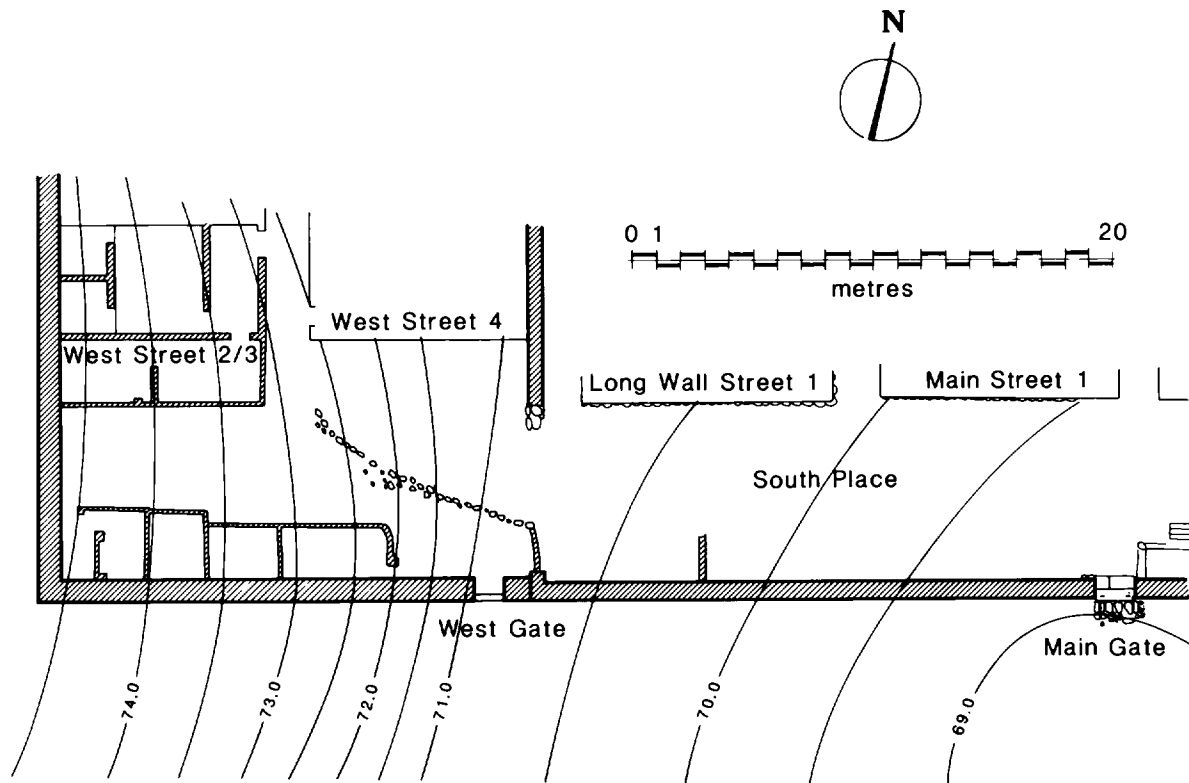


Figure 1.1. Outline plan of the south-west corner of the Walled Village. The contours are those of the original ground surface, and are partly reconstructed.

The side entrance had not been so solidly constructed. A patch of organic debris [2732] showed that much of the gateway had not been floored at all: the debris had accumulated on the desert. Across the outer line a threshold had originally been laid, its ends bedded into holes cut into the flanking walls [2733]. The threshold had not survived (possibly it had been made of wood), but it had been laid on a bed of mortar [2746] and this was found in good condition. The archaeological record is, on its own, quite straightforward. It does not, however, quite agree with what was reported in the 1920s. The *COA I* account in one place (p. 67) reads: "The outer doorway in the east (*sic*, read west) annexe has been blocked with stone, and a midden, kept in place by a rough stone barricade, formed over the whole". In another place (p. 54) the gateway is said to have been "roughly bricked up and a breast-high wall of uncut stones was thrown up anglewise..., to form a regular pen: the cattle stayed on there, and rubbish was flung into the empty space", and this is what Newton's plan (Plate XVI) actually shows. Its position does not coincide with the line of the threshold, however. It crosses the middle of the doorway. Newton was a careful planner and this element on his plan cannot be dismissed. It is marked in broken line in Figure 1.2 and given the unit no. [2747]. However, contrary to the sequence stated in *COA I*, this blocking wall must have been put up at the very end of any kind of serious activity in the vicinity. The build-up of the "midden" is still represented by unit [2732] inside the gateway, with no sign of the disturbance which would have arisen from the removal of a wall against which it should have accumulated. The blocking wall must have been built on top of this deposit after accumulation had ceased, and removed in or after Newton's time at the site leaving no trace whatsoever. Since its removal a good part of the organic fill has been dug away, now represented by the cut [2749]. The value of establishing this sequence is that it turns West Gate into the regular access to the open space in the south-west corner of the Village, and probably to West Street as a whole.

The "breast-high wall of uncut stones" still remains, deeply buried in sand. Enough of the sand was cleared to enable its general course to be included on the plan of this area (Figure 1.1), and its junction with the Village Enclosure Wall appears in the detail plan (Figure 1.2). At this

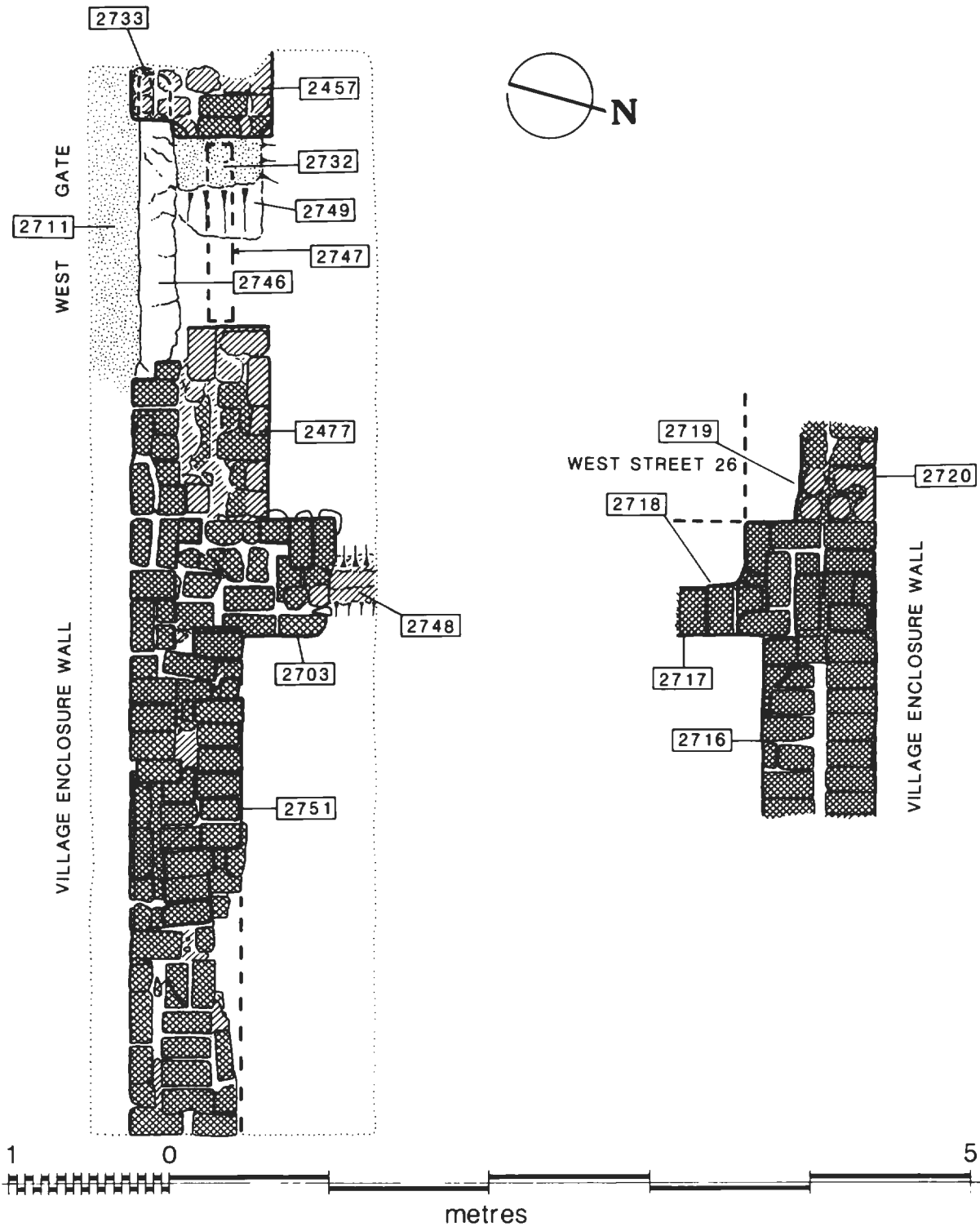


Figure 1.2. Detail plan of two sections of the Village Enclosure Wall; left: part of the south wall in the vicinity of West Gate; right: part of the north wall, at its junction with the Village dividing wall.

point all that survives is the mud plaster foundation [2748]. It would have been useful to have found a formal termination of this wall at its western end. Newton shows it stopping at a point on line with the eastern side of West Street, and the present spread of stones still more or less does

this. The question of whether a gateway which could be closed ever joined the end of this wall to the eastern end of West Street 2/3 was left unresolved, although without a closure at this point the value of the stone wall would have been less.

A short stretch of the north Enclosure Wall was also cleared, at the point of junction with the north-south dividing wall. In the plan (Figure 1.2) the incoming wall from the east [2716] belongs to the initial laying out of the Village, when this part was the north-west corner, the wall turning through a right-angle and continuing southwards [2717]. Subsequently the Village was enlarged by the construction of West Street, and the north wall was therefore continued westwards [2720], though at the same slightly greater thickness as occurs in the south and west sections. Wall [2717] now became a dividing wall within the Village. A house, West Street 26, was next constructed in the corner between walls [2717] and [2720], and to achieve a slight increase in space the surface of both walls was cut back to form shallow alcoves [2718, 2719].

1.2 The house West Street no. 2/3: the south annexe

The excavation of this narrow area (Figure 1.3) involved the removal of a considerable quantity of loose sand over both the western half [2096, 2097, 2103] and the eastern half [2172, 2106]. With the former the depth of this deposit reached 1.5 metres, and also contained within it a lens of grey redeposited organic material [2102]. Once cleared the pattern of the expected modern robbing of the site was clearly revealed. A trench of about 60 cms. width had been dug along the side of the north wall for its whole length. As it cut ever more deeply into the drift sand on the west a rough retaining wall of mud bricks had been thrown up to keep the sand back. The diggers of this trench had also managed to slice off the top of a quern emplacement as they went. Having got this far, the whole of the rear part of the annexe, Area viii, had then been turned over. They did leave, however, a small floor area in Area viii, and much of the lower deposits in Area ix, untouched.

The first result that can be salvaged concerns the roofing of the annexe. Some mud roofing-fragments occurred throughout the loose fill units, but because of the modern disturbance their direct value for this particular area is not very great. The pattern of collapse of the southern wall [1781] can be reconstructed. The eastern half, which borders Area ix, fell inwards, to the north, and much of it was found still *in situ*. The western half, however, had apparently fallen outwards, to the south. Patches were found last season (AR III: 30, Figure 1.16, units [2029, 2047]), but much had been removed by the digging of another robbers' trench also lined with a brick wall [1780]. This outward collapse explains why no rubble was found over the intact portion of the floor in the south-east corner of Area viii. Neither of these two areas of rubble was accompanied by a concentration of roofing-fragments. From this we can conclude that it is very unlikely that either part of the annexe had a solid roof. Since the rear part, Area viii, corresponds to the Front Room of the common design for Walled Village houses, this strengthens the case for regarding these front rooms as having often been more or less open to the sky, serving in effect as a forecourt (see AR III: 19, and below, section 3.4). The slight qualification in this statement arises from one notable feature of the excavation here: the numbers of pieces of matting. Several were found last season in the open area to the south, lying directly on the surface of the organic fill [2042], as if blown there. Three more pieces were found this year lying together in the southern part of Area ix [2638] (Figure 1.4). They were covered by a thin layer of reeds [2116], and sealed by the collapsed rubble [2109]. This amounts to a fairly reliable statement that Area ix was roofed with mats and then a layer of reeds bound with string, laid over a framework of light poles, but without the thick covering of mud which created the solid heavy roofs which also required much thicker and more robust timbers for support. The remains of similar light roofs or awnings were found by Peet and Woolley in some of the streets of the Village (COA I: 67-68). This light roof over Area ix must have remained in place until after the Village was abandoned, for some of the matting subsequently blew south and came to rest on the organic fill of Area vi of West Street 2 after its accumulation had finished.

The western part of the annexe, Area viii (c. 2.5 x 3.5 metres), had resembled many of the front rooms of the normal village houses. An outer (eastern) part had been paved with rounded boulders [2750], and a dark organic deposit [2708], probably animal dung, had filled up the interstices (cf. COA I: 60; AR III: 19). The presence of animals is indicated also by the finding of

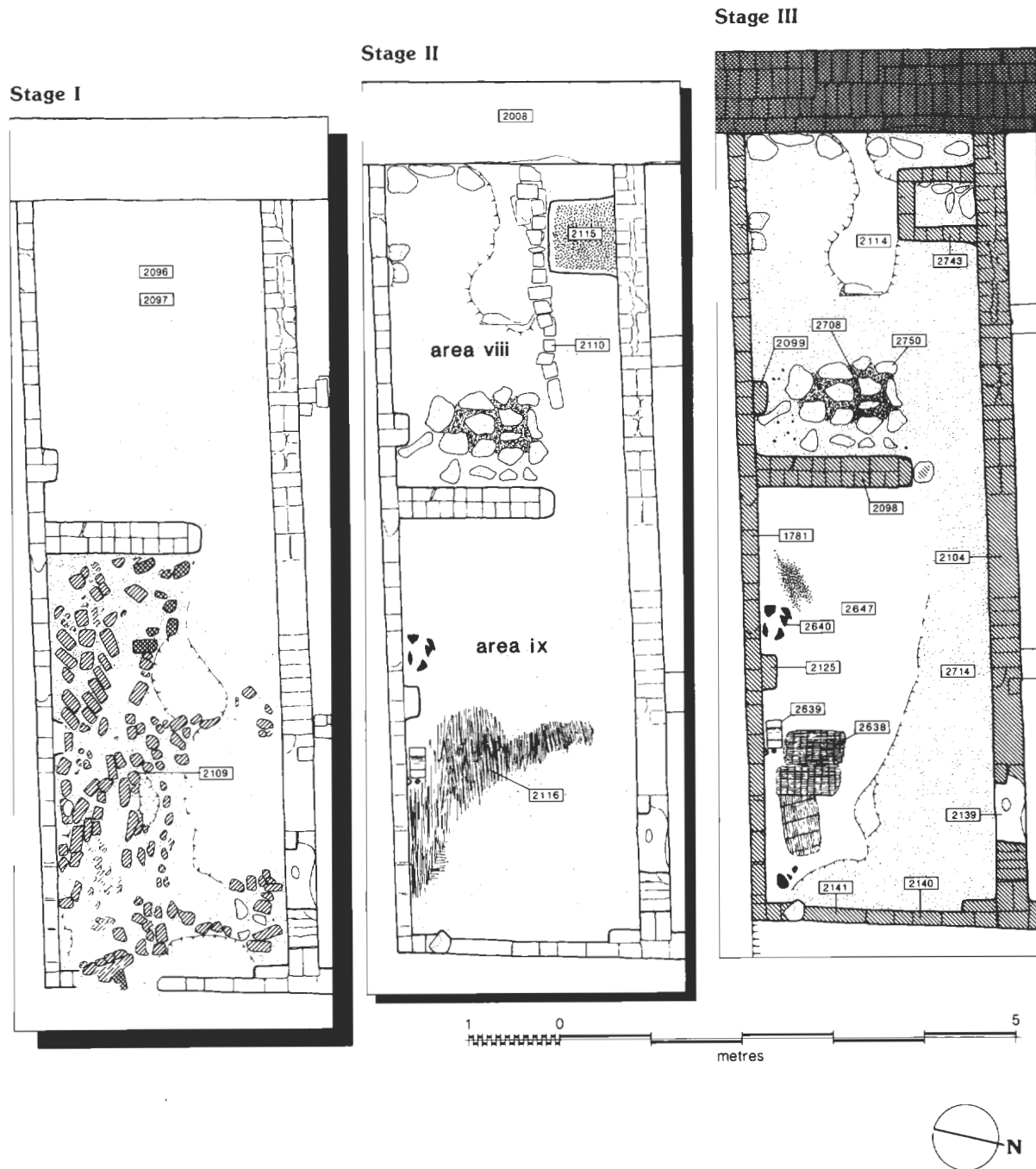


Figure 1.3. Plans of three successive stages of excavation of the south annexe to West Street 2/3 (originals by I.M. el-Saidi).

two limestone feeding-troughs in the loose sandy fill [2096, 2097] of this area. The western part had been given a smooth mud floor [2114] at a slightly higher level. A quern emplacement of the standard kind (AR III: 3-5) occupied the northern part, built against the dividing wall with West Street 3. Only the base of the central box-like support for the quern survived [2743], but the adjacent wall [2104] bore clear traces of the characteristic profile of these emplacements [2744], with an area of white gypsum plastering [2745] above, another commonly associated feature.

As with the brick support found last year in house Gate Street 8, this one had been partly filled with a layer of grey ash [2115] over a layer of sand [2117]. This raises a question of coincidence. For a third example can be quoted: from the 1973 University Museum of

Pennsylvania excavations at a small village site at Malkata.¹ This one was more badly damaged, but the deposit of ash within the quern pedestal was clearly defined, and this time associated with blackening of the walls. A deliberate act is thus invoked, which we can explain as a simple disinfecting process of that part of the structure immediately beneath the quern stone, the surrounding area being treated for the same reason with gypsum plaster. This is a significant discovery, for it alters one of the basic identifications of the Peet and Woolley report. They saw one of the standard features of the houses, particularly common in the Front Room, as "square hearths or open fire-places quite distinct from the ordinary cooking hearths. They were built just like the mangers and sometimes could only be distinguished from those by the presence of ashes on them or by the blackening of the wall above them" (*COA I*: 61). Some of their own illustrations (the photograph in Peet 1921: Plate XXVII.2; the sketch elevations in Newton's section in *COA I*: Plate XVI which show the characteristic sloping profile; the drawing in *ibid.*, 77, Figure 11, discussed in *AR III*: 3) as well as numerous references in the individual house descriptions to the white plastering around them seem to leave no doubt that features described as hearths and having a characteristic double-enclosure plan are, in most cases, quern emplacements. The notes on individual cases in *COA I* do add one useful fact. Not only was ash laid under the quern stone itself, from time to time a more radical disinfection was carried out by lighting a fire on the emplacement itself. This aspect of ancient hygiene is discussed in an Appendix by Robert Miller at the end of this chapter.

In the loose sandy fill of this area [2096] a limestone mortar was found, which logically would have stood close to the quern emplacement. This means that the mortar found built into the Front Room of the main house was an additional separate one.

Much of the floor deposit of the eastern half of the annexe, **Area ix** (c. 2.50 x 4.60 metres), was found undisturbed (Figure 1.3). The rubble and the remains of the light roof lay on a mud floor [2647]. Also on this floor, against the south wall [1781], were sherds from a pottery storage jar [2640], and a limestone beam-end holder [2639], partially secured in place by a vertical wooden peg against one side (Figure 1.4). These limestone objects have been found before, both by the current excavations and also by those of the 1920s. They tend to come in pairs, and in fact a second example occurred in the loose sandy fill [2097] above **Area viii**. The original explanation that they were to help anchor "the bed-beam of an upright loom" (*COA I*: 60-61) seems still to hold, and since they were usually found in association with the front rooms of the standard houses this particular discovery in West Street 2/3 again shows how the side annexe of this house is really equivalent to the front part of a normal house.

1.3 The house West Street no. 2/3: the house proper (Figures 1.5 and 6)

The pattern of modern disturbance over the area of West Street 3 was similar to that in the annexe on the south, in that the greatest intensity of effort and thus the greatest destruction had been reserved for the deepest deposits towards the rear of the house, and the robbers had aided themselves in a methodical approach by building brick partition walls to enable areas of floor to be better exposed. However, much of the original deposit had been left in the Front Room.

West Street 3 has the normal subdivision into three main parts. In the following sections the results of excavation of each part will be summarised.

Front Room (c. 4.50 x 2.40 metres). This had been built anciently without internal partitioning, the reason being that the south annexe housed separately some of the functions that in other houses were crowded into this space. The cover of loose sand [2108] lay above a deposit of rubble containing many broken brick fragments and roof remains. A table of roofing fragments is given as Table 1.1. It reveals the presence of probably two roofs, one of reeds and grass laid over poles, the other of closely set poles, both of them laid over beams and made solid with a cover of mud. A few of the fragments were smoke-blackened. One might have expected less variety, but it has to be remembered that the wall which divides the Front and Middle Rooms was reduced to a height of about 90-95 cms. That this was a result of ancient early collapse rather than of very prolonged weathering is suggested by the preservation of the painted bricks discussed in Chapter

¹ Publication forthcoming.



Figure 1.4. Limestone beam-end socket [2639] and supporting wooden peg in Area ix of the south annexe. Note the pieces of fallen matting in the foreground.

2. Consequently part of the roofing material could have entered the Front Room from the collapse of roof and wall in the Middle Room. This situation is rather different from that in Gate Street 8, where preservation of the walls must have prevented lateral spreading of material from individual rooms.

The deposit, which had been burrowed into from the east by modern robbers, was removed as two adjacent units, [2123] and [2128]. Amidst the rubble of both were a few fragments of brick with wall plaster still bearing the remains of a painted outline design and an artist's grid. This is described in Chapter 2. The fact that they were found in the Front Room does not preclude the equally valid possibility that they come from a scene painted on the east wall of the Middle Room, which had collapsed eastwards. Unfortunately, the complete loss of the original fill from the Middle Room has removed the option of observing directly the amount of rubble which had accumulated against this wall on this side. The removal of the fill of the Front Room revealed a largely open floor space bearing the remains of two superimposed thin mud floors [2648, 2649],

1986 excavation

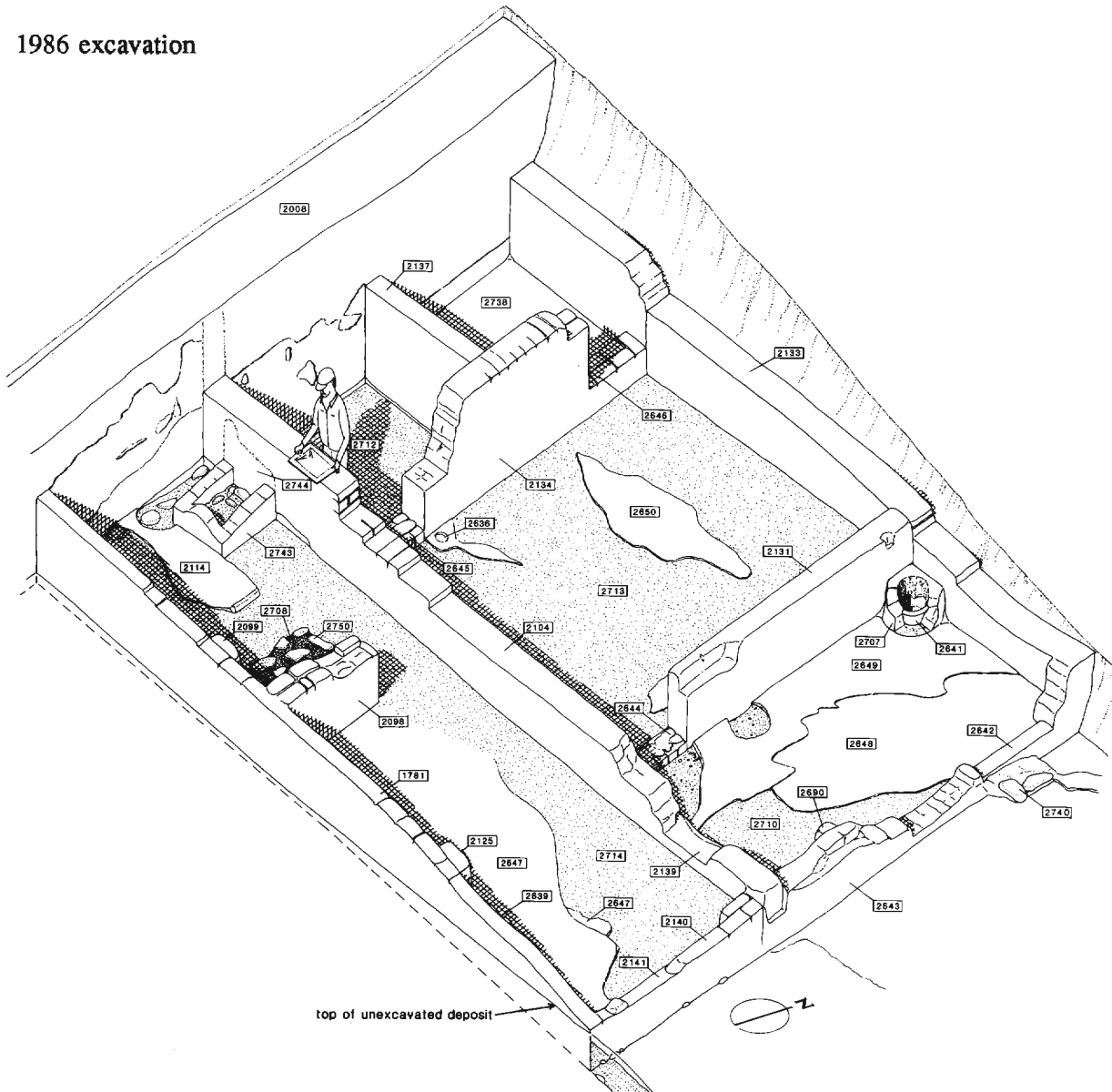


Figure 1.5. Isometric drawing of West Street 2/3 at the conclusion of the excavation (after plans, elevations and spot heights by I.M. el-Saidi).

units	beams	poles	reeds	loose grass	grass bundles
[2123]	11	10	?1	6	0
[2128]	9/10	4	3	11	0
Totals	20/21	14	3/4	17	0

Table 1.1 Numbers of roofing fragments by units and types in West Street 3, Front Room. Unit [2123] is the southern half, [2128] the northern half.

and two constructional features: a small projection of mud brick [2690] on the east, surrounded by a deposit of ash [2127] and of uncertain purpose, and a limestone mortar [2641] set in place in bricks and mud plaster in the north-west corner (Figure 1.7). This is the kind of mortar used



Figure 1.6. General view of the main part of West Street 2/3, looking west at the conclusion of the excavation.

anciently for the initial crushing of grain prior to grinding,² often let into the floor (as in Gate Street 9, see Figure 3.1), but here carefully built into a corner to be above floor level. The separation of the mortar from the quern, both occupying two distinct rooms, is unusual though not unique at the Village. However, this disassociation is probably misleading. For, as noted above, a second mortar was found in the loose disturbed fill [2096] of West Street 2, Area viii. This presumably had originally stood beside the quern, and the one in the corner of the Front Room was a second example.

Three doorways led off from the Front Room: the main entrance to the street, reached by means of a low step [2740]; the doorway into the annexe, up a step [2139] and originally across a wooden threshold in the south wall; and the doorway into the Middle Room, again up a step

² Cf. COA I: 64-65, Plate XVII.5, 6; Winlock 1955: 28, Figures 22, 64, 65.1.



Figure 1.7. The mortar emplacement in the north-west corner of the Front Room of West Street 2/3, looking north-west.

[2644] to a higher floor level.

Remaining rooms. Robbery in the three remaining rooms had been very thorough, leaving little structural evidence behind. The Middle Room (c. 4.50 x 3.50 metres), when cleared of its fill and two modern partition walls, was found stripped down to patches of floor [2650] without trace even of the normal bench or dais, although beside the doorway into Rear Room S. a circular depression [2636] in the mud floor could have been for the support of a large jar. Both of the rear rooms were at a higher level and thus reached up a step. Rear Room N. (c. 2.10 x 1.80 metres) had been given a floor of mud brick coated with mud plaster [2738]. In Rear Room S. (c. 2.22 x 1.83 metres) the original floor had been wholly dug away leaving only sand [2126]. However, it can still be deduced that a circular oven had been built into the south-west corner. The excavation of the filling units had initially uncovered many pieces from a circular oven-lining lying amidst ash at a fairly high level above the rear rooms (principally unit [2119] above Rear Room N.). Deeper into the fill a layer of ash [2633] was found over much of the area of Rear

Room S. Furthermore an examination of the walls in the south-west corner of the same room revealed patches of smoke-blackening on both walls [2104] and [2008]. Evidently Rear Room S. had been robbed last, and the pieces of oven thrown on to the surface of the newly turned over fill in Rear Room N. One final comment has to be made: the house does not appear to have possessed a staircase. We can be fairly confident in saying this, for despite the modern loss of so much of the flooring, structures built against walls - and a staircase would have been one such - inevitably leave marks on the wall surfaces. No such trace occurs on the walls of West Street 2/3. The additional ground floor space represented by the south annexe thus seems to have removed the necessity of utilising the roof at all.

1.4 West Street: concluding comments

One of the points requiring further investigation was the claim by Peet and Woolley that the western portion of the Village had been abandoned before the main part. One reason given was the absence of fallen roofing material. This was explained as a result of the surviving inhabitants having removed the wood for re-use either as timber or for burning (*COA I*: 67). As already noted, for parts of West Street 2/3 the remains of fallen roofs were recovered: light awnings of mats and reeds and a solid roof of mud over reeds, poles and beams. In the course of excavating the fill units from the Middle and Rear Rooms modest quantities of mud roofing fragments were removed, although there was little wood with them. The pieces amounted to about 150, distributed mainly through the upper material, probably reflecting the way that the original deposits had been turned over during robbing. Many pieces were doubtless reduced to powder during this operation, and if we take this into consideration the quantity of fragments found is not inconsistent with collapsed roofs having been present until recent times in the rubble. Furthermore, as the records of Long Wall Street 6 (dug in 1979) and particularly Gate Street 9 (see below) demonstrate, the preservation of roofing material once robbery has taken place is highly erratic, and can be reduced to very little.

Peet and Woolley were not basing their comparison on the impressed mud fragments from roofs but on the wood and related botanical material. This introduces another factor: the extent to which destruction by termites was uniform over the site. This is now impossible to assess since we do not know how uniformly preserved was the wood over the eastern part of the Village. Deep burial alone was no guarantee of preservation. Very little wood was found, for example, in the undisturbed deposits of rubble towards the rear of the Main Chapel despite having been buried to almost the same depth as many houses in the Village. Peet and Woolley must likewise not have encountered wood, reeds, grass and matting in their chapel excavations, for they concluded that most of the chapel areas had been left unroofed and open to the sky, whereas the current work has provided direct roofing evidence not only for the Main Chapel but also for Chapel 556 (see Chapter 5), and there must be a strong presumption that all chapels were roofed from front to back. This line of argument for the western quarter of the Village is, therefore, not a strong one. It is countered by the impression created by the excavation of West Street 2/3 that where parts of the fallen roof survived they showed no signs of having been seriously disturbed anciently.

The claim that the west part of the Village was abandoned first does not lie solely on the roofing evidence. The numbers of small finds were also fewer in the west, comprising "only broken pottery and small stray objects" (*COA I*: 67). A comparison of the general spread of objects in the Village does indeed confirm this, and that in general the houses in this part contained simply a smaller selection of the standard repertoire of finds.³ This relative poverty is reflected in characteristics other than those represented by small finds, as discussed in the Appendix to Chapter 3, section 3.4. From this we can, however, advance the alternative hypothesis that the western part was occupied by a community poorer than the main one domiciled in the east, and perhaps having a different job to do.

The argument about the relative chronology of West Street in relation to the main part of the Village can be put on a very different footing. Hitherto both Peet and Woolley and ourselves had

³ Detailed and intricately designed comparisons are part of the unpublished thesis of I.M.E. Shaw.

assumed that only a short interval of time had elapsed between the building of the two parts. A new piece of evidence now provides the basis for questioning this. The evidence consists of the fragments of bricks bearing the gridded picture of a king, found in the Front Room of West Street 2/3 and the subject of Chapter 2. Although so fragmentary, by their style they are more likely to belong to a figure of Tutankhamun than Akhenaten; yet a technical study of the plaster itself reveals that the decoration was probably added in the course of building the house. If we continue to regard the village as initially a product of the agencies of Akhenaten's government which created el-Amarna, then we have to consider it possible that West Street was added significantly later, in the reign of Tutankhamun. The reason for making the addition is bound up with the question of for whom it was intended.

The West Street sector as a whole displays several individual departures from the norm. The north-west corner "house" (West Street 23) was no house at all, but a collection of spaces one of which was given over to animal keeping. It contained a rectangular animal pen, its internal dimensions 1.30 x 1.70 metres, entered by a doorway 30 cms. wide and 45 cms. high. These last are within the range of the dimensions for the doorways to the animal pens found outside the Village (e.g. exactly the same as this one AR III: 55), although it lacked the distinctive flanking buttresses. Much straw is said to have been on the floor, and in another part of this building a quern emplacement was located (see the discussion below, section 3.4). Animal keeping is a strong possibility also for the south-west corner of the Village, recently excavated. The rectangular enclosures are larger and had larger doors: the evidence is more the organic layers that had built up on the floors and more particularly on the sloping ground leading down to the West Gate, and the limestone feeding-troughs that were found in the loose deposits above this area, brought up by modern robbing. A further departure concerns West Street 13/25, where a complete house plot (no. 25) was used as a workshop equipped with furnace. Departure from the norm is also found in the main part of the Village (see section 3.4), but in the western quarter it seems to be taken a little further.

The western quarter would also have appeared to be a separate entity to those who lived in the Village. Modern excavations (both those of the 1920s and the current one) have considerably altered the topography along the southern side of the Village through extensive dumping of spoil. This has made it harder to see that the main entrance to the village lay close to a major change of slope: descending very gently from the east, sharply rising to the west. Anyone entering the village by the main gate anciently and looking left would have seen the edge of West Street 2/3 well above him, almost as if it lay on an acropolis. This sense of separation was emphasised by the rough stone walling that helped to cut off West Street from the rest of the Village, and even more by the existence of the West Gate, which allowed the occupants of West Street their own independent entrance and exit. Perhaps in this we can find an explanation for the western quarter's separate existence.

If we look at the contour map of the site as a whole, in terms both of linear distance and degree of slope the west gate provides a favourable direct route to sites X1 and X2. Site X1, excavated in 1979 (Kemp 1980), was tentatively identified then as a police post manning the natural access to the Village. Subsequent work in the vicinity (the *Zir*-area and Site X2) has also revealed that it stands in the middle of a linear spread of archaeological debris almost certainly connected with the supply of water and food to the Village. Site X1, perhaps coincidentally, also supplied evidence for craft activity (the manufacture of ostrich egg-shell beads) and for animal keeping (goat pens). We know, from the discovery of the top of a military standard in the Main Chapel (AR I: 27-30), that the Village accommodated a military (or police) unit. One good way of placing them at the site is to accommodate them in West Street.

We do not possess enough evidence to know how many men constituted a unit of this kind. Evidence related to the Ramesside army sets the smallest likely unit at fifty men (Schulman 1964: 26-29), but this is too large for our village since if each soldier/policeman was also a householder they would have formed the majority of the population. The evidence from Western Thebes is also not very helpful. The Medjay-police numbered 60 in the time of Rameses IV, but another list comprised 24, 6 of them "chiefs", whilst other records imply even fewer (Černý 1973: 261-263). However, they were, as a group, not accommodated in Deir el-Medina, and this itself could form one of several ways in which the two villages differ. Černý's evidence also implies that there was a "chief" for every three Medjay-men, but other sources imply that a "chief" could also be a

person of greater standing than this. The scenes of the "Chief of Medjay of Akhetaten" Mahu in his tomb at Amarna (no. 9) certainly convey this. If West Street accommodated a police unit, and each policeman was there with his own household, a force of around twenty men is involved, with a "chief" in West Street 2/3. Another consequence is that the size of the labouring population is correspondingly reduced to around forty-seven households. The hypothesis joins, moreover, the still barely understood internal history of the site. The suggestion from the Main Quarry stratigraphy that the village was abandoned and subsequently reoccupied during Tutankhamun's reign still stands. We can fit the West Street addition into the picture by saying that the reoccupation took place in more uncertain times, with most of the main city deserted, requiring a more substantial police presence at the village. This is, however, very much a provisional hypothesis.

1.5 Appendix: ash as an insecticide by Robert Miller

The presence of a layer of loose ash below quernstones set on top of pedestals in the Workmen's Village, as well as in other New Kingdom sites (see above, pp. 5-6) may perhaps be explained by the effectiveness of ash as an insecticide. Each time that grain was milled, there would be a possibility that fragments of grain and chaff might fall through cracks on the side of the quernstone and lodge in the pedestal below the quern. The combination of shade and food would provide an ideal habitat for the development of weevils and other insects from eggs already present in the stored grain (cf. Linsley 1944; Howe 1965; Kirkpatrick and Wilbur 1965), as insects in arid environments are able to subsist on grain and seeds despite the absence of external sources of water. Thanks to their impermeable cuticle and efficient reabsorption of moisture in the hindgut, desert insects can survive on water produced from the oxidation of their food, especially from the oxidation of carbohydrates (Wigglesworth 1963), which are a particularly good source of metabolic water (Edney 1977; Louw & Seely 1982: 70). While the amount of food lost to such insect species in the immediate vicinity of the quern emplacement would be minor, there would be an increased risk of adult insects emerging from the cracks around the quern and infesting the freshly milled grain, either reducing its storage life, or being crushed during milling and adding an unpalatable ingredient to the human foods prepared from weevily flour. People would have quickly noticed the bitter flavour of the quinones which the insect pests of grain use to harden their exoskeletons to reduce water loss and as protection against being eaten or attacked by predators (Blum 1985: 574-5; Hoffmann 1985; Needham 1978; Pasteels et al. 1983: 278). There would thus have been good reason to design the milling equipment so as to reduce the possibility of such bitter tastes being added to the diet of the workmen in the village.

The insect species which have become pests of stored agricultural products evolved in well-shaded, sheltered microclimates (Linsley 1944) and would have quickly adapted to a variety of niches in early agricultural storage systems (Solomon 1965). The granary weevil, *Sitophilus granarius*, the flour beetle, *Tribolium confusum* and the saw-toothed grain beetle, *Oryzaephilus surinamensis* are among the species of grain storage pests recorded from both Old Kingdom and New Kingdom tombs in Egypt (Solomon 1965). Given the excellent conditions for the preservation of organic remains in the arid Egyptian climate even earlier identifications of grain storage pests would be possible. Certainly by New Kingdom times there would have been a wide variety of insect species at hand to benefit from the food and shelter provided by grain storage and processing facilities at Amarna. As a complement to the study of insect casts already collected from sieving in the Workmen's Village (Hecker 1986: 87), it would be useful to analyse grain samples and areas used for food storage, processing or waste disposal for evidence of eggs, larval and adult stages of the insects which live off stored foods.

The hypothesis that the layer of ash under the quernstones served as protection against insect pests of stored grain is based on both ethnographic and chemical studies of the use of ash as a desiccant. In East Africa and elsewhere grain has traditionally been mixed with plant ash to assist with insect control (Ngugi et al. 1982: 81; Luca 1981: 148; Cotton 1956: 85). A standard text on the chemistry of insecticides also notes the use of ash as an effective insecticide (O'Brien 1967: 198) and a number of experimental studies have confirmed this usefulness. The small size of insects makes them extremely vulnerable to desiccation, as their small surface area in relation to body mass means that if an insect loses water at the rate of only 5 milligrams per centimetre in an hour - a rate which would have to be increased by a factor of 4500 for a human to suffer an equivalent rate of water loss (Cloudsley-Thompson 1965: 36) - it would lose 10% of its body weight in an hour. As many species of insects, particularly those which live on stored grain, are unable to survive when water loss reaches around 30% of their body weight, desiccant substances which affect their ability to conserve water can be fatal within a few hours (Edney 1977; O'Brien 1967: 199). Moreover, since insects survive by reducing water loss with the aid of a thin waterproof waxy epicuticle no more than 0.1 to 0.4 microns thick (Ebeling and Wagner 1959), any dry powder can act as an insecticide if it adsorbs the wax of the epicuticle, scratches it, or attacks it chemically (O'Brien 1967), so that even modern insecticides can depend for much of their effectiveness on the inert powders they sometimes largely consist of (Ebeling and Wagner 1959, Ebeling 1961). Clay, calcium carbonate, and a number of powder oxides and silicates have been shown to be effective against rice weevils, granary weevils, bean weevils, houseflies, roaches

and termites (Chiu 1939a & b; Alexander et al. 1944; David and Gardiner 1950; Hockenyos 1933; Kalmus 1944; Zacher and Kunike 1931). Ash is particularly effective (Zacher and Kunike 1931; Kalmus 1944) because it not only adsorbs the wax of the insect epicuticle, but also attacks it chemically by saponifying the wax.

If the presence of an ashy layer on New Kingdom quern platforms represents an early example of the recognition and use of the desiccating insecticidal effect of ash, it would extend the use of insecticides in plant processing and storage back to the second half of the second millennium BC. However it is unlikely that this insecticidal resource would have been overlooked at earlier periods of farming in Egypt, and if detailed attention to the sediment composition and description of grain storage and processing deposits were given in prehistoric excavations earlier occurrences of ashy deposits used for their insecticidal action against grain weevils might be identified. While examples of excavated contexts which suggest the use of ash as a desiccant may perhaps be identifiable in the record of earlier prehistoric excavations, caution is needed in interpreting finds of ash and grain or grain storage pits dug out in these excavations, and it should be emphasized that this is more of an hypothesis to be tested in future excavation and survey than a clearly documented prehistoric agricultural storage technique. Two possible instances of the use of ash as an insecticidal desiccant in prehistoric Egypt are nevertheless suggestive. In a Badarian village at Matmar, the presence of a layer of ash extending over the mouth of an empty granary pit was noted (Brunton 1948: 5). While it is possible that this represents no more than the tipping of domestic hearth ash over a disused pit or the ash washed down from a hearth upslope (ibid.) this ashy layer could also be the remains of an ashy fill used to protect pots of grain or seed stored in the granary, by analogy with the modern African techniques of seed and grain protection described by Luca (1981) and Ngugi et al. (1982). Clearer possible examples of the mixture of grain and ash can be reconstructed from the careful recording of Caton-Thompson's work on the Fayum Neolithic. Two silos were noted (nos. 13-14) where "a few carbonised corns of wheat and barley were mixed with several handfuls of uncarbonised grains and husks (Caton-Thompson and Gardner 1934: 43)." Caton-Thompson also recorded two more silos (nos. 33 & 44) where the association of tamarisk twig charcoal mixed with charred grain (ibid.: 43) might indicate the kind of deposit to be expected from silos after the grain had been separated from the ashy desiccant mixed in with it. However the deposits in Fayum silos 33 & 44 could also have originated during some stage of food processing and storage related to parching or heat treatment (Hillman 1981 & 1984) or could even result from using the pits to dispose of accidentally charred seed which had been protected from weevils by being suspended over the hearth from the roofbeams (cf. Harlan 1975: 164). The practice of cleaning used grain storage pits by burning (Hillman 1981: 138), which would be one possible explanation of the mixture of burnt twigs and seeds in Fayum silos 33 & 44, could also perhaps be related to the insecticidal effectiveness of ash which would attack any larvae or adults which emerged from grain even where the temperature of the fire had not been high enough to destroy all the eggs and instars present in the seeds (Kirkpatrick et al. 1965).

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