macroscopically visible phytolith remains, such as visible traces of matting. An especially interesting sample was taken from an extensive deposit (20703) of pure visible phytolith remains in the burned store room in the TPC Area; the first analyses have identified the striate emmeroid glume wheat. Phytolith sampling has particularly focused upon deposits from bins, middens, hearths and ovens. One aim is to further explore temporal changes previously observed in the phytolith record; samples analyzed from TPC Area middens unit have helped reaffirm previous observations of increased *Phragmites australis* (common reed) in late East Mound levels (units (30773) and (30774)).

Preserved grain stores in TPC: Naked barley bins and carbonized and ashed ears of 'new type' glume wheat

Excavations also recovered a charred mass of seeds in two bins ((30785) and (30859)) and burned cereal remains in the adjacent room in parts of the TPC Area (Figure 7.1), units (30871) and (20703). These consist of pure deposits in two bins of naked barley, a northern bin (30859) and a smaller southwest corner bin (30785), a small deposit (30871) immediately outside and between the two bins, and a larger deposit in the adjacent room that consisted on large charred grain concentration and thick layers of articulated phytoliths, represents a deposit of glume wheat (20703), preserved both carbonized and silicified (Figure 7.2). A small and large bin on the side of

Figure 7.1 *(LEFT) Excavation of storage bins in progress; (RIGHT) carbonized wheat lens [left] and carboized barley bin [right].*

Figure 7.2 *(a) silicified (ashed) wheat; (b) closeup of wheat glumes.*

the room contained fills of pure, carbonized naked barley, which was a common food grain across the Çatalhöyük sequence and areas. Of particular note is the large ashy deposit consisting of pure silicified (phytolith) remains of wheat chaff (20703), in places a few cm thick. The intact nature of this find and its completeness in terms of chaff remains, suggests that it was burned in the spikelet or ear. Spikelet storage is attested in an earlier burned

building of the mid-Neolithic sequence, B.77 (Bogaard *et al.* 2013). The silicified deposit consists of wheat chaff (lemma, palea, glumes) suggesting that it had been burned at higher temperatures (~500°C) and with oxygen such that organics (e.g. grain, thicker rachis) was completely burnt away. By contrast, the carbonized deposit, suggests a slower, lower charring (~200°C) in reducing conditions by which larger organics (grains, glume bases) were carbonized and preserved. Between the two preservation types we have all parts of the spikelet/cereal ear.

Figure 7.3 *(LEFT) Typical wheat spikelet; (RIGHT) sample from 20703.s7.*

How do we infer the state of preservation? Each wheat spikelet normally contains two grains (Figure 7.3). Some examples from (20703.s7) preserved a pair of grains, below-to-belly, with fragment of papery chaff on the outside: this means they were carbonized in the spikelet. At the right is an example of a grain from the sample which suggests the elongated "new type" glume wheat known in quantity from the site (Bogaard *et al*. 2013). This "striate emmeroid" wheat is a lost landrace, important in the Neolithic of Anatolia, Europe and the north Iranian Plateau, but extinct from modern cultivation (Figure 7.4).

Preserved in an ashed form (silica skeletons) are fragments of wheat chaff, including some outer glumes (Figure 7.5). The two acute teeth at the top of the glume indicate a tetraploid glume wheat. The very strongly ridged glumes indicate the 'new type' or 'striate emmeroid' wheat, which has only been recognized as a distinct species for about 15 years (Jones *et al*. 2000; Kohler-Schneider 2003). This is because this type is not among the modern landraces of Turkey or Europe, nor found among the 'founder crops' in the Neolithic Levant. However, it was clearly important in Neolithic Anatolia, as well as northern Iran, Turkmenistan (Bogaard & Charles 2010) and it spread through Neolithic Europe, where it went extinct sometime after the later Bronze Age (Köhler-Schneider 2003). This find provides new details on some of the lost crop diversity of the Neolithic.

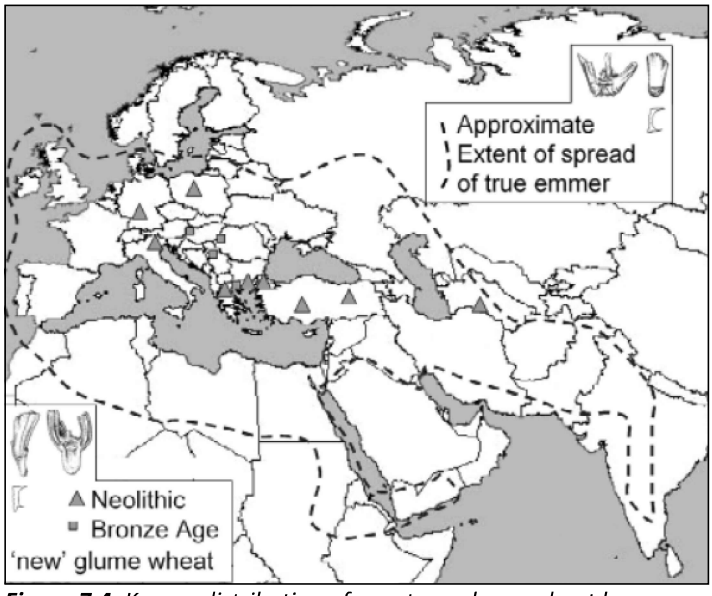

Figure 7.4. *Known distribution of new type glume wheat known from Neolithic and Bronze Age examples (map from Fuller 2008).*

Figure 7.5. examples of ashed wheat glumes from (20703)

The state of storage has implications for the organization of crop-processing at least for this household. The bin finds of barley indicate that this was stored as pure grain ready for food preparation, with few inclusions of chaff or weed seeds. Similar stores of barley have been recovered before, for example in B.52 (Bogaard *et al.* 2009). By contrast the glume wheat was stored as ears or spikelets, requiring threshing and dehusking before consumption.

Tubers: snack or accident?

In the fill of Sp.511 in the North Area (presumably Level 4040 G), and midden building up around the time of the occupation of B.77. These samples included large well-preserved tubers from (20965) and (20988), identified as those of *Bolboschoenus glaucus* (formerly called *Scirpus maritimus*). Unit (20965) produced a concentration of 14 tubers, and one *Pistacia* nut. Many more whole and fragmented tubers were recovered from flotation of these units. These were above average size tubers, mostly round (with one elongated example) and charred whole or nearly whole. These are bulbous rhizome tubers with characteristic scars for the rhizome stalk on the ends and smaller scars for peripheral roots. Smaller examples of such tubers and fragments thereof have been found to be quite common at Çatalhöyük in previous work. It is possible that this part of the sedge was sometimes eaten, but other pathways onto the side should be considered, such as collection with clay used as building material. This species was likely quite common in damp and shallow wetland near the site, with the above ground shoots grazed by sheep and goat, leading to nutlets coming onto the site through dung fuel, and tubers through clay collection. Nevertheless both the nutlets and tubers are sources of edible starch that might have been used to supplement other food sources (Wollstonecroft *et al.* 2011). The tubers, in particular large example like those here, are rich in starch, which can be eaten if processed through grinding or pulverization before cooking (Wollstonecroft *et al*. 2008). These tubers might have been gathered in spring or autumn, and might have been especially valued in early spring before the crop harvest period when the winter larder might have been running low. Proof that the tissues of such tubers became part of food, and how they were processed, should be sought in preserved food residues.

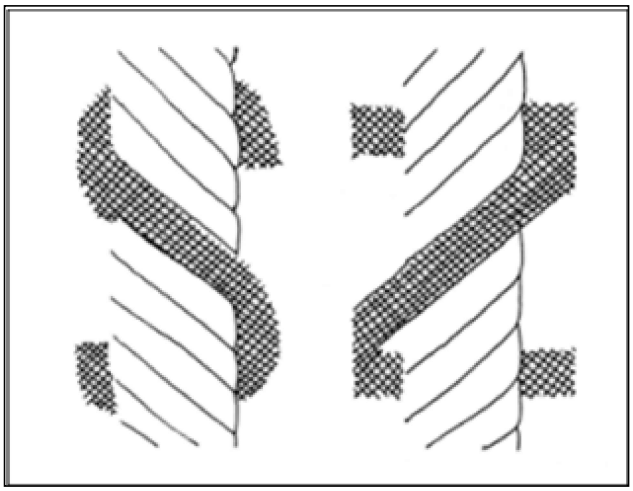

Figure 7.6. *S-spin [left] and z-spin [right] weaves.*

Imported linen textiles in infant burial

In addition to flotation samples, textile remains from a burial in B.52 (30511) were examined. Preliminary assessment suggests that these fine fibers are flax (*Linum ussitatissimum*), although this identification should be confirmed with higher resolution examination by SEM. Simple weave (tabby), of which cords are mostly two threads twined together in an s-spin. Individual threads are spun from numerous fine bast fibers in a z-spin direction (Figure 7.6). In a few cases, cords are s-twisted made from more than two threads, e.g. the four-thread braid (Figure 7.7 middle). Some areas of textile have two layers (Figure 7.7 right).

Figure 7.7. *Textile remains from Building 52 burial.*

The fine structure of these fibers reveals them to be a plant bast fiber and their size and uniformity suggest we are dealing with flax fibers (Figure 7.8, and see Figure 7.9 for comparison). These are bast fibers (straight, and have cell ends – pink arrow; if they were animal hair or wool they would have a scaly surface and natural twist). Among bast fibers flax (*Linum ussitatissimum*) is very fine and uniform (15-22 μ fibers) in contrast to the larger and highly variable fibers in other common bast sources, e.g. nettles (20-50 μ). Flax fibers tend to be slightly thickened at cell ends.

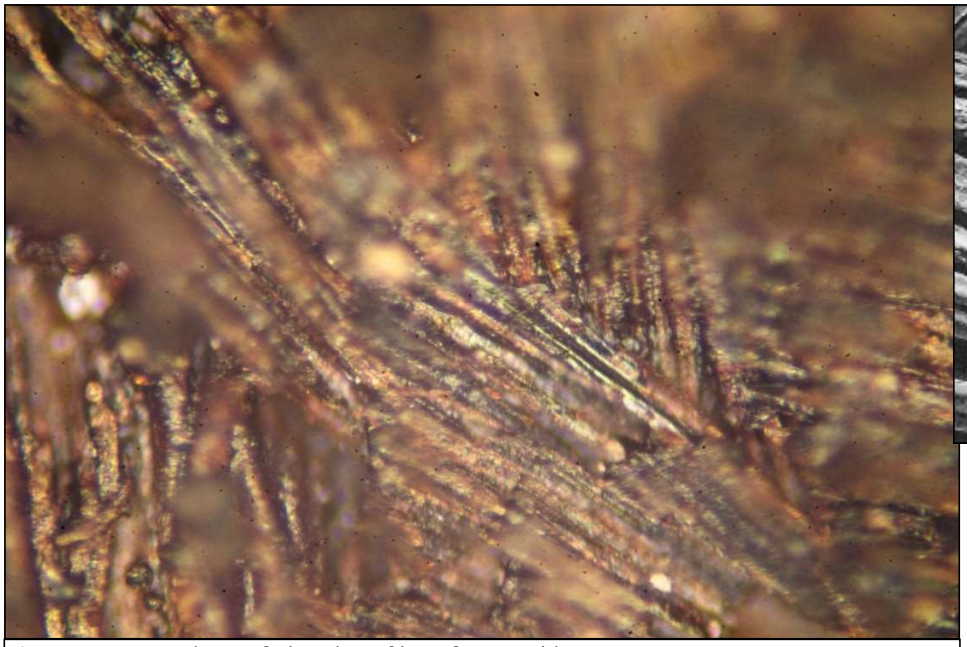

Figure 7.8. *SEM photo of plant bast fibres from Building 52.*

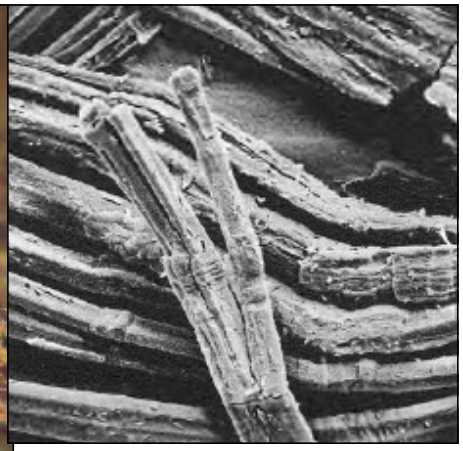

Figure 7.9. *SEM of linen fibres for comparison, archaeological textile From Meroitic Nubia (Mayer-Thurman & Willams 1979).*

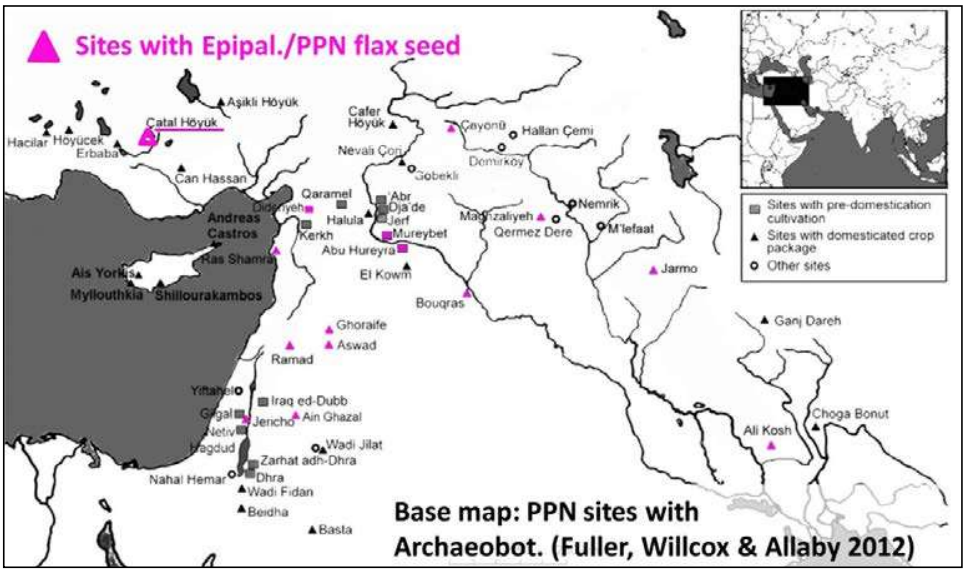

Figure 7.10. *Distribution of flax seed in PPN Near East.*

The significance of this find is that (a) it is the second earliest clear textile of flax and (b) it suggests an established trade in linen textiles by the Late PPNB period, since this is unlikely to be a local product at Çatalhöyük. Building 52 is placed in Level 4040 G (ca. 6500-6400 BC). The map (Figure 7.10) indicates that flax is widely found in the seed record of the PPN Levant and eastern Fertile Crescent, but not Anatolia (based on recent reviews of archaeobotany in Fuller *et al.* 2012; Asouti & Fuller 2013). Flax seeds are largely absent from Çatalhöyük, suggesting that this was not a crop grown here and processed on site (Bogaard *et al.* 2013).

TPC archaeobotanical analysis (carried out by D. Filipović)

In the 2013 season, 214 soil samples deriving from 188 excavation units were floated from TPC. Preliminary analysis ('scanning') was carried out on 121 samples; in addition, 27 samples from prioritized excavation contexts were analyzed in more detail. As part of the preliminary analytical step carried out in the field, presence and/or amount of general plant classes were recorded for these samples. Table 7.1 shows the ubiquity of plant

TPC SAMPLES (2013)	SCANNED (n=73)		PRIORITY (n=27)	
BOTANICAL CLASS	**ubiquity**	**abundance**	**ubiquity**	**abundance**
Parenchyma	17		11	
Wood	72		24	
>100 wood fragments	33			
barley grain	54	908	18	447
barley rachis	17	37	6	17
hulled wheat grain	54	244	19	523
hulled wheat glume bases	60	1130	23	886
free-threshing wheat grain	22	57	9	15
free-threshing wheat rachis	22	495	11	38
basal wheat rachis			3	5
cereal indeterminate grain	64	541	23	206
cereal culm node	16	46	4	6
Pea	2	3	9	9
Lentil	9	14	1	1
Chickpea	2	2	0	0
bitter vetch	6	9	0	0
pulse indeterminate	19	34	7	8
Hackberry	2	2	4	8
nutshell/fruit stone	26	54	7	8
weed/wild seed	66	1229	25	453
sedges (*Cyperaceae*)	57	1065	20	584
reed culm node	40	190	13	39
Dung	2		6	

Table 7.1. *Ubiquity of plant categories and the abundance of the remains in the 27 priority samples and 73 scanned samples.*

categories (number of samples in which the remains occur), and the abundance (absolute number) of the remains in the 27 priority samples and 73 scanned samples (note that the abundance figures are based on the analyzed portion of the samples, i.e. the samples are normally split into smaller fractions and *c.* 10 ml of each examined in the field laboratory).

Cereal remains are present in all of the samples; most prominent are hulled wheat glume bases and barley grain, followed by hulled wheat grain and free-threshing wheat rachis. Pulses appear rare compared to cereals. Weed/wild seeds, including seeds of potential arable taxa, are highly frequent and numerous, testifying to the widespread activity of crop processing and/or use of by-products and dung as fuel etc. Sedge (*Cyperaceae*) seeds are found in a large number of samples; they have been shown to result from the use of animal (sheep/goat) dung as fuel and may, therefore, indicate (varying) presence of dung-derived material across different deposits.

The composition of the majority of samples indicates that they are 'mixed' in terms of crop type and plant part (e.g. combination of barley grain with hulled wheat glume bases); this is in agreement with the archaeological context from which they derive that is, in most cases, described as building infill or other kind of fill (i.e. secondary/tertiary context) likely containing midden material. They represent a combination of residue(s) from food preparation - cleaning of hulled and free-threshing cereals (glume bases, rachis, weed seeds) - often mixed with (other) fuel remains (wood charcoal, dung). However, several units contained distinct deposits of potentially primary origin, that is, with a more or less preserved 'original' composition, thus allowing for inferences on the discrete activity/process/event that produced them:

Unit (30762) (Fl. 10706) - a large number of free-threshing cereal rachis and weed/wild seeds - possible residue of cleaning (on-site threshing?) of free-threshing cereals.

Unit (30783) (Fl. 10747) - high amount of weed/wild seeds (relative to other plant classes) - could point to cleaning (e.g. sieving) of crop in food preparation.

Unit (30784) (Fl. 10814) - almost pure barley grain - remains of crop storage?

Priority unit (30252) (Fl. 10444) - an almost clean concentration of hulled barley grain - possible storage deposit or burnt food.

Priority unit (30274) (Fl. 10543) - a relatively large number of seeds of sedges, knotgrass (*Polygonum*) and dock (*Rumex*) indicating burning of dung.

Priority unit (30716) (F.10647) - mainly composed of hulled wheat glume bases - potential unmixed residue from fine sieving of hulled wheat.

Priority unit (20703) (Fl. 10714) - very well preserved, almost pure grain of the full range of hulled wheat types, and naked barley - possible remains of storage [see §4]

Priority unit (20703) (Fl. 10830) - high density of 'new type' wheat grain and chaff (storage in spikelets), and naked barley - potential stored food. [see §4]

Priority unit (30784) (Fl. 10834) - virtually clean barley concentration with admixed wood charcoal (very large fragments) - accidental burning of food?

Priority unit 30842 (Fl. 10872) - well preserved, large number of arable weed seed and some hulled wheat glume bases - possible evidence of crop processing.

Priority unit 20703 (Fl. 10925) - almost entirely composed of 'new type' wheat grain and glume bases, suggesting storage of whole spikelets. [see §4]

Other priorities units from 2013

Table 7.2 (below) lists priority units assessed in 2013, excluding those from TPC (§5).

Flot No.	Unit	Building	Space	Interpretive Category	Level	comments
NORTH AREA						
10342	(20625)	77	336	Mixed burial fill	4040 ?G	good preservation and high density of plant remains, especially dehusking waste and possible dung-burning instigated by Bolboschoenus nutlets. 1 Cyperaceae tuber in the 1mm. 4mm fraction is about 75% bone (fragmented human). Good density of cereals, including 6x FT wheat charr, prob. 1-gr and 2-gr einkorn and tetraploid glume (new type). Small legumes, Malva sp. Type, Chenopodium.
10521	(20961)		87	*In situ* burning (hearth)	BACH ?G	3 frags bread/fruit, 2 frags possible legume pod
10553	(20686)	77	336	Burial fill	4040 ?G	1 ml food residue in 4 mm.
10558	(20965)		511	midden		Hand collected carbonized tubers. All appear to be similar Cyperaceae rhizome tubers, 42 were normal size 10-15mm diam., but one was significantly larger, >25mm diameter. All probably Bolboschoenus glaucus type. In addition 18 Pistacia nuts and 1 pulse indet in 4 mm. Some very well preserved chaff, naked barley rachis with hairs, glume wheat grain with lemma/palea adhering.