Ancient Monuments Laboratory
Report 5/87

PLANT MATERIAL FROM EXCAVATIONS AT THE WILSFORD SHAFT, WILTSHIRE, 1962.

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Summary

Plant fibres from three samples from near the base of the shaft were examined. Although some of the material was probably contamination, some bast fibres were identified as well as a variety of other plant fragments. Material from a further three samples, composed of vegetative pellets, was found to be herbivore dung, containing very well preserved Gramineae epidermis.

Author's address :-

Environmental Archaeology Unit
University of York
Heslington
YORK YO1 5DD

0904 4300000 x5531

PLANT MATERIAL FROM EXCAVATIONS AT
THE WILSFORD SHAFT, WILTSHIRE, 1962.

PLANT FIBRES

Methods

Material in fifteen tubes from three samples (202, 229 and 291) was examined. The fibres were soaked in 88% lactic acid, which helps to clear the cells making them more readily visible (Tomlinson 1984). The fibres were examined under an ordinary light microscope (Leitz) and also under polarised light and phase contrast. Reference books used are listed in the bibliography.

Results

The complete list of results is given in the table. Detailed descriptions of each type of material are given here:

a) Cotton wool fibres

There were several clumps of fairly short, loosely twisted, white fibres. Each fibre was twisted and there were reversals in the direction of the twist every 100 µm (approx) along the length of the fibre. The fibres were very variable in thickness from about 14 µm to 25 µm. Modern cotton wool reference material, and the descriptions in Anon (1975) and Schoch (1985) compare very well with these fibres. Cotton wool fibres are composed of the seed hairs of Gossypium sp., although modern cotton wool may also contain man-made fibres such as viscose. Presumably this is contamination from the excavation, or subsequent processing.

b) Animal hairs

The animal hairs were distinguished by the characteristic scales on their surfaces. 225/19 had a tuft of very short hairs in a clump; the ends of the hairs were broken. Two hairs in sample 291 had a ladder type medulla with uniserial and multiserial ladder types (Wildman 1954). The scales formed a double chevron pattern. These characters are typical of hare/rabbit hairs.

c) Roots, rhizomes and fungal hyphae

There was a variety of roots, generally characterised by the pattern of cells and the presence of short cells and root hairs. Some of the roots were of Gramineae (grasses). Moss rhizoids were also present. Fungal hyphae were entwined in some of the other plant fibres.

d) Gramineae fragments

These consisted of the veins of grass leaves which had mostly become disengaged, forming long "fibres". A few of the veins had fragments of epidermis still attached. These had the various features typical of grasses, such as long cells and short cells, dumb-bell shaped stomata and prickles along the margins. Some of the silica cells were also visible along the veins. Further identification was impossible with such small fragments.

e) Mosses

There were some small fragments of moss stem. These have not been identified as the leaves had mostly become detached.

f) Wood fragments

Small fragments of wood fibres, with rays and vessels, were identified as coniferous wood because of the presence of bordered pits on the rays. These are not fragmentary enough to be paper fibres, which have similar bordered pits. They could be ancient fragments, or possibly from splinters of planking used in the excavation.

g) Bast fibres

Bast fibres occur beneath the epidermis of many plants. Some of them are useful for making cloth or rope, though not all bast fibres are necessarily used for these purposes. Thus, when bast fibres are found in isolation it is not easy to be certain that they were once used in cloth or rope.

The bast fibres from Wilsford were from fragments several centimetres long. The fibres were clumped together, a feature which distinguishes hemp from flax. The individual (ultimate) fibres had relatively blunt ends. The ultimates varied in thickness between 12-23 µm. They had thick walls (approx. 5 µm) and a fairly thick lumen (approx. 7 µm). Under phase contrast, spiral markings were not seen. However, a drying twist test (Anon 1975) showed the fibres to be twisted in an anticlockwise direction (Z-twist), unlike flax which gives an S-twist. Under polarised light cross-lines (dislocations) were clearly visible crossing the walls, but relatively rarely crossing the whole width (see Figure 1.). X-shaped 'knees', which are so characteristic of flax, did not occur. These are found in hemp, but it is thought that they only appear when the fibres have been processed or mechanically stressed (Korber-Grohne 1967). The ashing test (Anon 1975), which should reveal the presence of rounded crystals in hemp, was carried

out on two of the Wilsford fibres, but no crystals were found.

These fibres, therefore, had many, but not all, of the characteristics of hemp (Cannabis sativa L.) (Mauersberger 1954; Korber-Grohne 1967; Haas 1985; Anon 1975). They are certainly not flax (Linum usitatissimum L.). It is very likely that other plant species have fibres with the same characters as hemp. Textiles can very often be positively identified because they have small pieces of characteristic epidermis still attached to them. Without these it is impossible to provide a positive identification of these few fragments.

h) Indeterminate plant fibres

Other bast fibres with thin walls and a thick lumen were present. These had no other features to make further identification possible.

i) Dicotyledonous plant fibre with epidermis

This fragment of plant stem had some fairly long bast fibres still attached to an epidermis. The ultimate fibres were short, thus not suitable for use in a textile or rope. The epidermis had multicellular, glandular trichomes (hairs). The cell pattern, stomata and glands are shown in the drawings (Figures 2-4). The stomata have no subsidiary cells (anomocytic) and were scattered across the stem. The cells were variable shapes, but mostly oblong with oblique or straight end-walls. The cells in the areas around the stomata were more irregular in shape. The cell walls were moderately thick and somewhat pitted. Cuticular striations occurred, running in straight lines up the stem and crossing cell walls. It has not been possible to identify this plant but the characters are very similar, but not identical, to some members of the Solanaceae (Moeller 1928).

j) Xylem tracheid fibres

There were at least two types of tracheid occuring in these samples, as well as xylem spiral thickenings. These types occur in many plant taxa and cannot be identified further on their own.

VEGETATIVE PELLETS

Material from the following samples, described by Andrew Jones (Jones 1987), was examined: 248/109, 291/184 and 248/7. These were found to contain many small fragments of grass leaves. The larger of these fragments ranged in size from 5-8 mm long by 1-2 mm wide. They nearly all had torn, straight ends which are typical of grass leaves that have been chewed by an herbivore. The epidermal features were all characteristic of grass leaves (see Figure 5). There were many grass pollen grains. These were all less than 30 µm in width, which suggests they are not cereal grains. There were a few fragments of moss. One of the smaller mosses was a whole plant which still had its rhizomes attached. There were a number of grass flowers, some still containing pollen, but not seeds. Although it was not possible to identify the grass, the size and shape of the flowers suggests a small meadow grass. The epidermis fragments were from more than one species of grass. There were a few Stellaria media (L.) Vill. seeds, a wasteland plant which grows in a variety of habitats. The mosses included Thamnobryum alopecurum (Hedw.) Nieuwl., Eurynchium Br. Eur. sp. and Neckera complanata (Hedw.) Hüb. None of these mosses suggest a particular habitat as they are found in a range of situations, but mainly in shade on rocks or tree stumps.

Conclusions

Some of the plant material in the samples suggests contamination, for example the cotton wool and possibly some of the other fragments. The grass fibres, mosses, other plant fragments and animal hairs may represent some human influence or may have fallen into the shaft by chance. The bast fibres could have been used in some cloth or rope, but it is impossible to be certain.

The dung pellets are very well preserved, however, there is no suggestion that these are contaminants. There is little doubt that the pellets are herbivore dung. It has not been possible to identify the grass species, although it is probably a small meadow or turf grass. The other taxa grow in a range of habitats. It is therefore difficult to describe a possible grassland assemblage which the herbivore might have been grazing.

Acknowledgements

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List of figures:

(All draw using a microscope drawing tube attachment, with the exception of Figure 1.)

Figure 1. Bast fibres; sketch showing the pattern of the cross-lines.

Figure 2. Dicotyledonous epidermis, showing the pattern of the cells in the region of the stomata.

Figure 3. Dicotyledonous epidermis, showing the arrangement of glands and stomata.

Figure 4. One of the multicellular glands from the dicotyledonous fibre.

Figure 5. Part of the epidermis of a Gramineae fragment from the vegetative pellets, showing stomata and prickles.

TABLE OF RESULTS

Sample no.:	Contents:
202/11	Animal hair; Rootlets; Cotton wool; Fungal hyphae; Gramineae fragments; Indet. plant fragments.
202/14	Cotton wool; Moss;
202/23	Bast fibres;
202/45	Wood splinter; Indet. plant fragments and fibres;
202/52	Bast fibres; Indet. plant fragments;
225/19	Tuft of animal hair; Bast fibres;
291/7	Dicotyledonous plant fibre with epidermis;
291/10	Roots;
291/11	Animal hair; Gramineae fragments; Roots; Cotton wool; Fungal hyphae
291/36	Roots;
291/37	Gramineae fragments; Roots; Cotton wool; Indet. plant fibres; Animal hair;
291/82	Gramineae fragments; Roots; Bast fibre;
291/122	Gramineae fragments; Moss; Cotton wool; Xylem tracheid fibres; Roots;
291/169	Cotton wool;
291/177	Cotton wool;

Figure 1.

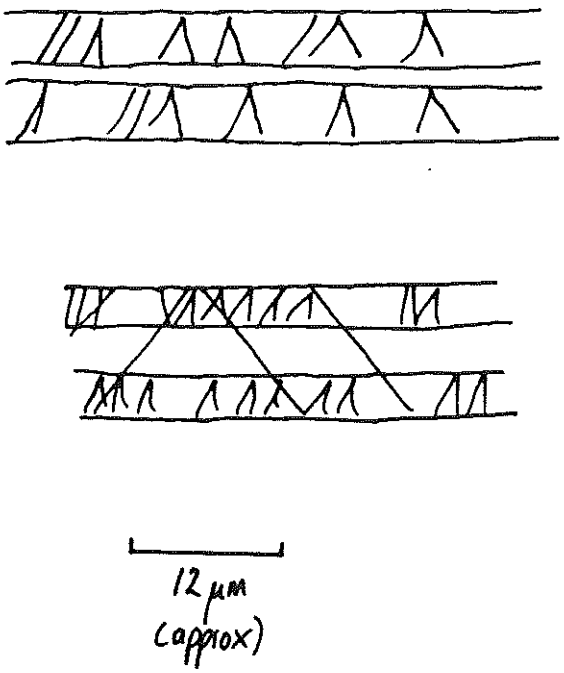


Figure 5.

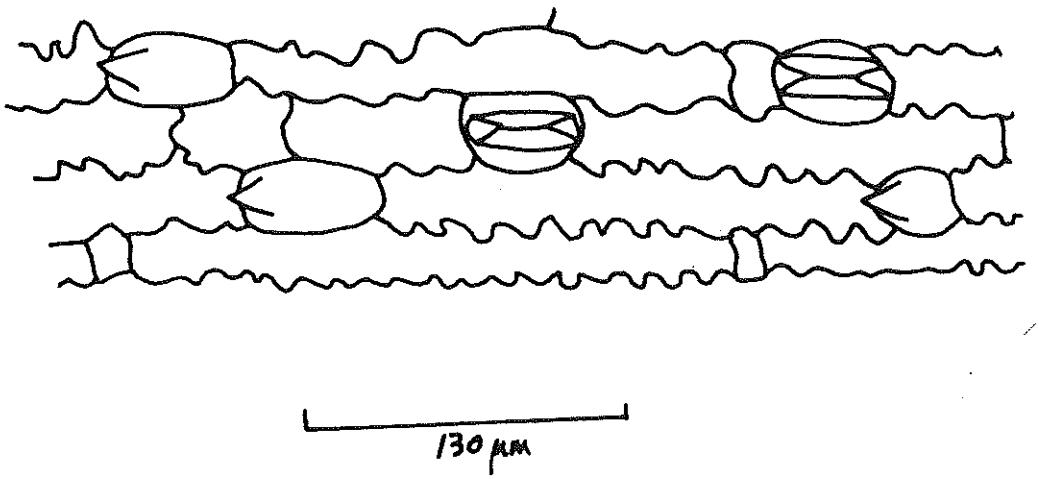
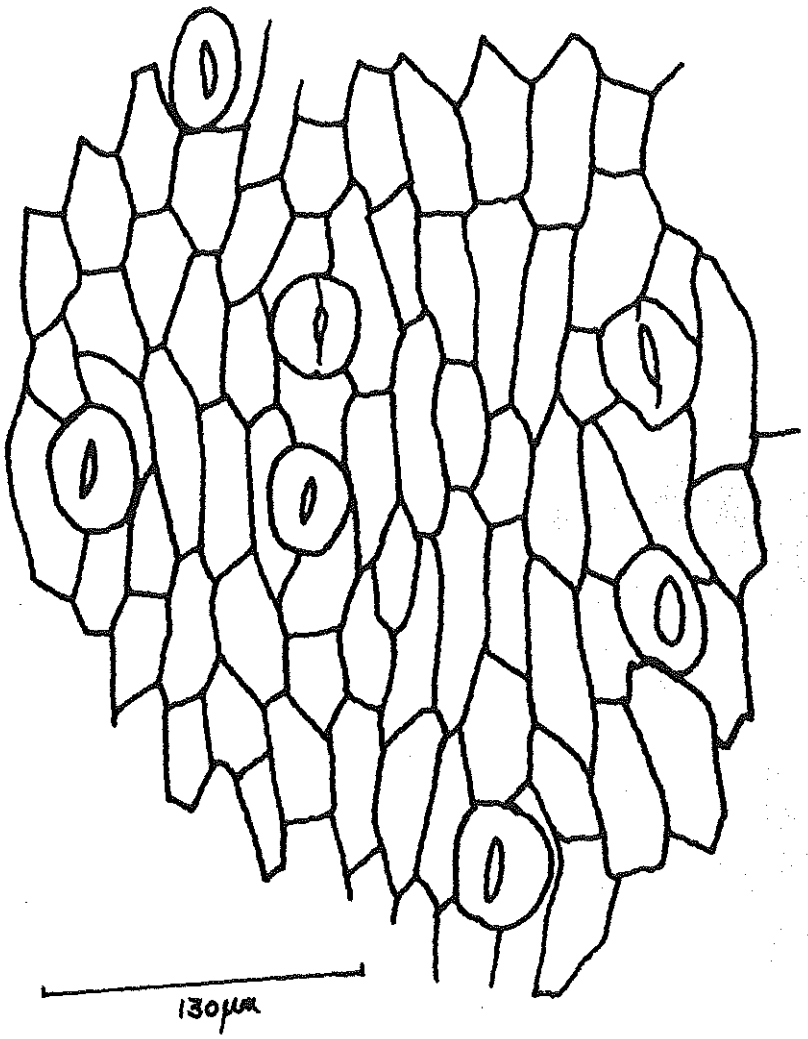


Figure 2.



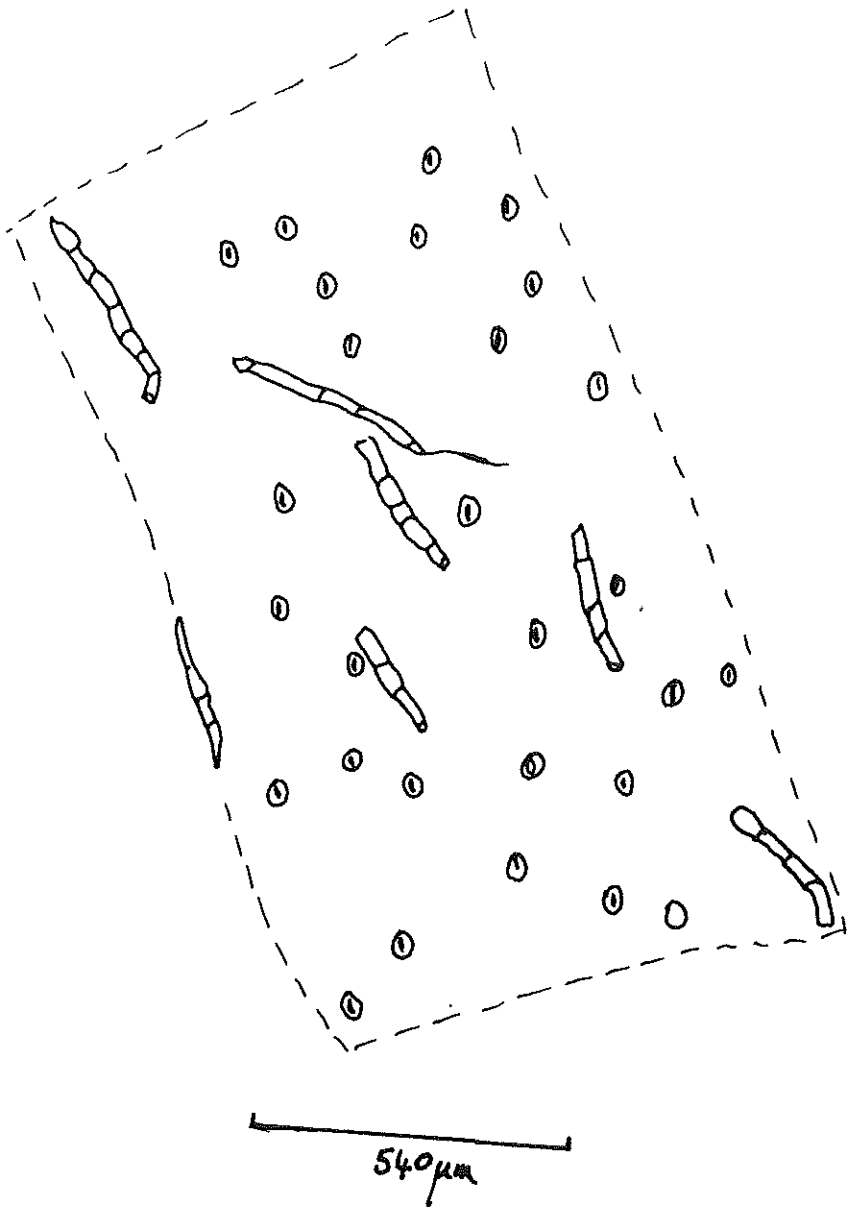


Figure 3.

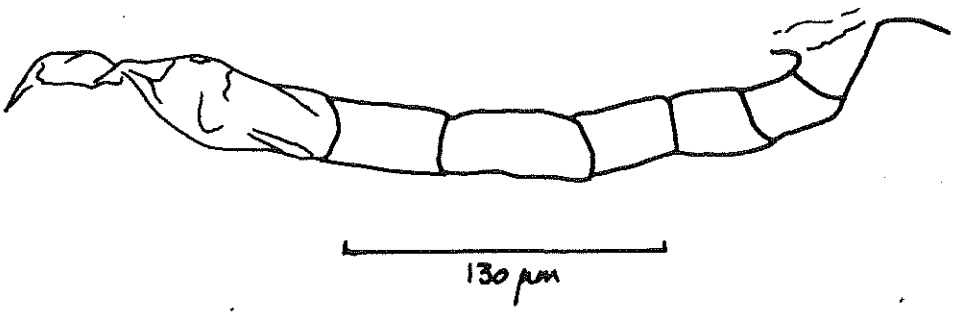


Figure 4.