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ANTHROPOGENIC SOIL EROSION IN PREHISTORIC SUSSEX: EXCAVATIONS AT WEST HEATH AND FERRING, 1984

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with contributions by Caroline R. Cartwright, Robert G. Scaife, Richard I. Macphail and Mark F. Gardiner

Recent studies of river valleys and chalkland dry valleys have shown evidence for extensive anthropogenic soil erosion in prehistoric Sussex starting during the Mesolithic but increasing rapidly with the arrival of the earliest farming communities shortly before 4,000 B.C. This article adds to that data by examining evidence from the Greensand (West Heath) and the Coastal Plain (Ferring). At both sites evidence for soil erosion is centred on the 2nd–1st millennia B.C.

Evidence for the removal of vegetation by prehistoric man may be found both in changes in pollen and molluscan sequences and in the rapid development of colluvial or alluvial deposits in dry or wet valleys. Classic studies such as M. Bell's study of valley sediments on the South Downs (Bell 1983) have shown that human activities like agriculture accentuate the natural effects of gravity in moving particles down slopes. The results of such erosion may be found in virtually all valley situations in Sussex. The dating of these deposits has shown a mosaic of clearance from the Mesolithic onwards (Ellis 1986). Substantial deposits of alluvium in the Ouse Valley, for example, may have been the result of Mesolithic man's interference with the vegetation cover (Scaife and Burrin 1983). Smaller scale interference with the forest cover probably took place over much of Sussex in an attempt to attract game into forest clearings (Simmons and Dimbleby 1974; Dimbleby *in* Drewett 1975). Such clearings were probably short-lived and caused minimal soil erosion. Most erosion after the Mesolithic was due to the breaking up of ground level vegetation cover for agriculture. Occasionally, however, other anthropogenic activities can be isolated as the cause of soil erosion. One such cause was the stripping of large areas of turf for the construction of round barrows in the Early Bronze Age. The result of turf barrow construction is particularly evident on the fragile Greensand soils of West Sussex. It was partly to study the result of the effect of turf barrow construction on the landscape that test pits were excavated across the now dry valley to the east of the main barrow group at West Heath (Drewett 1976; 1985). In the same year the opportunity arose to examine the deposits in a small coastal plain valley now containing the canalised Ferring Rife in West Sussex.

WEST HEATH, 1984

The excavation of nine round barrows at West Heath, West Sussex (SU 786226) by the author between 1973–1980 (Drewett 1976; 1985) indicated extensive stripping of turf for the construction of the mounds. Pollen analysis (Baigent *in* Drewett 1976 and Scaife *in* Drewett 1985) suggested a local source for this turf and so it may be assumed that the area immediately adjacent to, or at least close by, was stripped of all its vegetation cover. Such clearance would have resulted in almost immediate soil erosion.

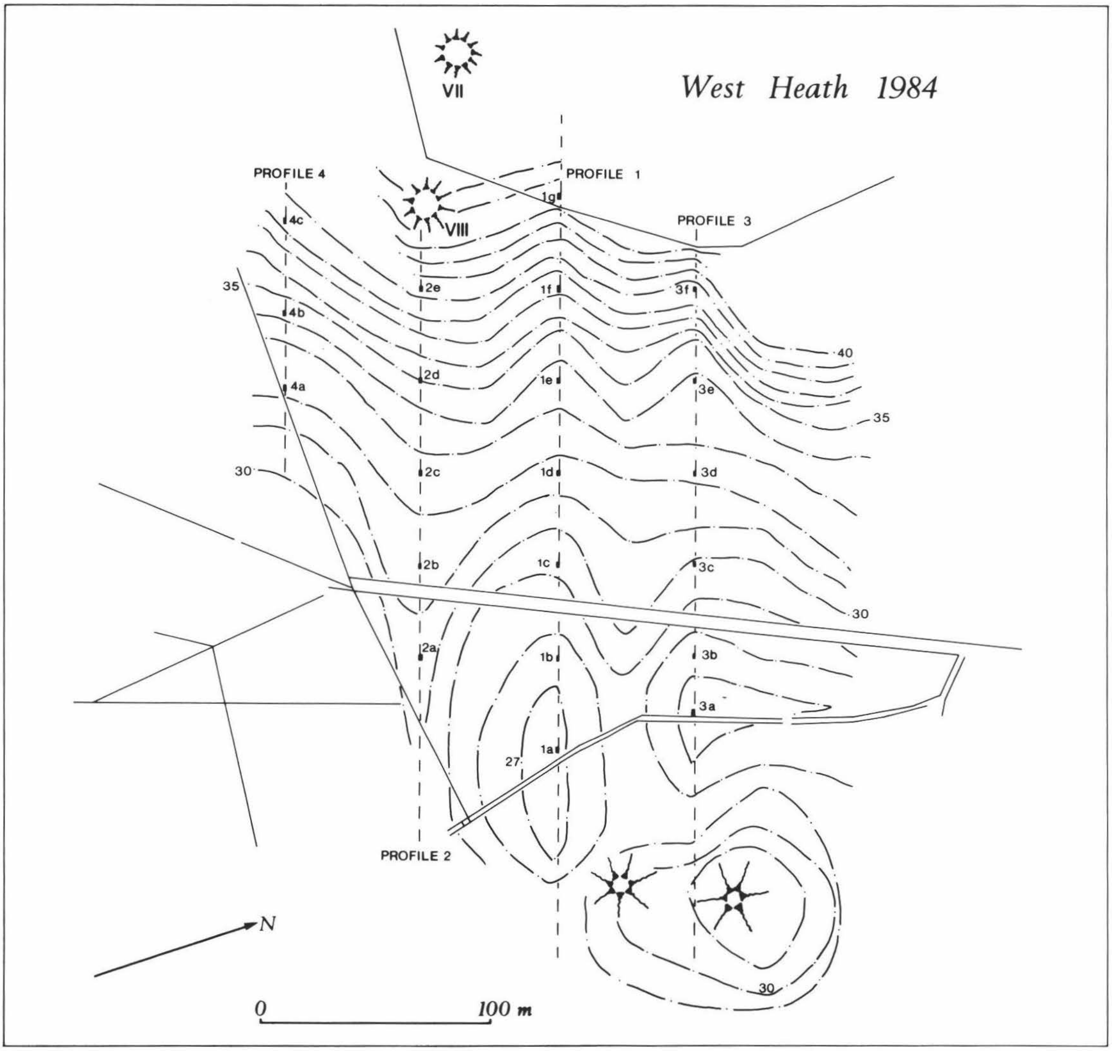

Fig. 1 West Heath, 1984. Location of transect lines and test pits in relation to Barrow Cemetery.

The products of such erosion may be expected to lie in the adjacent valleys, particularly that to the east. As this valley is scheduled for sand extraction it was decided to excavate 21 1 m. x 2 m. test trenches in transects across the valley (Figs 1 and 2). It was also hoped that these excavations might have located settlement evidence related to the barrows or the Mesolithic activity located under them. In the event the only man-made feature was a small pit located in Trench 3e (Fig. 3). This contained birch, heather, hazel, ash and pine charcoal and was overlain by a layer of charcoal (Context 99) containing birch, hazel, ash, pine and oak (see Microfiche Report p. 2).

The pit also contained six waste flakes and one retouched flake. Two Carbon 14 dates of 6820 ± 80 b.c. and 7090 ± 90 b.c. clearly indicate a Mesolithic date for this pit. The remaining evidence for human activity in the West Heath

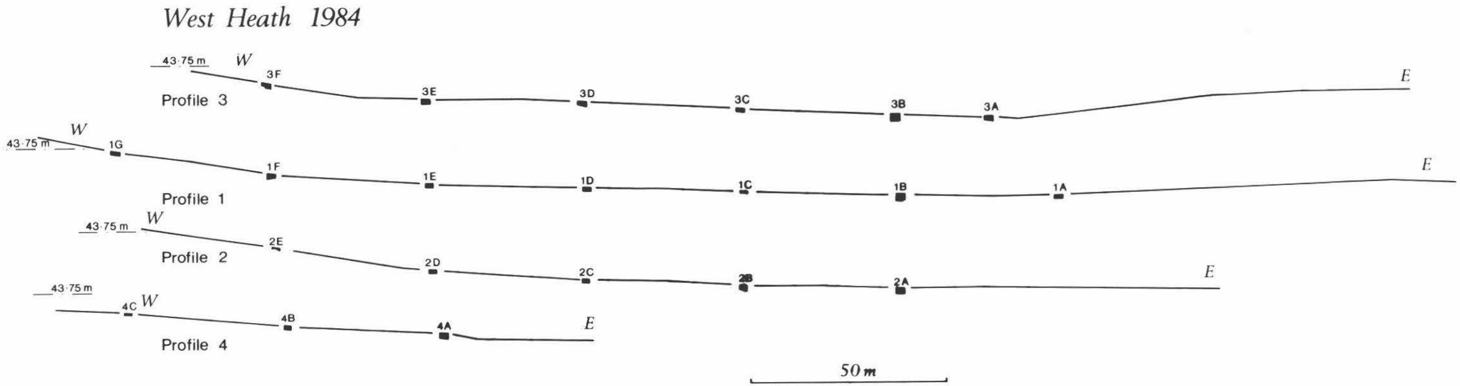

Fig. 2 West Heath 1984. Transect line profiles.

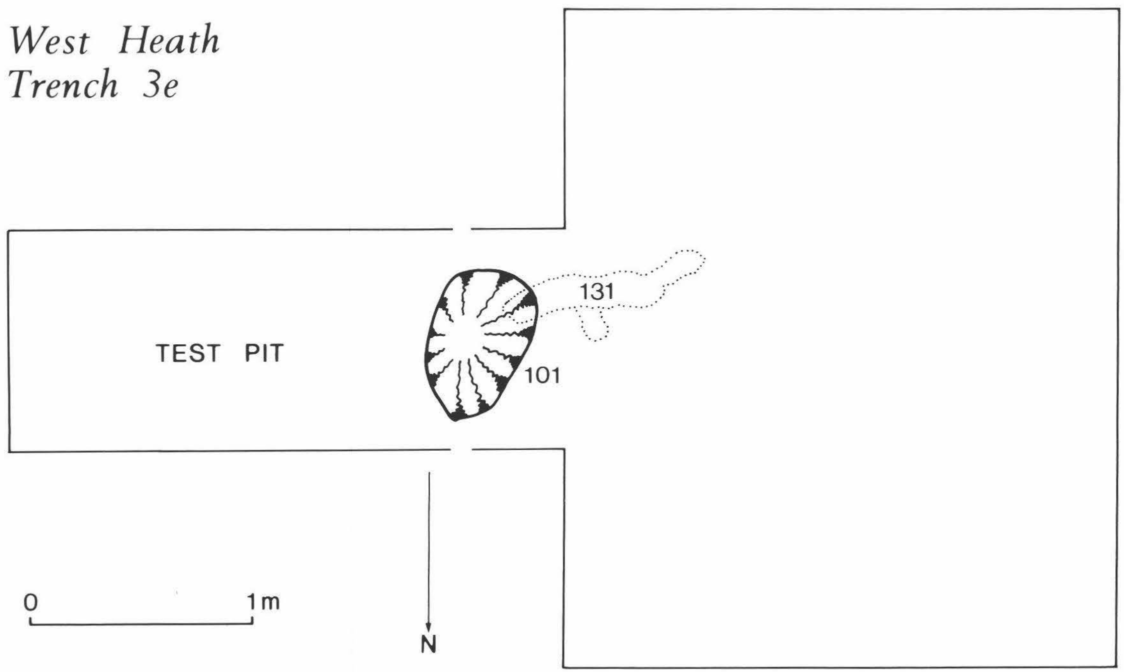

Fig. 3 West Heath 1984. Mesolithic pit in test pit 3e and excavation extension.

valley is shown by anthropogenically enhanced erosion of the soil cover itself and its deposition in greater or lesser depths in the valley floor. A detailed study of the sediments themselves was undertaken by Dr R. Macphail, together with a pollen analysis by Dr R. Scaife.

West Heath Soil Report (by R. I. Macphail)

During August 1984 the colluvial slope to the south-east of the Barrow Cemetery (Drewett 1976; 1985) at West Heath was pit sampled. Four lines of seven to eight pits each were excavated from the break of slope in the areas of barrows VII and VI south-eastwards to the valley floor (*c*. 200 m.).

All the pits were examined in the field. Soil profile descriptions (Appendix 1; Microfiche p. 4) were made on pits 1g (break of slope), 1f, 1e (colluvial slope) and 1d (side of valley floor). Samples from these soils, and from beneath barrow VIII (Macphail *in* Drewett 1985) for comparison, were analysed for loss on ignition (organic matter) and grain size (analyses carried out by Matthew Canti at the Ancient Monuments Laboratory), and ignited soil profiles were also examined to show absence and degree of presence of iron in these podzolic soils. Results are presented in Appendix 1, Microfiche p. 4 and Table 5, and interpreted in Appendix 2, Microfiche p. 10.

Fig. 4 West Heath 1984. Test pit 1d. Colluvial humo-ferric podzol towards base of colluvial slope and valley floor junction with a concentration of 'plateau gravels' within lower bleached sand (Ea) indicating possible Bronze Age or earlier erosion and deposition. The black Ah horizon above could relate to Bronze Age surface stability noted beneath some of the barrows. Various narrow horizons above testify to renewed colluviation.

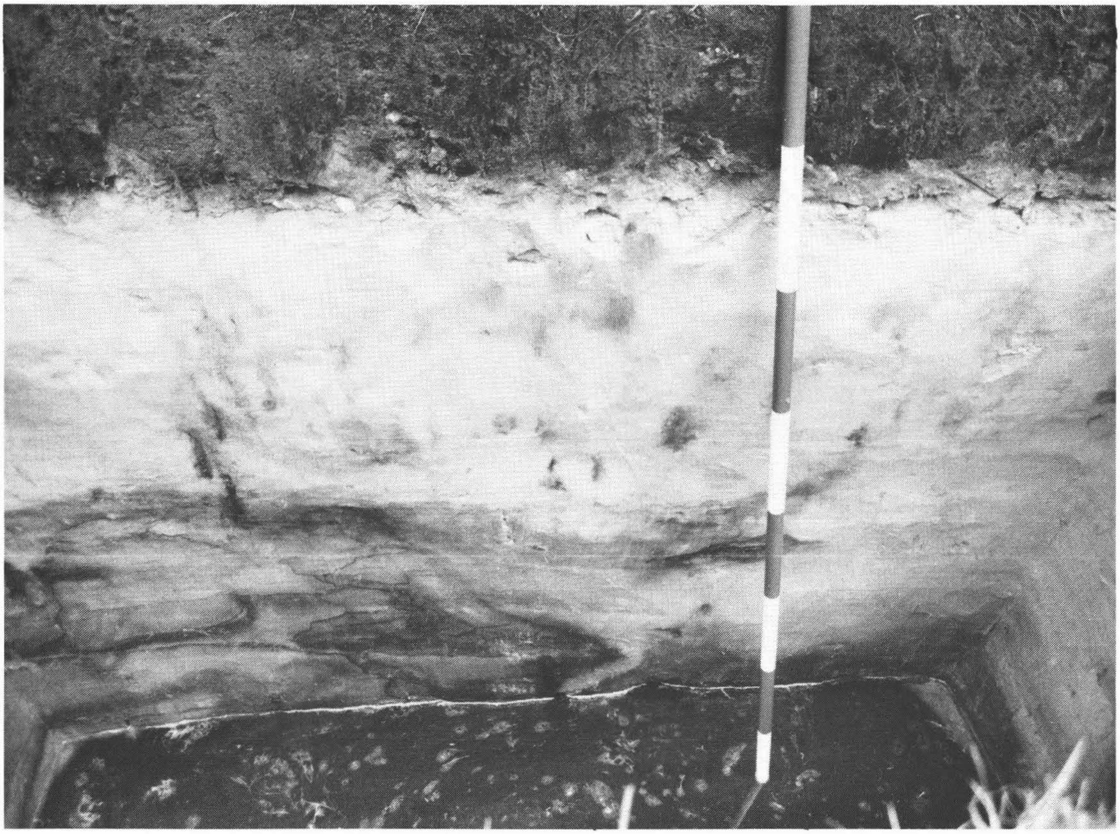

Fig. 5 West Heath 1984. Test pit 1b. Colluvial typical gley podzol in valley floor; with weathered (bleached and humus stained) obliquely bedded Lower Greensand 'subsoil'.

West Heath: Soils

From an examination of the field and analytical data of this (Appendices 1 and 2; Table 5) and previous studies (Macphail *in* Drewett 1985; Scaife and Macphail 1983) at West Heath it can be deduced that a number of phases of soil formation and erosion/colluviation can be recognised, and approximately dated.

Pit excavation revealed catenary sequences of humo-ferric podzol (Shirrel Heath 2; Jarvis *et al.* 1983; Avery 1980) formation. At the break of slope *in situ* podzol formation is little affected by earlier erosion and recent colluvial burial (Profile 1g, Table 5). On the colluvial slope profiles 1f and 1e reveal *in situ* podzols deeply buried by colluvial and repeated Ah surface horizon formation. At profile 1d (Fig. 4) similar colluvial spreads bury the *in situ* soil, whereas at profile 1b (Fig. 5) weathered Lower Greensand and parent material occurs near the surface in this valley bottom site affected by both (valley) erosion and a high water table.

The Lower Greensand at West Heath comprises both sands dominated either by fine (100–200 μm) or medium (200–500 μm) sand, and loamy sands with *c.* 15–20 per cent silt and clay, and clay loam (28 per cent clay, 24 per cent silt) bands. The eluvial (Ea) or bleached sand horizons are generally poor in silt and clay because of leaching, whereas the podzolic enriched subsoils (Bh or Bs) can be more loamy.

The subsoil at profile 1g may be correlated

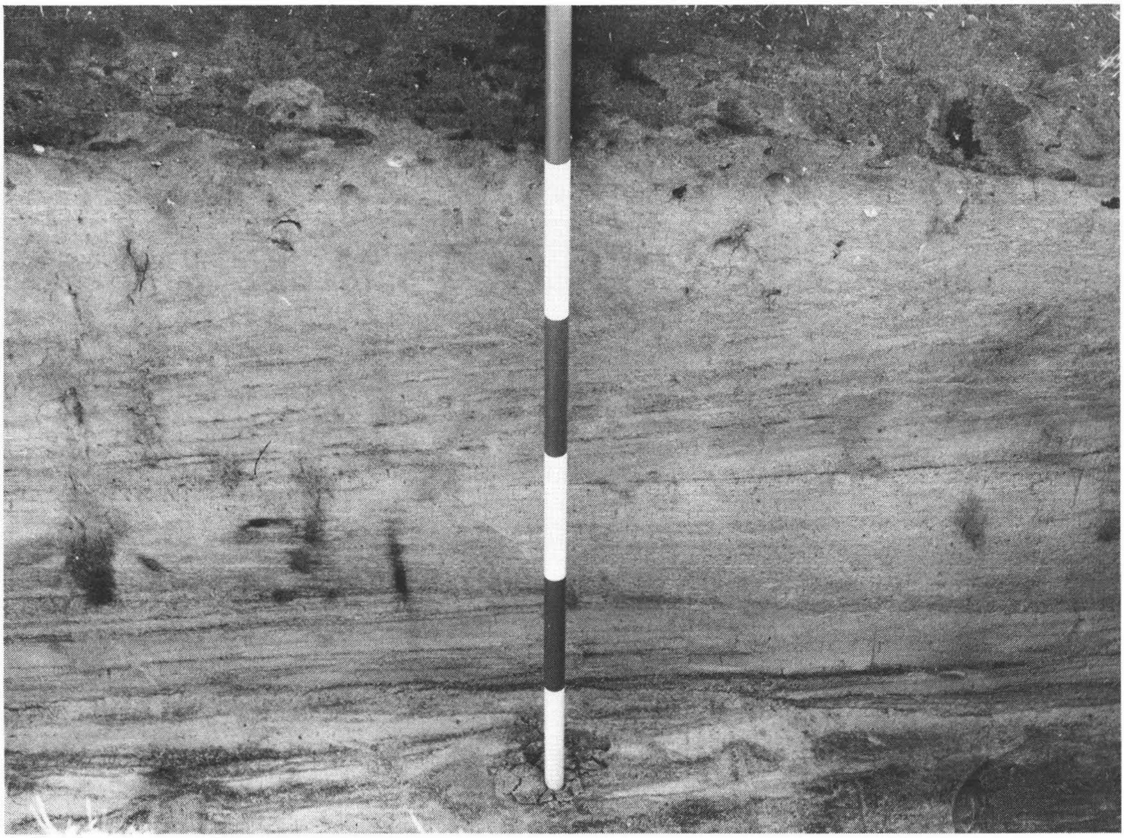

Fig. 6 West Heath 1984. Test Pit 3b colluvial weakly formed humo-ferric podzol; with shallow buried weathered (bleached and humus stained) obliquely bedded Lower Greensand sediments very close to the surface, indicating major erosion of the soil cover in this site.

with primary podzol formation at West Heath (as under the Bronze Age barrows) although the top part of the profile is 'disturbed'. At 1f a sequence of burials may suggest that the lowest bleached sand horizon (2bEa3) and underlying soil could be contemporary with Bronze Age profiles on the site. The level of burial at profile 1e is less clear but again the lower bleached horizon and subsoils are believed to be early. At profile 1d the well-formed buried organic surface (3bAh/Ea) horizon could be contemporary with post-erosional Ah formation noted in the podzols buried by the barrow cemetery. If this is the case, then the gravel spreads within the lower bleached sand (junction of 3bAh/Ea and 3bEa2 horizons) could relate to an earlier phase of high energy erosion and deposition. The bleached sands above and below this gravel vary texturally (Sa.18a, 19A) and the gravels may bury an eroded lower Ea horizon, perhaps relating to a phase of disturbance which partially eroded the soils beneath barrow VIII (Scaife *in* Drewett 1985). Lastly, on the valley floor, at Pits 1b (Fig. 5) and 3b (Fig. 6) bleached sand colluvium buries deeply truncated soils with geological layering extant within 40–50 cms. of the surface.

The Environmental History at West Heath

This present study (see Appendix 2, Microfiche p. 10), and work carried out previously (Macphail *in* Drewett 1985; Scaife and Macphail 1983) seems to indicate that on particularly poor parent materials such as the Lower Greensand, podzolisation may have developed very early. It has been suggested that *Calluna*, which was common in Late Glacial times, may have persisted in acid regimes such as at West Heath, so that the raw mineral soils of this period could have developed as a podzolic ranker—podzol sequence (Scaife and Macphail 1983). This is in contrast to the more normal inferred developmental sequence of raw soil-brown soil-argillic brown soil-podzolic brown soil-podzol (Mackney 1961), which relates to brown soils under forests being replaced by podzols under *Callunetum* (Dimbleby 1962)—the latter situation being recognised on the Lower Greensand in Surrey for example (Macphail 1979, 1983a).

The pollen evidence from West Heath (Scaife *in* Drewett 1985, Scaife and Macphail 1983) also indicates that *Calluna*, which was perhaps residual from Late Glacial flora, spread locally in the Mesolithic because of burning and general opening up of the forest canopy. Drastic effects on the soils in the form of sand blowing at Iping, Sussex (Keef *et al.* 1965), bleached sand blowing at Oakhanger, Hampshire (Rankine *et al.* 1960) and probably soil disturbance leading to podzolisation at High Rocks, Kent (Macphail *et al.* in press), can all be related to Mesolithic or occupational activities (Macphail 1986).

Specifically at West Heath a Carbon 14 assay of the organic matter in the buried Bh horizon beneath barrow VIII gave a mean residence date of 3770 ± 75 yrs. b.p. (HAR–4840) clearly indicated organic matter translocation, or in other words, the onset of podzolisation had commenced by Mesolithic times—Mesolithic activity itself being dated by charcoals within a pit under barrow I at 8100 ± 70 b.p. (6510 b.c.) (Drewett 1976). Soil pollen (Zone 1; Scaife and Macphail 1983) from the base of the bEa horizon beneath barrow VIII is arguably of Mesolithic date and indicates a vegetation of post-clearance Hazel scrub with a mosaic of *Calluna* and grasses, the pollen of which is preserved at this level because the soil had already become sufficiently acid by this time. The present soil study suggests that the lower Ea horizons at profiles 1f (2bEa3, –81–121 (162) cms.) and 1d (3bEa2, 43(58)–90(110) cms.) could also correlate to this period. There is pollen and soil evidence (Scaife and Macphail 1983) that the 'Mesolithic Ea horizon' was truncated, and it is clearly apparent at profiles 1f and 1d that the erosion of the podzol cover was a general event at West Heath. At profile 1d this can also be associated with a spread of gravels produced by high energy fan deposition. It has already been suggested (Scaife and Macphail 1983) that turf stripping for barrow construction may have been one of the main causes for this erosion. At barrow VIII it was clearly demonstrated that the erosional hiatus was followed by minor bleached sand colluviation and the development of a surface Ah horizon prior to barrow construction (Macphail *in* Drewett 1985; Scaife and Macphail 1983) and it may be that the well developed buried Ah horizon (3bAh/Ea) at profile 1d could have similarly formed in the Bronze Age.

The study demonstrates how early (by the Mesolithic) the soils at West Heath were podzolised, in comparison to a general Bronze Age date for heaths in southern England (Dimbleby 1962), and this in response to human activity encouraging *Callunetum* to spread, rather than just to progressive podzolisation on a coarse parent material. In fact, the investigation shows the Lower Greensand to have fine sand and loamy elements present. This may be compared to the situations at Caesar's Camp, Keston, Kent (Cornwall 1958, Dimbleby 1962, Macphail 1986 AMLR) on the Blackheath Beds, and at Hengistbury Head, Dorset on Tertiary sands and loams (Macphail and Scaife *in* Barton, in prep.) where podzols were slowly developed from argillic brown sand soils under oak woodland extant until the Iron Age and Late Bronze Age respectively, probably because of the low level of human interference in the landscape.

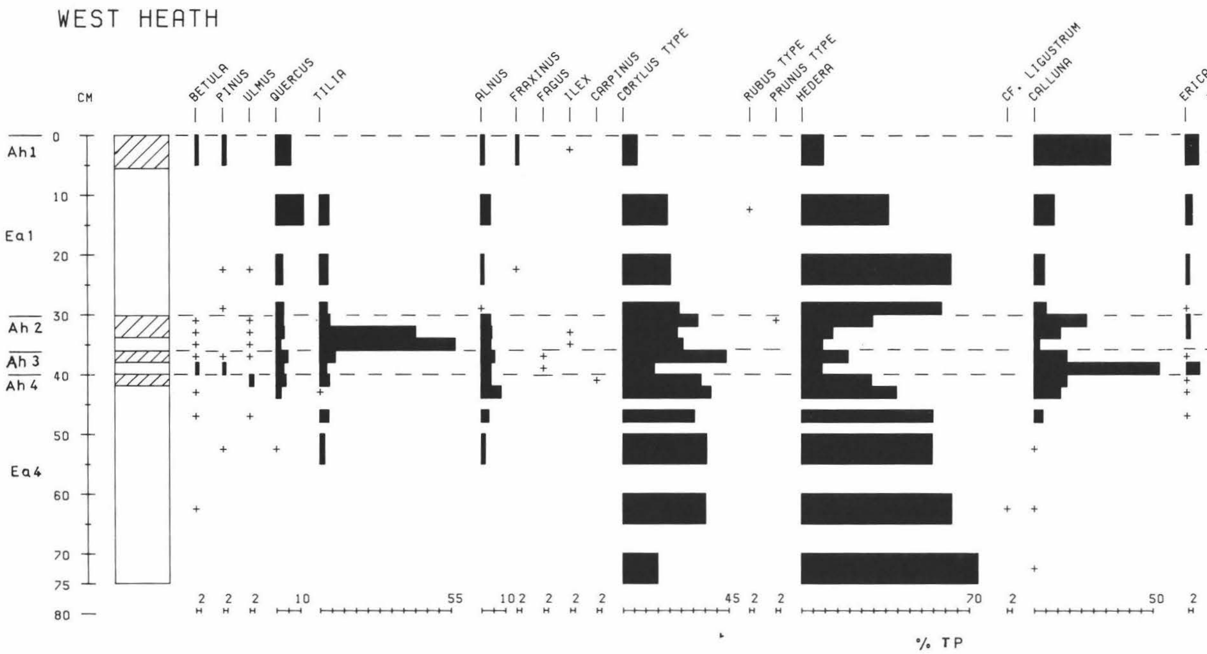

Fig. 7 West Heath. Trench 1D. Pollen Diagram.

Acknowledgements

The author wishes to acknowledge Matthew Canti (laboratory grant funded) for grain size and loss on ignitition analyses, and Bob Otlet and Jill Walker of Harwell for the soil radiocarbon date.

West Heath Pollen Analysis (by Robert G. Scaife)

The soils of the West Heath area are humo-ferric podzols and therefore of highly acidic character which has facilitated the preservation of pollen. Extensive excavation of the nine barrows comprising the Bronze Age nucleated cemetery has already taken place prior to their destruction by extraction for sand (Drewett 1976, 1985). Detailed pollen and soil studies of the old land surfaces underlying these barrows have previously been carried out and published (Scaife 1985, Scaife and Macphail 1983). These studies elucidated the environment of the period immediately prior to the construction of these earthen mounds. It is clear from these excavations (Drewett 1976, 1985) and from the soil and pollen analyses that a substantial degree of soil truncation (as for example at barrow VIII) and soil erosion had taken place. This resulted from both turf stripping for construction of the mounds and from natural downslope mass movement processes, perhaps a consequence of the removal of surface vegetation which bonded the soils. The absence of Neolithic artifactual evidence on these areas of heathland and the fact that the soils were apparently already podzolised by the end of the Mesolithic period (Keefe *et al.* 1965, Scaife and Macphail 1983) prompted this investigation into the possible causes of colluviation and the character of the vegetation during those periods not represented in the sub-barrow soils.

Methodology

Trench 1D exhibited a number of clearly defined buried soils (podzolic Ah and Ea

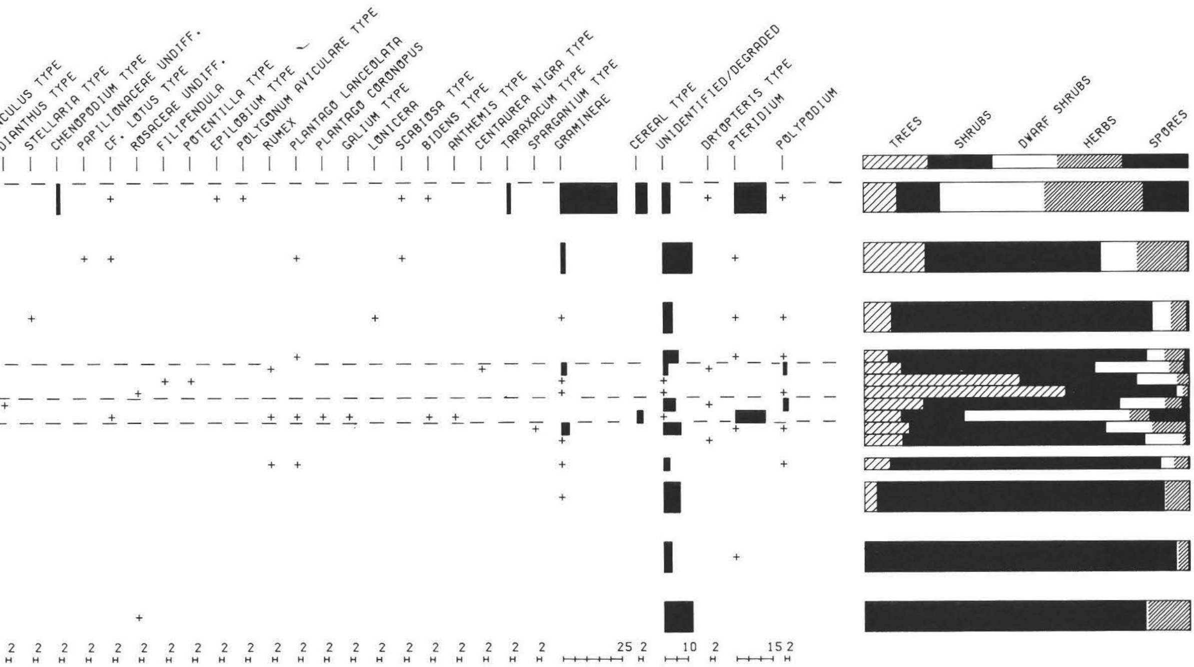

Fig. 7 (Cont.) West Heath. Trench 1D. Pollen Diagram.

horizons) and was therefore chosen for palynological study. Samples were obtained directly from the open trench sections from the present ground surface to the basal lithology (Cretaceous, Lower Greensand) at 80 cm. where the soils were of a sandy and friable character, samples 5 cm. thick were taken. Samples of 2 cm. thickness were obtained contiguously across the three thin buried Ah and Ea horizons. Samples of 2 ml. were subjected to standard techniques for the extraction of the sub-fossil pollen and spores (Moore and Webb 1978). A known quantity of exotic pollen was added at the outset of the extraction procedures in order to calculate the absolute pollen frequencies present. Pollen sums of 300 grains per level were made except where absolute pollen frequencies were low. The results of this analysis are presented in pollen diagram form (Fig. 7). Pollen is expressed as a percentage of total pollen, and spores as a percentage of total pollen plus spores. The principal characteristics of this pollen sequence are described briefly from the base at 75 cm. upwards:

74–42 cm. (Ea4); Pollen preservation was poor in these basal samples. This, and the relatively low pollen frequencies, suggest that differential pollen preservation/degradation has taken place which may have resulted in a 'skewed' pollen spectrum. Pollens are dominated by *Hedera* (ivy) and *Corylus* (hazel) type (70 per cent TP and 40 per cent TP respectively). Few trees are present, with only low frequencies of *Tilia* (lime) and *Alnus* (alder) evidenced between 42 cm. and 55 cm. *Calluna* (ling) is almost absent.

42–40 cm. (Ah4); This humic Ah horizon is dominated by *Hedera* type and *Corylus* type with *Calluna*, *Tilia* and *Quercus* (oak) becoming more important. *Alnus* is present in low frequencies.

40–38 cm. (Ea3); *Hedera* and *Corylus* type remain dominant with *Calluna* reaching its highest values (50 per cent TP). *Erica* (heather) values also increase. Of importance is the expansion of *Pteridium* (bracken) and a minor increase in Gramineae (grasses) and herbaceous pollen. *Fagus* (beech) is also noted in this and the subsequent level.

38–36 cm. (Ah3); *Corylus* attains its highest percentages (45 per cent TP). *Tilia* starts to increase in value.

36–34 cm. (Ea2); *Tilia* expands to extremely high amounts (55 per cent TP). *Corylus* and *Hedera* decline (a statistical response to the sharp increase in *Tilia* pollen percentages).

34–28 cm. (Ah2); *Tilia* values drop markedly from 40 per cent TP to 5 per cent TP. *Hedera* conversely, increases as a statistical response to declining *Tilia*. *Calluna* expands to the top of this Ah horizon. *Corylus* remains important (20–30 per cent TP).

30–6 cm. (Ea1); This represents the thick Ea horizon of the modern podzolic soil. *Quercus* expands; *Hedera* declines. *Tilia* and *Alnus* remain present.

6–0 cm. (Ah1); This represents the modern podzolic Ah horizon. *Corylus*, *Hedera* and *Tilia* decline, the latter to absence. Percentages of *Erica*, *Calluna*, Gramineae, cereal type and *Pteridium* all expand.

Discussion

Of those trenches excavated, 1D was chosen for pollen analysis because it contained the best developed sequence of multiple humo-ferric podzols. This is perhaps due to the fact that this sequence lies on the sides of the valley floor and this is a more stable environment.

Macphail (1986b) has suggested that these well formed buried organic horizons may be contemporaneous with post-erosion Ah formation in the podzols buried underneath the barrows of the Bronze Age cemetery. It is clear that there is a very substantial thickness of Ea (bleached sands) below the lowest Ah (Ah4) horizon. Macphail has suggested that this depth of sand is colluvial and perhaps relates to the evidence of eroded soils underlying barrow VIII (Scaife *in* Drewett 1985).

Consequently, interpretation of the pollen spectra at this site must consider the possibility of:

a) pollen profiles forming *in situ* in the buried soils of the old land surface;

b) pollen derived from up-slope through colluvial processes.

At the base of this section (1D), recovered charcoal fragments have been dated to 8770 ± 80 b.p. (HAR 7036) and 9040 ± 90 b.p. (HAR 7037). These two dates therefore fall within the early part of the Flandrian Zone I (Boreal). The vegetation of this period in southern England was dominated by *Pinus* (pine) and *Corylus* (hazel) (Seagrief and Godwin 1960; Carpenter and Woodcock 1981; Scaife 1980, 1982, 1984, 1987a, 1987b; Burrin and Scaife 1984). This is not, however, evidenced in the pollen profile presented here. The Ea horizon above this charcoal (Ea4) is dominated by *Corylus* and *Hedera* but with few other taxa present. Differential pollen preservation had undoubtedly occurred, thus giving a 'skewed' pollen spectrum. However, *Pinus* is usually over-represented in such poor pollen-preserving situations and the fact that it is not present here suggests that these basal soils are of a later date than the Boreal suggested by the radiocarbon dates. It is likely that the charcoal represented a basal ground surface whose pollen and soil evidence has been subsequently destroyed.

The basal Ea4 horizon of section 1D is comparable with the lower soil horizons under barrows V, VIII and IX with the exception of the absence of *Tilia*. This is not, however, surprising because of the poor dispersal characteristics of *Tilia* pollen (Andersen 1970, Keatinge 1983). It is likely as suggested by Macphail, that this thick basal Ea sequence was derived from up-slope and may be correlated with the late-Mesolithic soil erosion evidenced in the soil profile of barrow VIII (Scaife and Macphail 1983).

Three buried humic horizons are present and each contained pollen. These and the associated Ea horizons represent phases of soil (podzolic) formation in which the pollen largely represents the *in situ* vegetation. The vegetation represented in these humic horizons is broadly comparable, but with some variation in the dominant taxa. Overall, it is clear that the environment was one of heathland (dominated by *Calluna)* within *Corylus* and *Tilia* woodland. This is typical of the pollen profiles from sub-barrow old land surfaces on southern English heathlands (Dimbleby 1962). These include Minsted (Dimbleby *in* Drewett 1974); Ascot, Berks. (Bradley and Keith-Lucus 1975); West Heath, Sussex (Baigent *in* Drewett 1976; Scaife *in* Drewett 1985 and Scaife and Macphail 1983).

High *Hedera* pollen frequencies pose a particular problem and are discussed below. The exceptionally high *Tilia* values (especially in Ah2 and Ea2) are similarly typical of pollen sequences in southern England (Baker, Moxey and Oxford 1978); Scaife 1980, 1985; Greig 1982). The fact that lime is entomophilous (insect polinated) and a poor pollen producer illustrates that lime was the dominant tree on these soils. The dispersal characteristics may result in marked fluctuations in its pollen percentages from soil pollen spectra. Thus, when found in soils, it indicates strongly the presence of *Tilia* growing on the site. Such fluctuations may account for the exceptionally high peaks in Ah2 and Ea2. *Alnus* is noted throughout these buried soil profiles. This may be regarded as evidence of its growth at some distance from only very sporadic local growth (in damp areas) in the valley bottoms. If *Alnus* was an important constituent of the local vegetation, pollen percentages might be expected to be much higher (being anemophilous and a high pollen producer).

Dating of these old land surfaces poses a problem, due to the absence of artifactual dating and organic material suitable for radiocarbon assay. If comparisons are made with the pollen profiles of barrows V, VII and IX (Scaife *in* Drewett 1985), it is clear that Ah2, Ah3 and Ah4 resemble the pollen spectra from the turves used to construct the early to middle Bronze Age barrows on the hill above. It is plausible therefore, that these spectra are contemporaneous and provide evidence for the vegetation growing on the valley bottom and side during the Bronze Age. Interestingly, at barrow IX, pollen evidence suggests that agriculture was being practised on this valley side (Scaife *in* Drewett 1985, 56). In Ea3, similar evidence is present with Gramineae and cereal type and a minor increase in weed pollen and *Pteridium*. This occurs only at one horizon and must be considered therefore, as of only minor importance or even due to contamination from the modern ground surface (possibly by rootlets) which similarly has evidence of agriculture. It is, however, thought that this ephemeral phase may be correlated with the turf used in construction of barrow IX.

The uppermost soil profile Ah1/Ea1 illustrates the change from wooded/scrubby heathland to open *Calluna* heath with recent changes to grassland and modern growth of *Betula* (birch) and *Pinus* (pine).

One apparent phenomenon of note is the exceptionally high values of *Hedera* pollen throughout the soil profile. Similarly high values have been noted at a now considerable number of sites in southern England at, for example, Minsted, West Sussex (Dimbleby *in* Drewett 1974); Oakhanger Warren, Hampshire (Dimbleby *in* Rankine *et al.* 1960); Portesham, Dorset (Dimbleby *in* Thompson and Ashbee 1957); and West Heath (Scaife *in* Drewett 1985). Simmons and Dimbleby (1974) have suggested that such pollen frequencies are due either to the collection of evergreen ivy as winter fodder for animals (not necessarily domesticated animals, but also Mesolithic animal husbandry) or from pollen present in animal dung (i.e. from animals grazed on winter evergreens). Although there is some evidence for this utilisation of evergreen fodder (Schweingruber 1976 *in* Dimbleby 1984), the high pollen frequencies now appear so widespread and throughout deep soil profiles, that natural causation seems more likely. However, such high quantities must be regarded as problematical in view of the very poor pollen production and dispersal of this plant (Dimbleby 1985, 142). It is possible that ivy was a more widespread and important constituent of the flora, perhaps growing on areas of dead decaying trees, themselves the result of prehistoric forest clearance.

Summary

Trench 1D, lying on the side of the valley floor, contains three buried land surfaces. These are humo-ferric podzols comprising Ah and Ea horizons. With the exception of a thick basal Ea formed from downslope movement of sand, their profiles are *in situ*. Pollen analyses of these soils show a vegetation which is comparable with those of the old land surfaces underlying the West Heath Bronze Age barrows on the hill above. That is, a vegetation dominated by *Tilia* woodland with *Corylus* scrub and *Calluna* dominated heathland. Exceptionally high values of *Hedera* (ivy) have been found.

Radiocarbon dates obtained from the charcoal at the base of the profile dates to the early Flandrian (8770 ± 80 b.p. HAR 7036); 9094 ± 90 b.p. HAR 7037) (Table 1). These dates apparently relate to an old land surface whose pollen profile was subsequently destroyed through podzolisation. Only limited evidence of agriculture has been found, but this may be comparable with similar findings obtained from barrow IX (Scaife *in* Drewett 1985).

TABLE 1

The Radiocarbon Dates (by R. Otlet)

Three samples of charcoal from Ferring and two samples from West Heath were submitted to Harwell for C-14 dating

West Heath			
Context:	Lab. No.:	b.p.	b.c.
Trench 3E 99	HAR–7036	8770 ± 80	6820
Trench 3E 103	HAR–7037	9040 ± 90	7090
Ferring:			
Trench A 16	HAR–7033	2800 ± 70	850
Trench A 43	HAR–7034	3040 ± 70	1090
Trench B 42	HAR–7035	2360 ± 70	410

FERRING 1984

Ferring Rife runs due south from the foot of Highdown Hill. Highdown Hill was occupied by a major later Bronze Age enclosure, pre-Roman Iron Age hillfort and Saxon cemetery with probably an associated village. The surrounding hillslopes show evidence of early agriculture in the form of lynchets. South of the hill is an area,

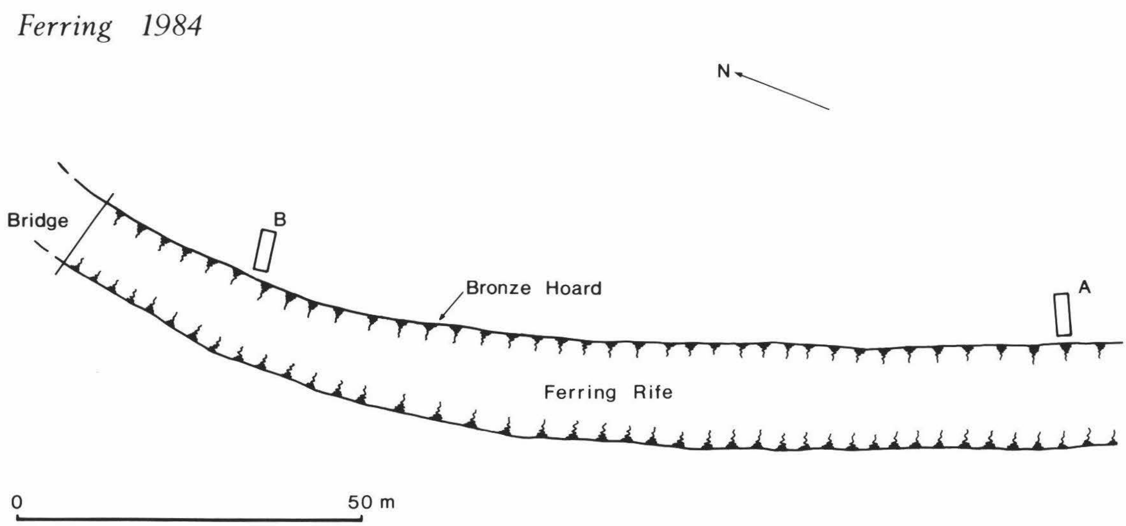

Fig. 8 Ferring 1984. Location of Trenches A and B in relation to the bronze hoard found in Ferring Rife 1983.

little more than a mile wide, of brickearth. Ferring Rife cuts through this deposit. In 1983 Mr F. Archer recovered a later Bronze Age hoard on the east bank of the Rife at TQ 089024 (Aldsworth 1983). As this hoard appeared to have been buried in alluvial clay, and lenses of burnt flint were visible in the Rife section, it was decided to dig two 6 m. x 2 m. trenches, one on each side of the find spot (Fig. 8).

The lowest deposits in both trenches (Contexts 31, 34, 35, 36, 37, 39, 40 and 41) appear to represent natural deposits derived from the erosion of the chalk, but containing beach pebbles and lenses of sand (Figs 9 and 10). This is *in situ* or redeposited material of periglacial origin. Above these layers were alluvial deposits (see Context Record, Microfiche p. 31) which, where dated, tie in well with major periods of activity on Highdown Hill.

The first main phase of alluvial deposition appears to have taken place *c.* 1100–800 B.C. Context 43 (Fig. 10) consisted of a layer of alluvial gravel containing burnt flint and charcoal from which a Carbon 14 date of 1090 ± 70 b.c. was obtained. This charcoal consisted of alder, hazel, hawthorn, beech, alder buckthorn, ash, *Prunus* sp., oak, willow or poplar, and elm. It is likely that this layer represents primary or secondary clearance of the area, resulting in the onset of gradual but continuous erosion during the later Bronze and early pre-Roman Iron Ages. Deposits above Context 43 consist of layers of fine alluvial clay. Context 16, a compact alluvial clay, also contained some burnt flint and charcoal from which a Carbon 14 date of 850 ± 70 b.c. was obtained. In Trench B (Fig. 11) a pre-Roman Iron Age date of 410 ± 70 b.c. was obtained from Context 42. The deposits can therefore best be interpreted as gradually accumulating over several hundred years during the 1st millennium B.C., probably as the result of agriculture to the north. The area sampled was clearly also utilized, as evidence from the preserved wood (Fig. 12) located in the deposits clearly shows (see Report on Wood and Charcoal below). The later Bronze Age hoard discovered in 1983 therefore appears to have been deposited in a utilized marshy environment which was being gradually raised by the movement of alluvium from agricultural lands to the north.

Wood and Charcoal from Ferring (by Caroline Cartwright)

Wood

As the level of organic preservation was high in many of the contexts excavated at Ferring, much waterlogged wood was recovered.

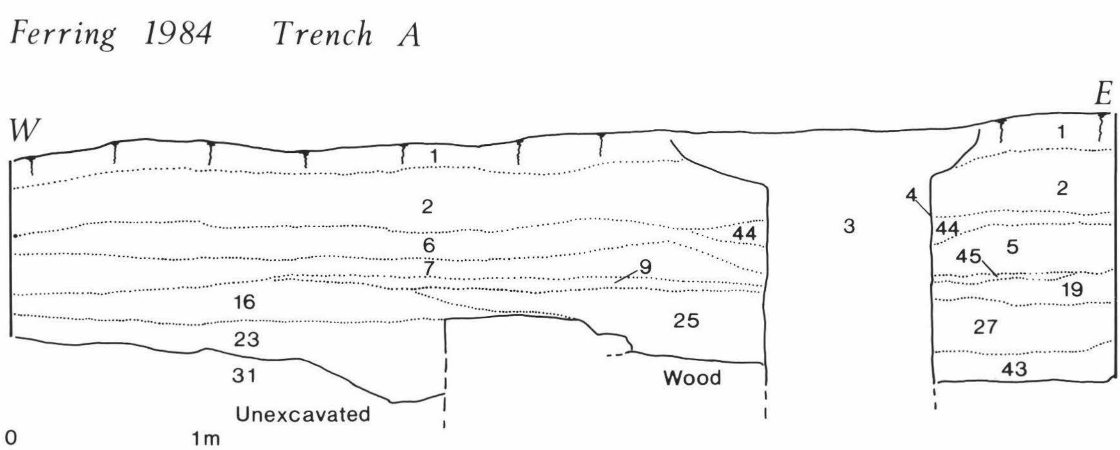

Fig. 9 Ferring 1984. North Section of Trench A. (Layer descriptions in context record on microfiche).

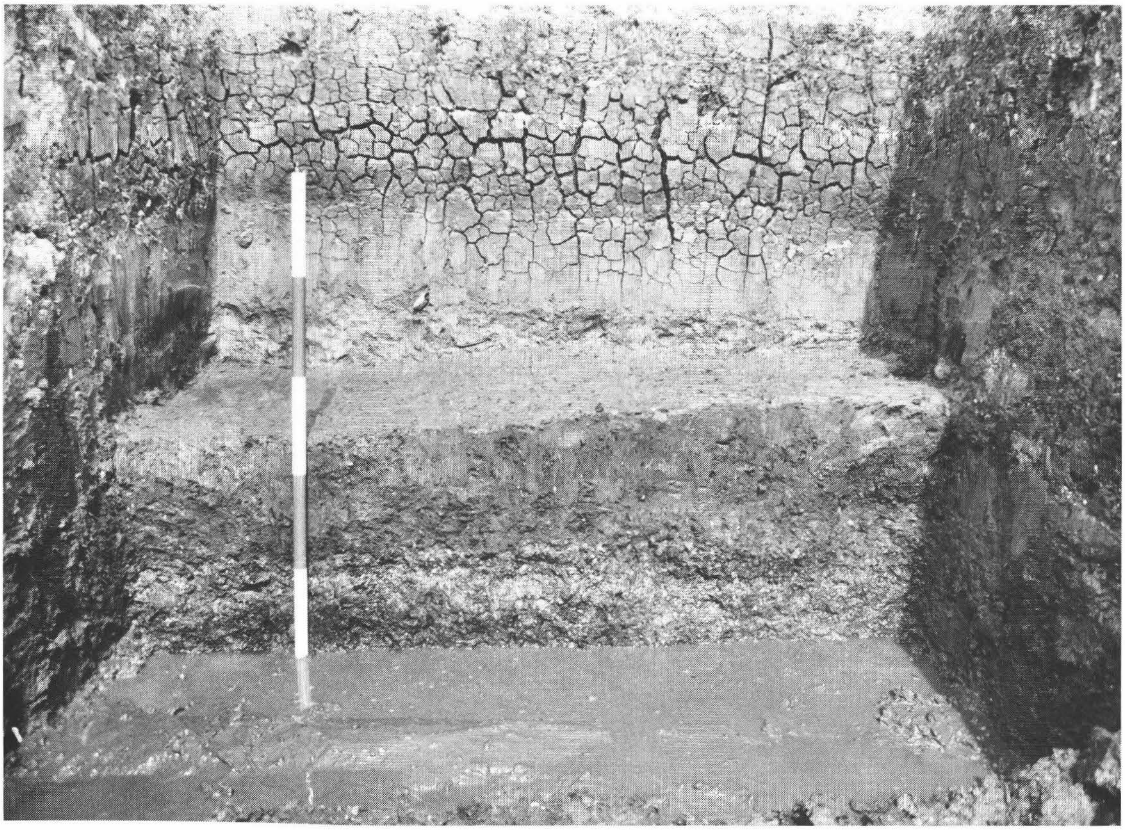

Fig.10 Ferring 1984. East face of Trench A showing alluvial gravels overlain by later Bronze Age silts.

The condition of the wood varied from fairly firm, to very soft with some cellular degradation. The fragmentation level was generally high, so for comparative purposes the different woods identified have been expressed in Table 9 (microfiche p. 34) as percentage by weight (g.). The total weight of the identified pieces from 18 contexts is 1,490 g. but it must be added that a further 1,605 g. of bark fragments (possibly pine and oak) were recovered from contexts 16, 22, 23 and 25. Most of the wood fragments are pieces of roundwood, commonly measuring between 4.44 cm. and 12.45 cm. However, there are larger fragments of ash, pine, oak and hazel (notably from Contexts 23, 25 and 26) which measure between 45 cm. and 53 cm. in length, with a diameter of 2.8 cm. to 4.6 cm. Whilst there is a lack of distinctive artifact types, chips or offcuts, diagonal cutting of branch ends and trimming occurs on some roundwood pieces. The nature and orientation of the wood is not inconsistent with bundles of brushwood and bark being laid down as a basis for hurdles or panels of a track or platform over a marshy area, with the larger pieces of timber serving to secure the sections in place. Context 25 produced 680 g. of large ash 'plank' fragments, and it is possible that hazel and willow withies (e.g. Contexts 23, 25 and 26) may have been utilized to tie the elements together. The bundles of brushwood mainly comprise field maple, alder, birch, hazel, beech, ash, pine, oak and willow/poplar (Table 9). No clear evidence of coppicing is present on the hazel roundwood, although the larger straight pieces

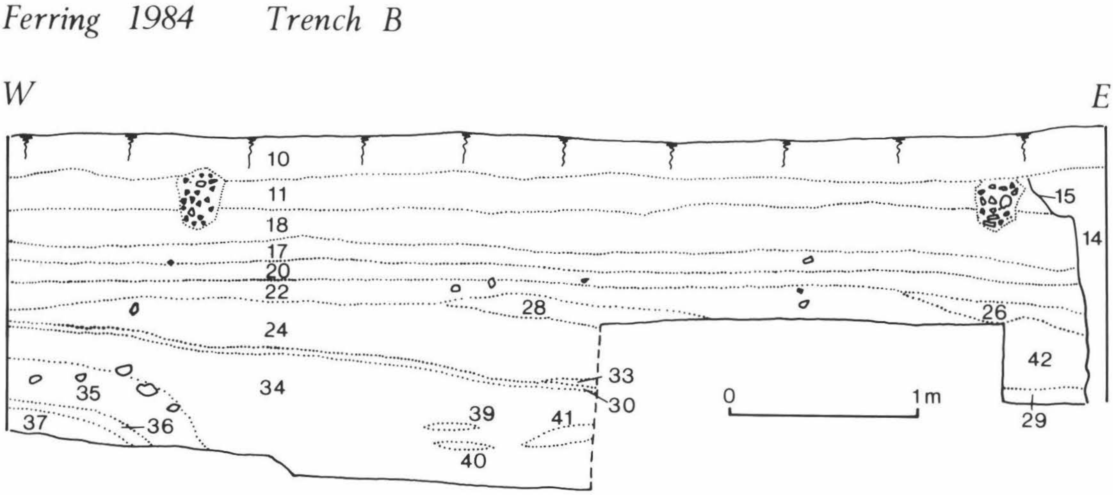

Fig. 11 Ferring 1984. North section of Trench B. (Layer descriptions in context record on microfiche).

Fig. 12 Ferring 1984. Later Bronze Age branch from Trench A, Context 23.

may have been cut from coppiced stands.

Not all the pieces necessarily represent track material. Branches and slender stems could also have been used for fencing, and as firewood. Partially-carbonized wood and charcoal occurs in seven of the contexts also containing waterlogged wood (see Charcoal Section below).

Whatever the function of the wood fragments, the selection of timber is interesting. The identified wood pieces indicate a marked use of ash and willow/poplar, with pine, hazel and oak also fairly commonly utilized. Hawthorn, beech, alder, field maple, elm, hornbeam and birch are represented—especially in Contexts 22 and 23. It seems likely that vegetation growing closely within the site's environs has been used, either as dead brushwood or cut/broken from hedgerows, shrubs, saplings and trees.

Charcoal

Charcoal fragments totalling 240 g. in weight were recovered from 11 excavated contexts at Ferring. All these contexts also contained fragments of fire-cracked flint. Table 8 (microfiche p. 33) has details of the identified charcoal fragments. Considering the quantity of burnt flint it is perhaps surprising that the quantity of charcoal is low and the fragments so small. However, if the charcoal fragments are interpreted as the remnants associated with hearths or fires, possibly the bulk of the material has been reduced to tiny flecks or entirely to ash.

In terms of timber selection, many of the same species are reflected in the charcoal record as in that of the waterlogged wood. There are interesting exceptions though—no field maple, birch, hornbeam or pine charcoal is present, and alder buckthorn and *Prunus*-type are only present in charcoal form. Calculated on a percentage by weight basis, oak (including some root material) is most strongly represented, followed by willow/poplar, hazel, alder and elm. *Prunus*-type, beech, hawthorn, ash and alder buckthorn are also present (Table 8). Table 9 compares and combines the wood and charcoal totals (percentage by weight (g.)). Ash emerges as the dominant wood present, followed by willow/poplar. Pine, oak and hazel are also significantly represented. How far these relative frequencies may be taken as representative of the surrounding environment of the site during its period of use remains a matter for discussion. However, it is interesting to note the character of the present-day (1984) vegetation which, although sparsely scattered, reveals much willow, (stunted) beech, blackthorn (*Prunus spinosa*), hawthorn and alder, with the occasional poplar, pine, oak and ash tree. In the hedgerow fringing Ferring Rife, dog rose (*Rosa canina*), holly (*Ilex aquifolium*) and blackthorn occur with the dominant hawthorn.

Ferring Hoard environmental samples
Charcoal

A small quantity of charcoal (16 g.) was recovered in 1983 from the soil contents of ten socketed and looped bronze axes (object numbers 1–10 inclusive) in the Ferring Hoard (Aldsworth 1983). The soil also contained tiny fragments of copper alloy corrosion products, presumably deriving from the axes and associated bronze objects.

The charcoal fragments comprise 12 g. *Quercus* sp. (oak) and 4 g. *Salix*/*Populus* (willow/poplar). These small fragments appear to be pieces of twig, but their precise relationship to the axes is unclear. As there are several accumulations of burnt flint presumed to be contemporaneous with the hoard (F. G. Aldsworth, pers. comm.) it is therefore possible that these charcoal fragments may have become incorporated into the soil filling the axe sockets through redeposition of hearth or fire debris.

CONCLUSIONS

In many parts of the world over-utilization of the land has resulted in such drastic landscape transformations that entire economic and social systems change as a result. In Southern Bulgaria for example, Dennell and Webley suggest that 'the removal of vegetational cover on the unstable uplands could have resulted in unforeseen erosion and consequent deposition in the valleys and lowland areas to an extent which would have impelled drastic economic and social change' (Dennell and Webley 1975, 108). Similar massive erosion may be seen on the edges of highland areas in Britain, for example the widespread downwash of soils into lake basins in the Lake District (Smith *in* Simmons and Tooley 1981, 209). In Sussex clearance of the post-glacial 'Wildwood' (Rackham 1976) in local patches during the Mesolithic, and more extensively during the early Neolithic and later Bronze Ages, caused equally extensive, if economically and socially less damaging, erosion. The dry valleys and wet valleys of Sussex, formed or at least modified during the last glaciation, became traps for eroding sediments. Such areas often became the focus of agriculture in later periods with thinner degraded soils reverting to rough pasture, as in the case of West Heath. Here the heath remained rough 'woodie pasture' until the present day (see report on documentary evidence by M. Gardiner, Microfiche p. 13).

The 'Wildwood' of Sussex developed during the Flandrian Period following extensive removal of superficial deposits during the last Pleistocene glaciation (Sheldon *in* Drewett 1978). Into this 'Wildwood' came hunting and gathering communities following fleet-footed woodland fauna: red deer, elk, roe deer and wild pig. These Mesolithic communities began the process of anthropogenic soil erosion in Sussex. Bore holes by Scaife and Burrin in the Ouse Valley have located alluvial deposits over 6 metres deep. Some 2 metres of these deposits are considered to possibly represent local removal of vegetation by Mesolithic man (Scaife and Burrin 1983, 9). Similarly in West Sussex at Iping Common (Keef, Wymer and Dimbleby 1965), Minsted (Drewett 1975) and West Heath (Drewett 1976, 1985) pollen evidence was found suggesting local clearance of the 'Wildwood', perhaps to attract game.

The greatest impact of man on the environment, however, followed the introduction of settled agriculture about 4000 B.C. (Drewett, Rudling and Gardiner 1988, 24–31). Agriculture on the valley sides of the Ouse and Cuckmere rivers resulted in up to 6 metres of alluvium in the areas sampled (Scaife and Burrin 1983, 1985). The erosion causing this great depth of alluvium was certainly taking place in the early Neolithic, but continued well into the Bronze and pre-Roman Iron Ages. Evidence for man pushing higher up onto the Downs and clearing forest cover during the early Neolithic came from a number of sites, e.g. Whitehawk and the Trundle.

Such clearance is likely to have resulted in massive soil erosion into river and adjacent dry valleys. Dry valley sections at Kiln Combe (Bell 1983), Itford Bottom (Bell 1983) and Cow Gap (Kerney 1963) however, show major deposition starting in the late Neolithic Beaker period. In each case agriculture is the likely cause of soil erosion.

Evidence for agriculture in prehistory on the Greensands of Sussex is minimal. However, at West Heath the construction of a substantial barrow cemetery of turf mounds resulted in soil erosion on a par with that caused by agriculture. Evidence for this erosion is presented above. Following this period of erosion during the 2nd millennium, the landscape stabilised and little evidence either archaeological or historical (Microfiche p. 13) is available to indicate later agriculture.

Evidence from the river valleys (Scaife and Burrin 1983, 1985) together with Downland dry valleys (Bell 1983) shows extensive erosion in the later Bronze and pre-Roman Iron Ages, although possibly declining with the establishment of permanent lynchetted field boundaries. Certainly in the Itford Bottom section erosion is evident in the later Bronze Age, contemporary with the Itford Hill settlement. Similar dates indicate erosion around the later

Bronze Age enclosure on Highdown Hill. Dates of 1090 ± 70 b.c. and 850 ± 70 b.c. from alluvial deposits in the Ferring Rife valley fit well with the construction of the first enclosure on Highdown Hill.

Although some erosion continued into downland dry valleys in the Romano-British and later periods, little new erosion products appear in the river valleys, even as the result of well-documented forest clearance associated with the Wealden Iron industry (Scaife and Burrin 1983).

In conclusion, therefore, it may be said that the evidence from West Heath and Ferring confirm the essentially later prehistoric date of the most serious erosion of the Sussex landscape until recent years.

Contents of Microfiche

West Heath

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