

Chalk, Heather, and Man

By A. S. THOMAS

THE beautiful English chalk downs, south of the River Thames, are of special interest to archaeologists and botanists; yet there is a great difference between the ways in which the downs are regarded by these two groups. The archaeologists recognize the downs as a centre of intense and prolonged human settlement; Curwen pointed out that the system of upland corn-growing persisted on the Sussex downs for 1,200 years, from the Late Bronze Age to Saxon times. Furthermore, Bowen has shown that there has been much sporadic ploughing on the downs in medieval and later times, so that the pattern of 'Celtic' fields has been altered or effaced in many places. Cornwall considered that "In our region, the plough has frequently spared only such structures and deposits as lay beyond its reach."¹

Many botanists, however, tend to stress the wild nature of vegetation on the downs; some even talk of "virgin downland." Perring in a survey of the literature on chalk grassland included the human factor merely in relation to the effect of grazing and made no mention of cultivation.² Disregard of cultivation has led to the suggestion that chalk heaths—areas where plants typical of acid soils are found on chalk downs, as described by Tansley³—might be formed on wind-blown loess-like material laid down over the chalk in the Bronze Age.⁴ But the area of chalk heath at Lullington is covered with a pattern of 'Celtic' fields and cultivation probably continued there until the coming of the Saxons.⁵ Wind-blown deposits might be expected to accumulate on level ground, but most remaining patches of chalk heath are on slopes, as the chalk plateaux have largely reverted to arable land.

The Nature Reserve at Lullington is one of the largest surviving patches of chalk heath in the south of England. It has altered greatly since myxomatosis exterminated the rabbits which swarmed there until 1954; where there used to be short grass and bell heather (*Erica cinerea*), which is unpalatable to rabbits, the grass is now much longer and the bell heather is being overshadowed by ling (*Calluna vulgaris*), formerly closely grazed by rabbits.

¹ E. C. Curwen, *The Archaeology of Sussex*, 1954, p. 165; H. C. Bowen, 'The Study of Ancient Fields', *The Advancement of Science*, LVI, 1958, pp. 366-8; I. W. Cornwall, *Soils for the Archaeologist*, 1958, p. 49.

² F. Perring, 'A Theoretical Approach to a Study of Chalk Grassland', *J. Ecol.*, XLVI, 1958, pp. 665-78.

³ A. G. Tansley, *The British Isles and their Vegetation*, 1949, p. 551.

⁴ R. M. S. Perrin, 'Nature of Chalk Heath Soils', *Nature*, 178, 1956, p. 31.

⁵ A. S. Thomas, 'Nature of Chalk Heath Soils', *Nature*, 179, 1957, pp. 545-6.

Gorse and other shrubs are spreading rapidly and are tending to obscure the pattern of the heath; the heathers and other plants which need acid soils are not evenly distributed over the level ground, as they would be if growing on deposits laid down over the chalk, but are concentrated on the scarps of the 'Celtic' fields and on the lower sides of the fields, just above the scarps.

A typical scarp near the north-west corner of the Lullington reserve is shown in Fig. I; it faces almost due south. Many years of ploughing must

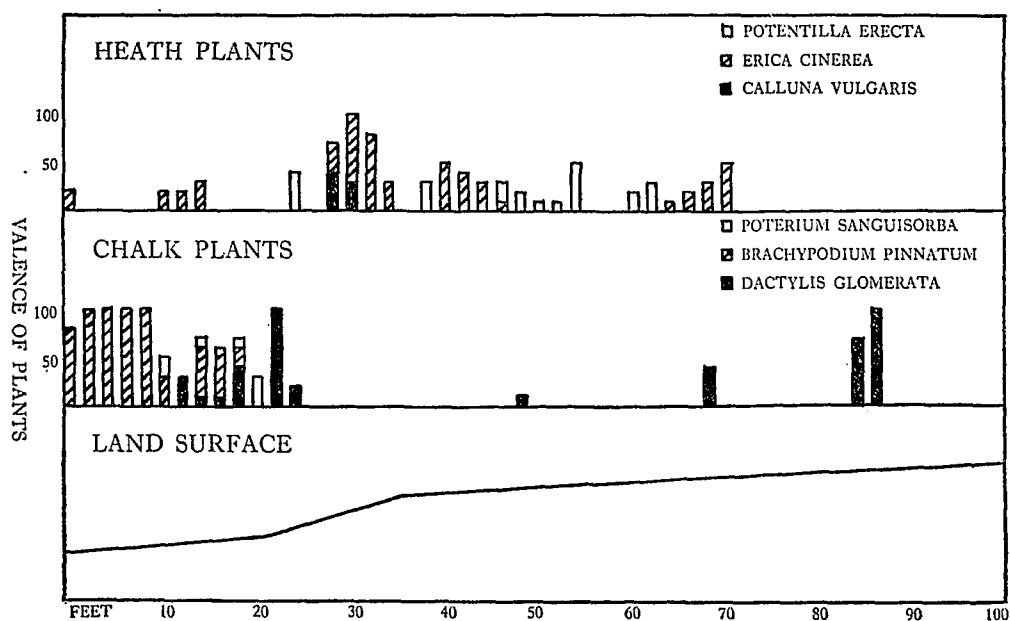


FIG. I

Lullington, 'Celtic' field scarp.

have been needed to build up the bank of earth and chalk rubble at the lower side of the field; the land which was cultivated is still not level, having a slope of 3 degrees above the scarp and of 5 degrees below it; the scarp itself has a slope of about 16 degrees. To get an objective indication of the vegetation, a steel tape was laid down over the scarp, a standard point-quadrat frame was placed at intervals of two feet along it, and all the flowering plants which touched each point were recorded.

Many of the plants were species which grew under a wide range of soil conditions. In order to demonstrate differences in the vegetation along the short transect, in Fig. I there are summarized the valences (the proportions of points which touched any given species) of three plants of heath soils—ling (*Calluna vulgaris*), bell heather (*Erica cinerea*), and tormentil (*Potentilla erecta*)—and of three plants typical of chalky soils—cock's foot (*Dactylis*

glomerata), tor grass (*Brachypodium pinnatum*), and salad burnet (*Poterium sanguisorba*). The diagram illustrates two points:

1. In grassland which has remained undisturbed for a long time, species which require an acid heathy soil may often grow very close to plants which need a soil rich in lime.
2. The greatest concentration of heath plants was not on the nearly level plots, formerly under the plough, but on the upper part of the scarp, on a slope of 16 degrees, and on the land just above the scarp. By contrast, the greatest concentration of chalk-loving plants was at the bottom of the scarp and in the field just below it, where the plough had penetrated deepest into the chalk.

Ploughing has obliterated most of the 'Celtic' field systems in the south of England; in spring and autumn, when the ground has been cultivated for seed sowing, the pattern of soil and chalk will show how many ancient small fields may be combined in one large modern one. But wherever untouched 'Celtic' fields still persist, any heath on them is associated with the tops of the scarps rather than with the more level ground. This fact is well demonstrated on Newtimber Hill, the beautiful National Trust property in Sussex.

The slopes of Newtimber Hill are covered with rather coarse grassland, in which species typical of chalk downs predominate, and the top of the hill is covered with scrub intermixed with grasses such as Yorkshire fog (*Holcus lanatus*) and sweet vernal grass (*Anthoxanthum odoratum*), which often grow on wetter, less alkaline soils. On the west side of the hill, near the top of the slope, there is a large scarp on which ling is plentiful, although there is little of it either below or above the scarp.

At one place below the main scarp there is a small patch, only about twenty yards long, where heath plants cover a series of small scarps, as shown in Fig. II. As at Lullington, the heath plants—ling and tormentil only, for no bell heather was recorded—were most abundant on the scarps and just above them, especially on the steepest and highest scarp, lying between 60 and 70 feet on the transect, and having a slope of 35 degrees.

A second transect was recorded on Newtimber Hill, about fifty-five yards south of the first, on the same part of the slope, with the same aspect, but where there were no scarps—only a fairly uniform slope of about 13 degrees or 14 degrees. The results, shown in Fig. III, demonstrate great differences between the vegetation on the smoother hillsides, typical of Newtimber Hill, and that on the small terraced patch shown in Fig. II. Chalk grassland, such as was growing below the terraces, was also growing on the same contours as the terraces and only a short distance from them. The only feasible explanation seemed to be that much of the hillside had been terraced by ancient

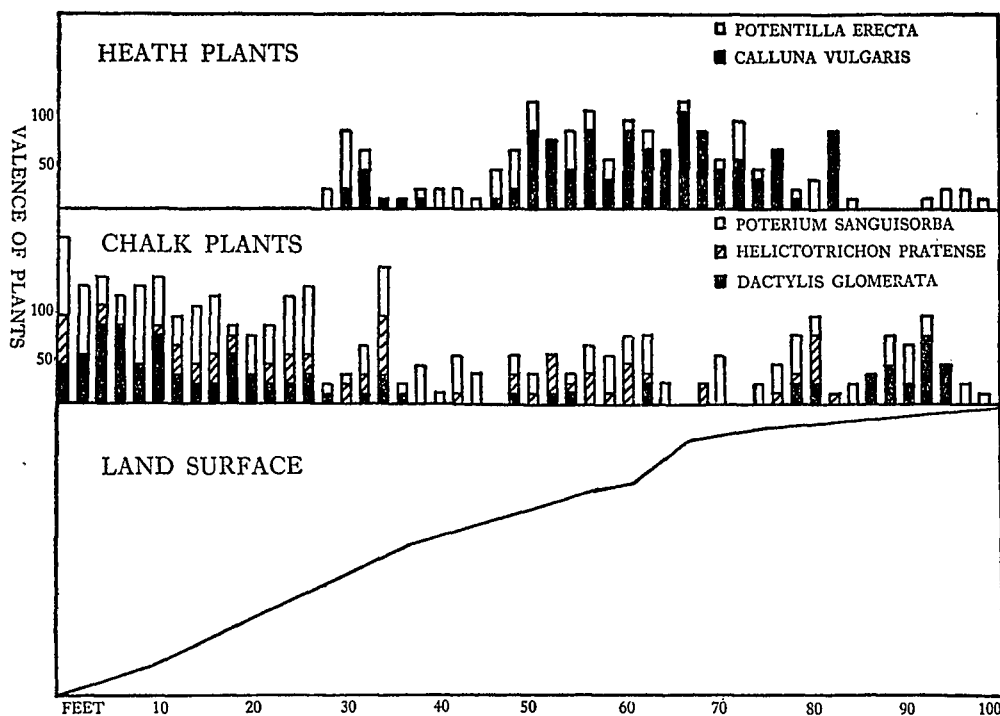


FIG. II

Newtimber, terraces.

cultivation and was largely covered with heathy plants, but that later cultivation had effaced the terraces and, by bringing up some of the chalk, had made the surface soil less acid. This explanation was confirmed by Mr H. C. Bowen, who inspected the site. But why had one patch been left unploughed? Had there been a building on it?

There are very many other instances where patches of ling and other heath plants are growing on mounds or banks, but are absent from smoother downland turf nearby. One of the most interesting stretches of downland in the south of England is that which covers the escarpment on the north side of the Pewsey Vale in Wiltshire; the great differences between the vegetation on some of the hills, close to each other, having the same aspect and derived from the same layers of chalk, show that the turf must have been greatly altered by human influence.¹ No bell heather was found on the escarpment and only a few patches of ling, which were on some mounds on Milk Hill, at the top of the gully to the west of it, and on a bank—possibly of Iron Age date—below Gopher Wood.

¹ A. S. Thomas, M. Rawes, and W. J. L. Banner, 'The vegetation of the Pewsey Vale escarpment', *J. Brit. Grassl. Soc.*, XII, 1957, pp. 39-48.

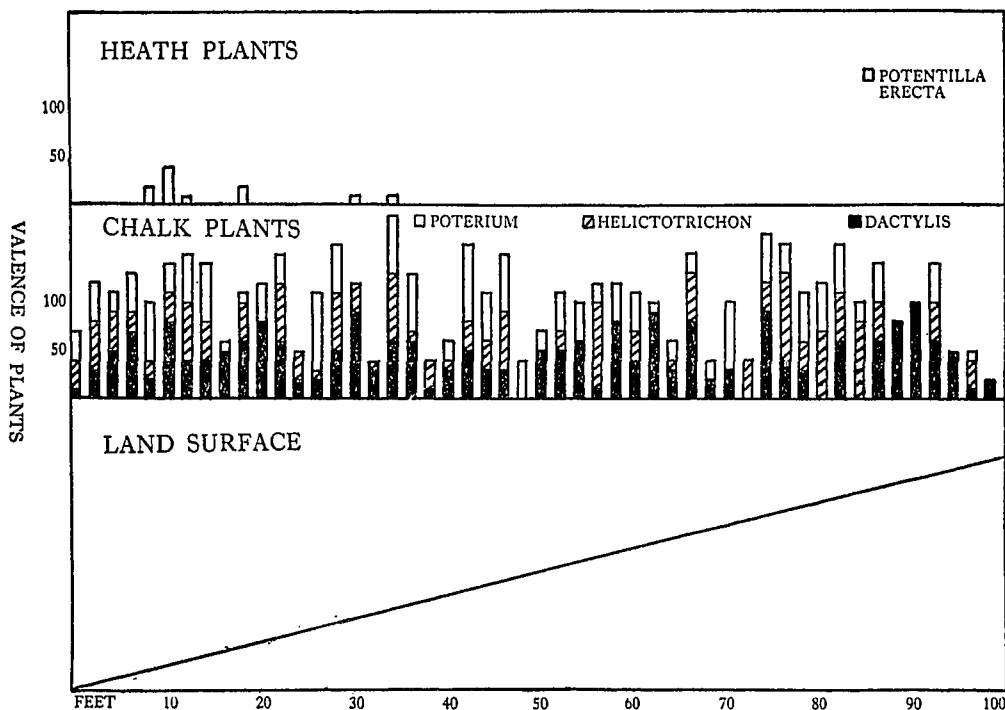


FIG. III
Newtimber, hillside.

Similarly on Overton Down, about four miles to the north of Milk Hill, air photographs show ridges of ploughing over 'Celtic' fields;¹ and no heather or ling was to be found there, except on some mounds of one small shoulder, protruding from the general line of the down and on that account left unploughed.

Most of the land at the base of the downs, even the bottoms of narrow valleys, has been under the plough in recent years. Kingley Vale, near Chichester, is one of the few valleys which have escaped recent cultivation and this Nature Reserve protects many ancient fields and many patches of heather, as well as the magnificent yew trees. There is much heath on the clay and gravel which covers the plateau, true chalk heath at the edge of the escarpment; and there is ling and dwarf furze (*Ulex minor*), a typical heath plant, growing on some scarps near the bottom of the valley.

In many of the examples cited above, the heath plants were growing on well-defined scarps, approximately on the contour. They have also been found on low, ill-defined banks running down chalk slopes, banks less than a foot high, but broad; to the botanical eye, these banks are obvious from the

¹ O. G. S. Crawford and A. Keiller, *Wessex from the Air*, 1928, p. 124.

heath plants growing on them and not from their topography. These heathy banks are quite different from the high banks of cross-ridge dykes, on none of which definite heath vegetation has been noted, and which are usually covered with chalk-loving plants.

The bands of heath were first noted on the spur in the south-east corner of the Kingley Vale reserve. There were low banks about twenty yards apart, running southwards on a slope of about 8 degrees, and on them were growing not only ling and bell heather, but also trees and shrubs such as bramble, hawthorn, and yew. One band of heath was especially interesting, for a bowl barrow lay across it, and heather was growing on this barrow; there was no heather on the large bell barrows which dominate the skyline of Kingley Vale, or on many other barrows which have been searched.

A transect across the band of heath, about twenty-five feet north of the barrow, is shown in Fig. IV. Heath plants were sparsely scattered in the grassland, but they were concentrated on the low bank between 20 feet and 30 feet on the transect; conversely, chalk plants were scarce on the bank. The idea that chalk-loving trees might grow on the same low bank down a chalk slope as were the patches of heath, served to throw light on the puzzling occurrence of heath on the sides of the main gully at Kingley Vale, where bell heather was noticed at the base of a yew tree on a slope of 22 degrees, and by itself on a slope of 25 degrees. It seemed unlikely that chalk heath should be formed on so steep a slope, for inversion of the soil as it moved downhill was likely to prevent acidity at the surface. And then it was noted that the patches of heath were usually in line with irregular lines of yew trees; this was well shown by a line of yews down the head of the gully.

The same idea explained the puzzling distribution of plants on a steep slope near the north-east corner of the Old Winchester Hill Nature Reserve near Petersfield. It had been noted that the trees in a young yew wood near the base of the slope tended to be in lines; and then it was found that in some cases there were patches of ling on slopes above, as steep as 23 degrees, and that there might be hawthorns near the top of the slope, all in the same line. Furthermore, the lines tended to be parallel. Where the slope faced west, the lines ran straight up and down; but where the hill curved around to face south-west, the lines were inclined and ran diagonally down the slope. One of the larger banks, with yews at the bottom, with a large patch of heath on a slope of 16 degrees near the centre, and with a yew and hawthorns above, was at an angle of 13 degrees with a line directly up and down the slope. Once one bank had been seen, traces of others at distances of about ten yards west and twenty yards east could be discerned. Not only heath and shrubs, but the rabbit holes also tended to be in the same lines, evidence of made-up soil, for

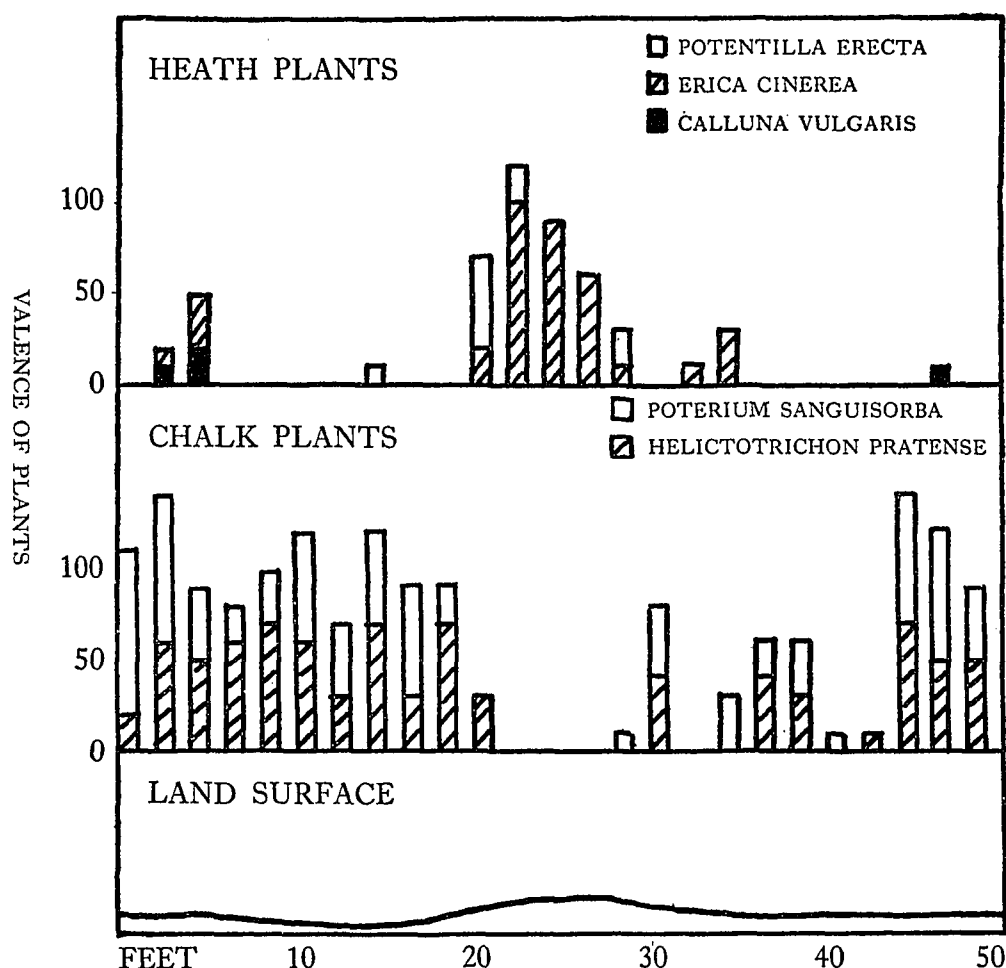


FIG. IV
Kingley Vale, belt of heath.

many of the rabbit burys on the downs are on tumuli or the scarps of fields.

The sparser lines and patches of heath on steep slopes at Kingley Vale seemed also to show the same tendency to be parallel, and to be inclined to the slope on the east side of the gully. Even better examples of bands of heath running down a chalk slope were found on Turnworth Down, about a mile south of Okeford Fitzpaine in Dorset; dark strips of heath, about twelve yards apart and separated by pale strips of grassland, ran down a north-facing slope of about 15 degrees. On a slope east of that bearing the heath, belts of shrubs such as elder and hawthorn ran down the slope.

Belts of heath down steep slopes seem rare on the Sussex downs, where most of the searching for them has been done; lines of shrubs are frequent,

and they often show the tendency to be parallel and inclined to the slope. Even where shrubs are absent, there may be a tendency for lines to show in the grass, as on Windover Hill near Eastbourne, where the lines run up and down the head of the gully, but are inclined where the slope curves around.

What is the cause of these lines? They do not follow the strata of the chalk; they can hardly be caused by wind. They do not seem to arise from paths; man-made paths are usually at the heads of gullies or at the ends of spurs; sheep paths have much influence on the vegetation but tend to be on the contour;¹ badger tracks tend to fan out over the slopes.

In tropical Africa, where steep slopes are cultivated by hoes, the rubbish is thrown into rows like the belts of trees and shrubs to be seen on the chalk in England. Therefore it seems possible that many of the chalk slopes of southern England, too steep for ploughing, have been cultivated by hand at some time; Bowen has said that some of the slopes were hoe-tilled in Romano-British times. Some of the bands of heath and shrubs may date from this time; some, like the one associated with the bowl-barrow at Kingley Vale, may be older. Not only the plough, but the hoe also may have had much influence on soils over the chalk.

Denudation of chalk has probably been much more rapid than was formerly supposed,² and this fact will help to explain the formation of chalk heath on level sites; it will not fully explain the preponderance of heath on some slopes. Is it not possible that the acid surface soil is not derived from the chalk, but from plant remains deposited on top of it? This theory would explain the growth of heath in bands down some slopes and on the scarps of 'Celtic' fields, for it is on the scarps that the weeds would be dumped when the fields were weeded by hand. And it might explain the absence of heath from areas of level ground over the chalk, known to be undisturbed, such as the east part of Hod Hill which is only three miles from the heathy slope of Turnworth Down.

A very puzzling phenomenon has been the presence of patches of ling on the steep south or south-west faces of Iron Age embankments; at Old Winchester Hill the ling is growing on a slope of 33 degrees and at Cissbury Ring on a slope 30 degrees; and in both cases the slopes must have been much steeper when the embankments were built of chalk rubble. Even if there had been rapid denudation of chalk when exposed to the full heat of the sun and the full force of driving rain, yet it is surprising that acid surface soils should have been formed on these embankments, when none has been obvious on

¹ A. S. Thomas, 'Sheep paths', *J. Brit. Grassl. Soc.*, XIV, 1959, pp. 157-64.

² P. A. Jewell, 'Natural History and Experiment in Archaeology', *The Advancement of Science*, LIX, 1958, pp. 165-72.

much older Neolithic camps. Is it not possible that the acid shallow surface was derived from a rotting palisade and not from the chalk?

Experience at Old Winchester Hill has shown that a thin layer of organic material may allow heath plants to grow above the chalk. After myxomatosis killed off most of the rabbits in 1954, dead grass accumulated on the turf inside the camp, so that by 1957 the living grasses were being suppressed and were being replaced by other plants, including heath plants like tormentil. Now, after two seasons of winter grazing, the layer of dead grass has gone and the turf is reverting to that of normal chalk downland. The animals seemed to eat little of the dead grass; it was mostly destroyed by their treading, a fact that may partly explain the persistence of chalk heath on slopes which are not grazed and trodden so much as level ground. Once patches of heath had been formed, might they not have maintained themselves under the British climate, unless destroyed by burning, cultivation, or treading?

Nearly all the level ground and the more gentle slopes on the chalk of southern England are now under arable crop or leys; repeated ploughing has smoothed out the 'Celtic' fields, even some of the larger lynchets. Heavy tractors, bulldozers, and winches are now being used to clear many of the steeper slopes. It is highly desirable that a study should be made of the patterns of heath, shrubs, and trees, on these slopes, and of the soils, before it is too late.

SUMMARY

In many cases where heath plants are growing on shallow soil over the chalk in southern England, they are concentrated on the scarps of 'Celtic' fields, on banks, or on mounds. In a few cases, the heath plants are in patches or bands on low banks running down the slope, sometimes at an angle; shrubs and trees may frequently be seen in lines on slopes too steep for ploughing.

It is suggested that the lines of heath and of shrubs on slopes must indicate former cultivation by hand; and that the shallow acid soils on which the heath plants are growing may be derived, not from the chalk, but from plant residues accumulated during the work of clearing land for crops, or of weeding the crops while they were growing.

ACKNOWLEDGEMENTS

Grateful acknowledgement is made of all the help received from Mr H. C. Bowen, both in the field and in the writing of this paper; and of the kind permission of the National Trust to record the vegetation on Newtimber Hill.