

## THE NEOLITHIC INDUSTRIAL LANDSCAPE AT CISSBURY, SUSSEX

David Field

**Abstract:** At present the Neolithic flint mines of Sussex provide the earliest evidence of mining in Britain. Recent surface survey at one of them, Cissbury, by the Royal Commission on the Historical Monuments of England (RCHME), has provided details of the extent of the minefield and provides a context for the 19th-century archaeological excavations which demonstrated the nature of the mining techniques employed.

### INTRODUCTION

For the earliest dated incidence of mining we must look beyond southern Britain to the Nile Valley of Egypt, where bell-pits for the extraction of chert were being excavated during the Palaeolithic period. These have produced radiocarbon dates of 33,000 BP (Vermeersch et al 1984). There is as yet no evidence for early mining in Britain before the Neolithic period and claims for Mesolithic quarrying (Ellaby 1987, 67) are open to question. Until conclusive evidence is forthcoming it is assumed that communities utilised surface drift deposits for their raw material. It is the Neolithic period that produces the first unequivocal evidence for deep mining in the British Isles. Numerous sites are known across the chalk of southern England ranging from Dorset to East Anglia with a particular concentration on the South Downs of Sussex.

The object of the mining activity, flint, is the result of siliceous deposits forming around echinoids and bivalves. These deposits occur in bands within the cretaceous chalk, a formation up to 300m in thickness, produced by repeated episodes of deposition of marine sediments which occurred over 70 million years ago. In south east England the upper levels of these deposits are known as 'Sussex White Chalk', subdivided into eight members, each containing flint deposits (Mortimer 1986). These deposits of flint outcrop in the undulating downland landscape where weathering and erosion by natural agencies has occurred.

In the Worthing area of Sussex these outcrops were extensively utilised by Neolithic miners. At least four mine complexes are known: Harrow Hill (NGR TQ081100) with at least 160 shafts; Blackpatch (NGR TQ094089), with over

100 shafts; Church Hill, Findon (NGR TQ112083) with about 50 shafts; and Cissbury (NGR TQ137079), the largest where in excess of 270 shafts are now known.

Flint, the raw material, is extremely hard and brittle, but fragments with a predictable conchoidal fracture, allowing it to be flaked into any desired shape with extremely sharp edges. It was a fundamental material for tool manufacture during prehistoric periods and could be made into a variety of artefacts. Its use continued into historic times for strike-a-lights, gunflints and as a construction material. Indeed the craft of flint knapping has continued into recent times at Brandon in Suffolk and has provided an insight into how Neolithic miners and knappers might have approached their craft. On the common land around Brandon, flint was mined into the 20th century, usually in shafts just wide enough for one miner (Skertchley 1879). Each shaft descended through several layers of flint nodules, or wallstone, to the tabular layer at the base, this being the superior quality floorstone, which is the same high-quality material that the Neolithic miners sought.

### BACKGROUND

The site at Cissbury lies on a prominent chalk spur overlooking Worthing, with commanding views of the coastline from Beachy Head to the Isle of Wight. It comprises a major univallate Iron Age hillfort with evidence of occupation and cultivation into the Romano-British period, all of which partially overlie an earlier, Neolithic industrial landscape of mineshaft hollows and spoilheaps.

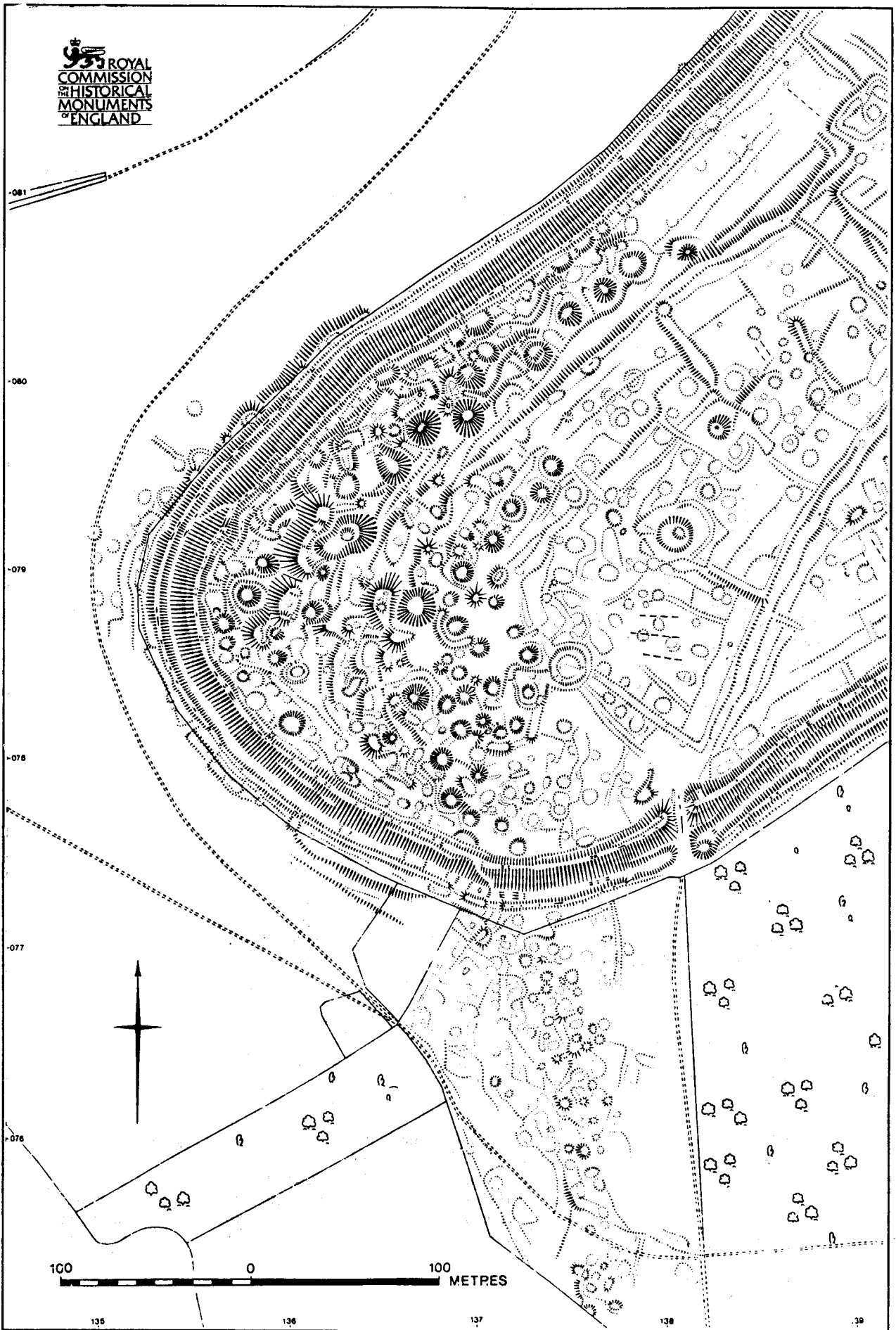
The history of research at Cissbury coincides with the dawn of 'scientific archaeology', for most investigation at the

site took place during the latter half of the 19th century. However, as might be expected, study of the site today is frustrated by the lack of adequate early records. Initially, the hollows on the hilltop were considered to be ponds, the site of huts, druids temples, or pig pounds. A number of the larger hollows were investigated by V.R. Irving in 1856, who interpreted them as reservoirs (Irving 1857). In 1867-8, Colonel Lane-Fox (later Gen Pitt-Rivers) who had been surveying Sussex hillforts, was attracted to the site. In order to ascertain whether the hollows were contemporary with the hillfort, he excavated approximately 30 to a depth of about 1m deep. Unfortunately, no records survive of these explorations and it is now impossible to determine either from surface or documentary evidence which shafts were excavated. As a result of the large number of flint flakes recovered, Lane-Fox concluded that the hollows were used initially for procuring flint.

In 1870 Canon Greenwell excavated at Grimes Graves in East Anglia and demonstrated that depressions similar to those at Cissbury were in fact mineshafts. This prompted Lane-Fox and others to return to Cissbury. Plumpton Tindall was the first in 1873. He excavated below the hard compacted chalk fill which Lane-Fox had mistaken for the bottom in 1867-8 and found that the hollow was indeed the top of a filled in mineshaft. The death of Tindall prevented publication of this discovery. His colleague, E Willett, excavated another shaft in 1874. This was found to have galleries radiating from the bottom of the shaft and demonstrated the complexity and extent of the mines (Willett 1875).

In 1875 Lane-Fox considered that by excavating in the hillfort ditch, the relative ages of the mines and hillfort could be established. He discovered that the hillfort ditch cut through a mineshaft with galleries running under the Iron Age rampart. Further excavations were directed on shafts both inside and outside the ramparts (Lane-Fox 1876).

Lane-Fox's colleague, Park-Harrison, excavated further shafts in the years 1876-7 to add to the body of evidence (Park-Harrison 1877; 1878). Interest in the site then waned for over 70 years until the 1950s when J. Pull and the Worthing Archaeological Society excavated two shafts on a spur to the south of the hillfort rampart. Sadly, Pull was shot dead during a bank raid in Worthing before he could publish his results: fortunately his notebook and a few plans survive at Worthing Museum, and these remain the best description of the shafts and galleries.



*Surface plan of the Neolithic flint mines on the western summit of Cissbury hill, partially obscured by the activities attributable to the later prehistoric and Romano-British periods (RCHME Crown copyright 1994).*

## THE RCHME SURVEY

The RCHME survey of the site was carried out during the late summer of 1993 at the request of the National Trust, the site owners. A full account of the survey findings will be published elsewhere, but the salient details concerning the flint mines are described below.

The most striking feature of site, shown on both the plan and photograph is the scale, extent and preservation of the flint mines and their spoil heaps in relation to the earthworks of the Iron Age hillfort. The hillfort clearly overlies the flint mines for shafts occur both within and outside the rampart. At certain points the slight counterscarp bank which lies immediately outside the hillfort ditch clearly overlies former mineshafts and spoil dumps derived from this activity are visible beside the bank. The hillfort rampart in the area of the mines is extremely irregular and it is likely that its course was influenced by the presence of a linear spoil heap. Such spoil heaps also occur within the rampart and some of the mineshafts appear to follow the contours of the hillside. From this observation it appears that mining started on the north-west side of the hillfort where the slope is extremely steep and soilcreep and erosion would have exposed the flint seam. Unfortunately, the hillfort ditch obscures details, but spoil can be seen underlying the counterscarp bank in this area. If initial quarrying followed the contour in such a manner, it would make sense for the deep mines to follow suit in order that the seam should be exploited efficiently.

The interior of the hillfort has been occupied or utilised from at least the early Iron Age. It was probably at this time that the field system which obscures much of the Neolithic industrial landscape, was created. Shallow hollows, undoubtedly mineshafts reduced by ancient ploughing can be traced over much of the south part of the hillfort. Because of this later agricultural episode, it is difficult to reconstruct the full extent of the mined area, although excavations of a field lynchet in the east part of the hillfort in 1936 recovered flint-knapping debris indicating that activity related to the mines extended over a considerable area. The sub-rectangular enclosure in the north of the hillfort (top right-hand corner of plan) was excavated by Lane-Fox and assigned a Neolithic date on the strength of the flint work recovered from the ditch. The enclosure is certainly earlier than the field system, as a field bank abuts it, but whether it is Neolithic or merely lies over Neolithic deposits is uncertain. Further confusion over the full extent of mining is caused by the numerous Iron



*Cissbury Hill, Sussex, with the Neolithic mines in the south-west. A few others can be discerned within the ramparts, and in the east just outside. Crown Copyright 1977.*

Age pits and Romano-British hut sites that cover the north-east part of the hillfort interior. Despite this later activity, the survey suggests that mining covered a minimum of 9ha and consisted of at least 270 mineshafts.

Many of the heaps, mounds, and depressions around the shafts have been caused by the dumping of spoil from the shafts, although some are likely to represent working hollows and manufacturing debris. Such features are little understood because excavation has tended to concentrate on the shafts. J. Pull investigated one such area on the spur to the south of the hillfort in the 1950s and found it to be a manufacturing workfloor comprising a solid mass of struck flint flakes. An eroding area adjacent to one shaft was also recorded by RCHME field staff which consisted of a concentration of struck flint flakes of various sizes ranging from large cores to the most minute spalls. This must be an *in situ* deposit representing contemporary flintknapping and indicates that artefacts were manufactured on site.

## THE SHAFTS

Some of the excavated shafts appear to be more sub-square than circular in plan, but all are of relatively large diameter being up to 7m across. The dimensions suggest a large workforce and a high degree of organisation. The diameter of the shafts increases towards the surface and such wide pits would have required the most elaborate superstructure at the surface for lifting gear. In some cases however this feature might be explained as weathering or erosion at the surface. Ledges and other features occur in some shafts and may have held some form of timber framework, as well as providing stages for ladders. The shafts vary quite considerably in depth (Tindall's shaft 6m, Willett's 12m), this presumably reflecting the dip of the flint seam. Section illustrations, some of which are among the earliest archaeological section drawings, are not always clear enough to determine whether pits were backfilled using material from the next shaft, or whether they were left open and allowed to silt up naturally.

At the base of each shaft a number of galleries radiated to allow maximum exploitation of the flint seam, and these

extend as far as 8m in the case of one excavated by Lane-Fox. Up to eight galleries were recorded in one shaft (Willett 1875). Typically these are less than 1m high and about 1m wide thus providing just enough room for a single face worker. The galleries frequently interconnected with those of an adjacent shaft, and, in order to extract the maximum amount of material, often dog-legged and doubled back leaving only a thin wall or pillar of chalk to support the roof. Occasionally, small windows were cut through these walls to provide reflected light.

The method of working was considered by both Willett and Lane-Fox. The latter conducted experiments to show how antler picks could be used to prise out lumps of chalk and which could be removed into baskets using shovels made from animal scapulae. In one of the shafts excavated by J. Pull, a bone punch was found lodged in a fissure where it had broken during use (J. Pull undated). Antlers and bone were common finds in the galleries, along with occasional piles of flint flakes.

Three skeletons were found during excavations at Cissbury, but it is open to debate whether they were miners. One was a deliberate burial, being accompanied by a flaked flint axe and eight snail shells of the *Helix nemoralis* sp. These were surrounded by large chalk blocks (Rolleston 1879, 378-9). The other human remains were found by Lane-Fox and Pull and are likely to represent accidents; both were female. The one discovered by Lane-Fox was upside down and had apparently fallen into the shaft head first. The other was at the entrance to a gallery where a roof fall had broken the individuals back.

## CONCLUSIONS

A series of radiocarbon determinations carried out by the British Museum in the 1970s shows that the Worthing flint mine complex of which Cissbury forms a part is the earliest known in the country (Burleigh 1975, 90). Individual determinations of 5340 BP, 5090 BP, and 4930 BP have been obtained for Church Hill, Blackpatch and Harrow Hill respectively, while two determinations taken from antler found in galleries at Cissbury by Park Harrissons gave dates of 4730 BP and 4650 BP. A third determination, also taken from antler found in a gallery by Pull gave 4720 BP (all dates uncalibrated). Whether the separate minefields were worked successively is open to question, and further radiocarbon determinations are needed to resolve the detailed chronology.

At present little is known of the communities who used the mines. Chemical analysis suggests that axes from this area found their way across a large part of Southern England (Craddock *et al* 1983, 159-61). The apparent sophisticated organisation and technological specialisation involved in the mining suggests a complex procurement strategy far beyond occasional forays by distant groups to replenish dwindling flint stocks. The Sussex chalk also has other monuments of Neolithic date, including causewayed enclosures and long barrows. It seems likely that, as Drewett (1978, 27) suggests, the local communities were well versed in the techniques of mining and had wide experience of the provenance of local outcrops. Exploitation of the flint may represent a specialised part of the local Neolithic economy and could have been a seasonal component of their broader economic base.

Elsewhere flint mine sites continued in use into the later Neolithic period, but at the beginning of the second millennium there is a reduction in the amount of flint used and the mines decline. The reason was the introduction of metallurgy which in turn brought with it new methods of mining.

## ACKNOWLEDGEMENTS

The RCHME is about to start a project aimed at surveying all the extant flint mine sites in England, and this will provide an opportunity to address the many problems related to our earliest industrial monuments, some of which have been highlighted in this paper. The Cissbury survey itself was carried out in the late summer of 1993 by the writer with J. Donachie, and with the help of G. Brown and D. McOmish. D. Cunliffe prepared the inked copy of the plan, while M. Corney, C. Dunn and R Taylor all provided helpful comment on the text of the paper. The field report on the site, reference number TQ 10NW2, has been deposited in the National Monuments Record, and can be consulted at the National Monuments Record Centre, Kemble Drive, Swindon, Wilts.

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David Field.