Introductions to
Heritage Assets

Pre-industrial Mines and Quarries

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Fig. 1. An aerial view of the Late Neolithic flint mines at Grime's Graves, Norfolk. Each hollow represents the location of a former mine or pit, and mounded up between them lie the spoil dumps of chalk which came from the shafts and galleries.

INTRODUCTION

People have mined and quarried stone and minerals for many thousands of years for a wide range of uses from crafting tools to producing building stone. The earliest extraction sites are now known to be some of the first archaeological monuments to appear in the landscape, and these mines and quarries were used at, or immediately before, the time when the first enclosures and burial mounds were being constructed during the Early Neolithic period.

The Neolithic axe quarries and flint mines developed around 4000BC at the very beginning of the Neolithic period and faded from use when the first metal objects were being introduced about 2400BC. The axe quarries are located in the uplands of the north and west, whereas the flint mines are largely restricted to the low-lying chalk of southern England.

The inherent dangers of this early stage of stone/flint extraction probably gave these 'exotic' raw materials a greater cultural value than more easily obtained varieties of stone. This is graphically illustrated at the dangerously exposed quarry sites on the near vertical mountain faces at Langdale. It was the combination of difficult quarrying and the procurement of rare, but recognisable, types of stone from culturally important sources that created a value to the community. Artefacts crafted from these raw materials were then used in important ceremonies, and some were found buried in pits. Studies of the stone artefacts from the South Downs, for example, have shown that flint axes made of mined flint were hoarded or buried in such pits, whereas the more functional tool kits of these communities were knapped from surface collected flint. Consequently, mining and quarrying was often a special activity during this early period.

Later in prehistory, extraction became a more functional activity, when raw materials such as tin and copper were important in their own right and as components in the production of bronze, which introduced a new metalworking technology that supplanted the earlier stone tools. Bronze working eventually gave way to iron working, all supported by specialist mines and quarries. Alongside such industrial activities were others which mined or quarried for lead, building stone and coal. These industries continued through the Roman period and into the medieval, some leaving behind more evidence of their former presence than others.

DESCRIPTION

The geology and topography at extraction sites have defined their form and the remains which have survived. Many mines and quarries are prominently located, overlooking the surrounding landscape. This is true of both the flint mines in the South Downs at sites such as Harrow Hill and Blackpatch in Sussex, and the axe quarries at Langdale in Cumbria. However, others could be relatively hidden in their landscape setting such as the flint mines at Grime's Graves in Norfolk (Figure 1).

A recent survey of flint mines in England has found that there may be as few as ten such sites, although others probably await discovery. Of the known sites, only six survive as earthworks and these are typified by various sized pits, which upon excavation can reveal both simple pits and deep shafts, some of the latter with galleries radiating from the base of the shaft. The pits can be as shallow as 0.6 to 2.0m as at Durrington in Wiltshire, whereas mines have been recorded up to 12m deep at Greenwell's Pit at Grime's Graves (Figure 2).

Fig. 2. A view of one of the underground galleries in Greenwell's Pit at Grime's Graves, Norfolk. The low ceiling stands roughly 1m high, and the black flint which the miners sought can be seen on the right hand side of the gallery entrance.

Fig. 3. The Langdale Neolithic axe quarries in Cumbria lie near the skyline on dangerous ledges, and were designed to collect stone from the band of green Seathwaite Tuff which outcrops around the valley sides.

Amongst the Neolithic axe quarries, Langdale in Cumbria (Figure 3) is arguably the most studied site in England. Here the mountain top workings take the form of both shallow pits on the relatively level areas, to near vertical surface quarries which exploit the outcropping green Seathwaite Tuff. Many of these quarries not only have sharply fractured surfaces, but also rippling, concoidal fractures scarring the quarry face recording where individual slabs of stone have been removed. Some of the apparent scree slopes lying below these quarries are actually debris from the quarrying activities, but sadly some have been severely damaged by scree runners and axe collectors.

Other types of early mining sites dating from the Bronze Age through to the end of the Roman period are more problematic in terms of field remains. This situation is largely due to the later use of the same locations by more intensive industries which have disturbed, hidden or destroyed the evidence for earlier activity. Examples of this are the tin and copper industries which had clearly developed during the Bronze and Iron Ages, particularly in the south-west, but have largely been obscured by more recent streaming activities.

However, recent discoveries at Alderly Edge in Cheshire suggest that evidence for quarrying for copper may survive here. Similarly, other industries referred to by Strabo (a Greek geographer and historian, writing about 44BC-AD23) in his description of Britain such as gold, silver and iron are now also largely lost in England. However, some early activity does survive such as the quern (millstones) quarries at places such as Wharncliffe near Sheffield, where many circular depressions remain in the millstone grit defining the imprint of a quern since removed; other partly completed querns are still attached to the bedrock or lie detached and abandoned. Similar quern quarries occur at Pen Pits in Wiltshire and Col's Pits in Berkshire.

Stone for building purposes is a basic requisite and quarries or borrow pits can be seen adjacent to certain archaeological sites. Some of the most prominent quarries survive close to frontier works such as Hadrian's Wall, which required vast quantities of dressed stone for both the Wall itself and for its forts, milecastles and turrets. For the Wall, relatively uniform facing stones 18cms high by 28cms wide and 51cms deep were required, and quarries developed along the frontier to service this need. To the east of Chesters fort, for example, at Fallowfield Fell a Roman quarry was discovered with the inscription '(P)ETRA FLAVI CARANTINI' or 'the rock of Flavius Carantinus' . Great linear groups of quarries (Figure 4) survive to the south of Housesteads fort where not only a major military installation had been built but an attendant vicus or civilian settlement sprang up immediately south of the fort – all requiring building stone. Other major Roman quarries have been discovered on the western part of the Hadrianic frontier in Cumbria at Irthington, Bleatarn and Grinsdale. During the medieval period the construction of the great cathedrals, monasteries, castles and houses for the rich and poor all required various amounts of stone. Quarries such as Barnack in Cambridgeshire with its distinctive limestone supplied many of the major building projects in the east of England such as Peterborough cathedral. These quarries were dug as open trenches which removed the topsoil to expose the limestone, which was then skilfully prised out using hand tools; the topsoil was dumped along the edge of the trenches.

Coal mining also has a long history but has not always left behind distinctive earthworks. In the earliest periods coal was exploited by quarrying outcrops, particularly in the northern counties, so little visible remains of this activity due to erosion or later mining. However, by the medieval period quite distinctive earthworks occur known as bellpits, which as the name implies have a bell-like profile below ground. Good examples of such mining can be seen on Cockfield Fell in County Durham and Clee Hill in Shropshire, but can also be found - surprisingly - on some urban commons such as the Town Moor in Newcastle.

Long-term mining for iron ore is well attested in various parts of the country such as the Weald of Kent and Sussex, the Forest of Dean in Gloucestershire and the Furness area of southern Cumbria. Much of this industry was water-powered, and such archaeological remains are typified by leats and dams (or hammer ponds) which were used to collect water to drive the forging hammers via water wheels.

Fig. 4. Roman quarries on the Hadrian's Wall frontier near Housesteads. The Wall runs amongst the trees on top of Cuddy's Crag in the foreground, and the irregular, shadow-filled quarries which supplied the stone for the Wall and the various military installations lie upon Deafley Rigg near the top of the photograph.

Flint mining re-emerged in the later periods when flint was firstly used in the construction of many medieval churches in the chalkland areas of eastern England. One of the finest examples of this is at Long Melford in Suffolk, which exhibits remarkably elaborate flint flushwork with ashlar tracery, most of which is 15th-century although the tower was rebuilt between 1898 and 1903 using flint from Brandon and Acton. However, with the invention of the flintlock gun around 1600 a new industry developed to service the needs of the military and Brandon in Suffolk became one of the major centres for gunflint mining from 1790 onwards, supplying the army with over a million gunflints per month by the end of the Napoleonic Wars. Although sadly many of the gunflint mines have been lost, some still survive in Thetford Forest, where their sub-circular man-sized shafts are encircled by waste dumps which always have one or two entrance breaks to allow easy access to the mine; these mines are always spaced at 5m to 10m intervals – unlike the Neolithic mines which are often tightly packed together. The gunflint mines reflect the way the later industry was managed and mining plots leased to the miners on a commercial basis.

CHRONOLOGY

The earliest evidence for mining and quarrying occurs during the Early Neolithic period around 4000BC at a time when many innovations were being introduced into the UK. Pottery making, small-scale farming, the construction of the earliest enclosures, and tombs for the dead all appeared at this time to create something of both a cultural and a technological revolution. Changing or developing technologies then led to further extraction as flint and stone gave way to the first use of metals during the Bronze Age, when initial copper use and the appearance of the first gold artefacts occurred around 2400BC, creating what is known in Europe as a Chalcolithic phase. Gradually this emergent technology developed the new alloy of bronze from the combination of tin and copper, which was then used for some 1,400 years until iron working eclipsed it at roughly 800BC to herald the advent of the next technological advance and the start of the Iron Age.

Alongside iron working, lead mining appears to have developed during the Iron Age, if not before, from the evidence of artefacts such as the lead net weights from the Meare Lake village in Somerset, which probably came from mines in the Mendips. During the Iron Age stone quarries continued to produce stone for building purposes, such as the shallow quarries on the summit of Brough Law in Northumberland which provided the raw material for both the ramparts of the hillfort and its few roundhouses, and other more specialised quarries used for quernstones for milling flour. Such quarrying continued into the Roman period and beyond.

In the medieval period the traditional industries were joined by silver mines in the 14th century at Bere Alston in the Tamar Valley and Combe Martin in north Devon. Zinc was mined at Rowberrow in the Mendips. The tin industry of the south-west is recorded by the accounts of the Stannary Courts which list the stream works and mines of this industry which is now largely represented by the survival of 'blowing houses', small robust buildings where the tin was smelted.

DEVELOPMENT OF THE ASSET TYPE AS REVEALED BY INVESTIGATION

Amongst the earliest mines and quarries there is little evidence for permanent settlement, which suggests that the miners may have travelled to these sites from a distance, used them seasonally while the weather was kinder, and only stayed for a short time which would explain the lack of accumulated settlement debris. Alternatively, archaeology could be suggesting that these sites were used by local groups who did not need settlements at the extraction sites. One of the few excavations to have revealed ephemeral structural traces lay at Thunacar Knott close to the Langdale axe quarries. This site had a hearth, scatters of knapping debris and broken axe rough-outs and could represent the remains of a knapping workshop with a temporary shelter. Little evidence for domestic activity survived, although the acid soils may have removed this evidence. A similarly ambiguous picture is provided by excavations at the Harrow Hill flint mines, where slight structural evidence was recorded around the mouth of Shaft 13.

Archaeology demonstrates the importance of the axe quarries from the evidence of extensive trade networks which distributed widely many types of stone axe, especially the abundant Group VI axes from Cumbria which were transported throughout the UK and also crossed the Irish Sea to Ireland and the Isle of Man. In contrast the Group IX axes originating in Northern Ireland, travelled in the opposite direction eastwards over the Irish Sea to UK, illustrating the cultural value placed upon these special tools.

In Greenwell's Pit, a flint mine at Grime's Graves (Norfolk), a Cornish stone axe was discovered in one of the galleries, evidencing a journey of roughly 540km [335 miles], so the flint mines must also have had extensive trade networks too. The distribution of flint axes contrasts with that of stone axes, each inevitably reflecting the location of the parent material: flint has a predominantly southern British distribution and in certain areas such as Sussex, Norfolk and Kent 80 per cent of axes are of flint. North of Yorkshire, however, flint axes are far fewer, perhaps suggesting that different cultural values prevailed in northern Britain where stone axes predominate.

Many of the other forms of prehistoric mines and quarries have been adversely affected by later workings which have hidden or destroyed the earlier evidence. However, the later extraction sites of the medieval period such as the tin streaming sites in the south-west have left behind some structural evidence such as the smelting houses, and much evidence survives from the iron industries in the Weald and beyond, particularly the water catchment systems designed to power the forging hammers.

ASSOCIATIONS

Very little evidence for settlements occurs at the earliest mines and quarries, suggesting that they were special places to which the miners travelled from a distance. Later in prehistory, the metalliferrous mines were located in areas which were subsequently re-used by more intensive industrial activity which has largely obscured or destroyed the evidence of the earlier mining. However, the medieval industries have left behind some elements of the infrastructure such as the smelt mills from the tin industry in the south-west and the stone quarries at Barnack.

Where materials were extracted in bulk, like building stone, efficient transport networks were essential, and where possible waterways were employed and modified to facilitate easy passage. In the 16th and 17th centuries, as seen in Shropshire at settlements like Broseley, larger-scale mineral extraction began, facilitated by a skilled mining workforce imported from elsewhere. These miners were accommodated on commons outside the ancient villages: new settlements for a new age. Similarly, the coal industry in the north-east had to develop a transport infrastructure to get its coal to the various markets; thus in the northern part of County Durham an extensive network of railways was developed by the Bowes family to transport coal from their collieries to the staithes on the River Tyne. Here the coal was loaded onto boats to ship it to both industrial centres and cities such as London.

FURTHER READING

The earliest Neolithic flint mining is described in the following books and journal papers: M Barber, D Field, and P Topping, *The Neolithic Flint Mines of England* (1999); Longworth, and G Varndell, *Excavations at Grimes Graves, Norfolk 1972-1976: Fascicule 5: Mining in the Deeper Mines* (1996); M Pitts, 'The Stone Axe in Neolithic Britain' *Proceedings of the Prehistoric Society* 62 (1996), 311-71; and P Topping and M Lynott, *The Cultural Landscape of Prehistoric Mines* (2005).

The Neolithic axe quarries are discussed in the following publications: R Bradley and M Edmonds, M, *Interpreting the Axe Trade: Production and Exchange in Neolithic Britain* (1993); P Claris and J Quartermaine, 'The Neolithic Quarries and Axe Factory Sites of Great Langdale and Scafell Pike: A New Field Survey', *Proceedings of the Prehistoric Society* 55 (1989), 1-25; T H McK Clough, 'Excavations on a Langdale Axe Chipping Site in 1969 and 1970', *Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society* New Series 73 (1973), 25-46.

The Iron Age quarries on Brough Law are discussed and illustrated in A Oswald, S Ainsworth and T Pearson, T, *Hillforts: Prehistoric Strongholds of Northumberland National Park* (2006), 46-7. The quern quarries at Wharncliffe are considered in T Pearson and A Oswald, 'Quern Quarries at Wharncliffe Rocks, Sheffield (SK 29 NE 7)', English Heritage Archaeological Investigation Report Series 20/2000 (2000; available fron the NMR). Several Roman quarries associated with Hadrian's Wall are described in C Daniels (ed), *Handbook to the Roman Wall with the Cumbrian Coast and Outpost Forts* (2008). The post-medieval gunflint industry is treated by A J Forrest, *Masters of Flint* (1983), while a survey of some of the few surviving gunflint mines is in T Pearson, 'Lingheath Farm, Brandon, Suffolk', unpublished English Heritage survey report (TL 78 NE 81; available fron the NMR).

CREDITS

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Cover: Grime's Graves, Norfolk (as Figures 1 and 2)

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