

## Placing Boxgrove in its prehistoric landscape

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*The Lower Palaeolithic site at the Boxgrove quarry in Sussex was featured in the first (1997/98) issue of Archaeology International, since when it has become internationally celebrated for the exceptionally detailed evidence it has provided of human occupation of a coastal habitat 500,000 years ago, towards the end of an interglacial period. New investigations of Boxgrove's place in the wider landscape are now under way, and there are plans for further excavations and the establishment of a field school at the site.*

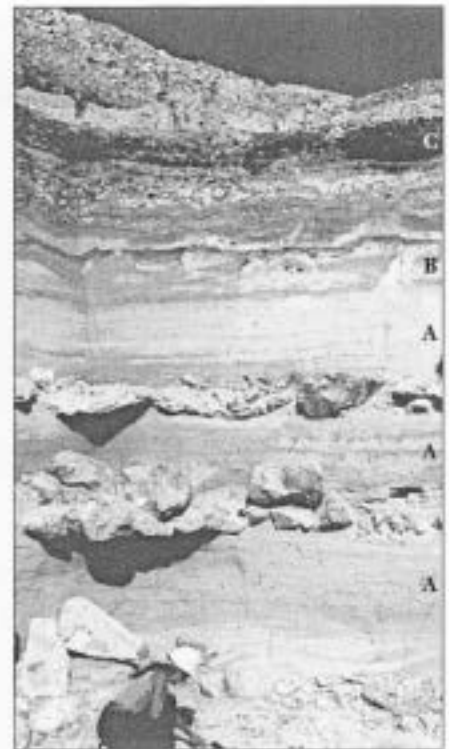
The desolate terrain of British gravel quarries contrasts starkly with the rural beauty of the countryside that commonly surrounds them. The open, sunken expanses of bare shattered rock and sand in the quarries are perhaps not unlike the barren ice-age landscapes that gave rise to the stony deposits they contain – landscapes in which ground-penetrating freezing and thawing created thick, mobile blankets of sediments stripped from the surrounding hillsides by melting ice. Over much of Britain these flows of broken bedrock ripped away the ancient land surfaces, lake beds and stream channels occupied by our earliest ancestors. Yet in some localities these sediments had the opposite effect, by covering fine-grain deposits in deep protective mantles of periglacial and fluvial gravels. For this reason, the study of Palaeolithic archaeology in Britain has had a long and close association with the aggregates industry, and for the past two centuries most significant collections of Palaeolithic artefacts have been made in these bleak environments.

In most cases, the conditions under which such discoveries are made are far from ideal for a discipline relying heavily

on scientific rigour in the interpretation of often meagre and fragmentary finds. From the earliest collections made by workmen at small quarry pits on country estates, to archaeological watching briefs alongside the imposing machinery of modern quarries, discoveries have often been made fortuitously. Undertaking thorough investigations amid the potential dangers of machinery and unstable sediments, or the obscuring effects of flooding, is a challenge to the modern discipline of Palaeolithic archaeology. However, as the past 25 years of research at the Boxgrove quarry has demonstrated, persistent endeavour in these superficially unattractive environments can yield unique insights into the life of archaic *Homo sapiens*. The new phase of work now under way at Boxgrove and its surroundings in West Sussex (Fig. 1) promises to provide a regional focus for Palaeolithic studies over at least the next 10–15 years.<sup>1</sup>

#### Previous research at Boxgrove

My personal involvement in the Boxgrove project began in the mid-1990s under relatively comfortable conditions and clement weather at the site, as a member of the team that was following up the discovery



**Figure 2** Section through the deep Pleistocene stratigraphy of the upper coastal plain at Boxgrove. The sequence shows a succession of marine, intertidal, terrestrial and periglacial deposits: A – marine deposits of the Slindon Formation; B – intertidal and terrestrial deposits of the Slindon Formation; C – periglacial gravel deposits of the Eartham Formation. The kneeling figure in the foreground approximately indicates the scale of the section.

of a human tibia (shin bone) in 1993. It had taken many seasons of dedicated fieldwork in rough conditions at the quarry before the importance of the site was recognized by the wider community of Palaeolithic specialists. It was while living for much of the year in a derelict, rat-infested and unheated farm in the early 1980s that Mark Roberts and his small team from the Institute of Archaeology had started to investigate fine-grain deposits at the base of the Boxgrove quarry (Fig. 2). Their dedication to the task stemmed from the recognition, at an early stage, that they had something unprecedented in European prehistory on their hands: a series of extensive and perfectly preserved ancient land surfaces containing untouched scatters of flint tools and fossilized animal bones of remote antiquity. During the 1980s, the initial exploratory excavations were consolidated into what became an established multidisciplinary research project, coordinated by the Institute under the direction of Mark Roberts.

As the project developed, over 90 areas of the buried prehistoric landscape were sampled, producing evidence of exceptionally well preserved areas of human activity associated with the butchered



**Figure 1** Location of the Lower Palaeolithic (Middle Pleistocene) site of Boxgrove, West Sussex, and of other Lower Palaeolithic sites mentioned in the text. The stippled area represents the deposits of the Boxgrove raised beach.



**Figure 3** Reconstruction by John Sibbick of humans butchering a rhinoceros carcass at the Boxgrove waterhole site. Stone biface tools were manufactured here with which large mammal carcasses were systematically processed, including the extraction of bone marrow (right foreground). The humans would have defended such valuable carcasses against other carnivores such as scavenging hyaenas (left background).

remains of large mammals. A picture began to emerge of the life and environment of the people who had occupied a landscape in which, towards the end of an interglacial period, a retreating sea had created an intertidal environment of saltmarsh and grassland overlooked by an imposing line of high chalk cliffs fringed by a beach (traceable today as the Boxgrove raised beach, Fig. 1). There was a ready supply of flint – the raw material for all the stone tools found at the site – in the talus (scree) slopes at the base of the cliff, and large herds of herbivores grazed amid the open grassland and freshwater springs of the lowlands below. The animal-bone evidence showed that the people were gaining access to carcasses of horse, red deer, rhinoceros and bovids such as bison. They were using the tools to extract meat and bone marrow (Fig. 3) but they had to compete with other carnivores such as wolf, hyaena and lion, whose gnaw marks were found to overlie the fine tracery of flint-tool marks on some of the bones. Some extensive activity areas, such as a horse butchery site (GTP17), perfectly preserved the evidence of butchery in the form of scatters of flint fragments left over from making (knapping) stone tools on site (Fig. 4). The knapping scatters surrounded the remains of a large horse and provided a snapshot of a few hours of activity left virtually untouched since the human group moved on, sated on horse flesh, some

500,000 years ago.

By the beginning of the 1990s the archaeological significance of Boxgrove had become widely recognized, but it was not until 1993, with the discovery of the human tibia, that the work of the research team gained international recognition.<sup>2</sup> The project was transformed by this discovery, unprecedented in Britain, and, with funding from English Heritage, a major excavation was undertaken that involved an international team of specialists and students. The new investigation focused on a suite of freshwater deposits – the remains of a small spring-fed pool – in the area (which we now refer to as the waterhole site) surrounding the spot where the tibia was found. In 1994 the team recovered two human teeth (lower front incisors) and the excavations revealed dense concentrations of stone tools and butchered animal bones. The concentrations of stone tools were dominated by several hundred bifaces (hand axes) in mint condition (Fig. 5). They had been worked finely on both sides and finished by expertly removing a tranche sharpening flake (a slice struck from the tip of a biface to make the cutting edge razor sharp).

Numerous bifaces had previously been recovered throughout the areas excavated at Boxgrove, together with the remains of knapping debitage (flint debris) produced during their manufacture. By refitting this debitage to re-constitute sequences of

knapping, we have been able to show that tools were routinely carried around by human groups and were subjected to minor modifications and re-sharpening as their edges became blunt through use. However, at the waterhole site, people appear to have abandoned this conservative approach to tool use and routinely discarded bifaces and blocks of raw material in large numbers, despite their obvious future usefulness. This behaviour has been noted at many other Lower Palaeolithic (Acheulean) sites and is usually, as at Boxgrove, associated with areas of springs, streams and other areas of fresh water. It is not the only type of enigmatic behaviour observed at the waterhole site: a small cluster of incised chalk blocks of unknown use were unearthed from the deposits there. Linear striations, apparently cut with flint tools, cross the upper surfaces of the blocks and may possibly relate to the processing of plant or animal resources, although it is equally possible that they derive from some activity not related to subsistence.

Results of the analysis of finds from the waterhole and horse-butchery sites and from other excavation areas at Boxgrove have been published in a series of papers and a major monograph.<sup>3</sup> The multi-disciplinary approach, incorporating the work of experts in fields as diverse as micropalaeontology, avifauna, palynology, soil micromorphology and human anatomy, has allowed a detailed picture to be built up of environmental changes and human activities at Boxgrove. The deposits have been dated to around 480,000 years ago by correlating stratigraphical sequences of mammalian remains.<sup>4</sup> This date is consistent with the tentative attribution of the human remains to the species *Homo heidelbergensis*, an archaic form of *Homo sapiens* that is currently thought to have been the common ancestor of populations of both neanderthals in Europe and anatomically modern humans in Africa.

Forensic analysis of the horse remains



**Figure 4** Excavating *in situ* knapping scatters at the horse butchery site GTP17.



**Figure 5** Excavating bifaces at the waterhole site, Q1/B. Over 450 mint-condition bifaces were recovered from the freshwater deposits at this location.

found at Boxgrove produced evidence of wounds from both bone breakage and projectile impact. The latter evidence supports finds from Lower Palaeolithic sites at Clacton in Essex and Schönningen in Lower Saxony (Germany), which suggests that humans were hunting large mammals with wooden spears. This evidence, together with the observation that butchery marks underlie carnivore gnaw marks, suggests that the Boxgrove people were competent hunters at the top of the food chain, who used tools and exploited the land in complex ways.<sup>5</sup> Finds of resharpened tools, and of hammers made of antler and used in the production of the fine bifaces, suggest that the hunters routinely curated valued tools, frequented areas such as waterholes where game was intercepted, and systematically defended and exhaustively butchered animal carcasses (Fig. 3). The local availability of fertile grassland, fresh water and abundant raw material for making tools would undoubtedly have attracted human groups. These factors, combined with the excellent conditions of preservation at the site and the use of modern excavation techniques, have combined to make the record of human behaviour at Boxgrove the most complete for any Lower Palaeolithic (and Middle Pleistocene) site in Europe.

**Mapping beyond the Boxgrove quarry**

During the past 150 years Acheulean artefacts have been found at several locations near Boxgrove, such as Slindon and East Lavant (Fig. 1), and some of them are associated with suites of marine and terrestrial deposits identical to those at Boxgrove, at a similar altitude of about 40m above present sea level. In the late 1990s, Boxgrove was shortlisted for inclusion in the

UNESCO list of World Heritage Sites, with the proviso that the full extent of the Boxgrove deposits should first be established so that the entire palaeo-landscape that they represent could be included in the designated area of the World Heritage Site. Therefore, in 2001, a geological survey referred to as the Raised Beach Mapping project was initiated with the aim of mapping the limits of preserved land surfaces, characterizing differences in local sedimentary sequences and prospecting for deposits with archaeological potential.

The Raised Beach Mapping project combined re-assessment of historical records with archaeological trial trenching and borehole surveys (Fig. 6) across the northern part of the coastal plain of Sussex and eastern Hampshire. As a result of 42 field investigations, the extent of the Boxgrove palaeo-landscape became apparent for the first time. The marine deposits and associated cliff line have now been traced for some 26km, between Westbourne and Arundel (Fig. 1),<sup>6</sup> and in this zone some 13 km of intact fossiliferous former land surfaces have been identified. The deposits are very similar to those discovered at Boxgrove and may well preserve extensive evidence of human activity *in situ*. One stratigraphical horizon, designated the Unit 4c palaeosol, is a single land surface that has been shown to have developed over a period of 10–50 years. It represents a developing grassland habitat and preserves *in situ* evidence of human activity over the timespan of a single human generation. It has now been traced east–west for over 10 km and offers a unique opportunity to investigate patterns of variation in human activity within such a short time period across a very extensive area.

The survey has also revealed some local environmental variation and has allowed

us to reconstruct the topographical setting of the palaeo-landscape in finer detail. The saltmarsh and grassland environments that developed as the interglacial sea retreated appear to have been partially enclosed by two pronounced chalk ridges (the Portsdown and Littlehampton anticlines, Fig. 1), since eroded away by marine action. Half a million years ago they ended in two headlands that defined a large embayment backed by imposing 80 m-high chalk cliffs, the line of which can be traced today along much of the course of the Boxgrove raised beach between Westbourne and Arundel. A series of streams flowing across the chalk surface behind the cliffs emptied into the embayment, forming gravel fans at their estuarine mouths. By means of the survey we have been able to explore the interface of these gravels with the grassland palaeo-landsurfaces. We have also identified beds of preserved organic remains, which may enable local vegetation to be reconstructed. At the western and eastern margins of the embayment, where unfortunately preservation is not so good, we have identified areas where the chalk cliffs were replaced by lower bluffs cut into soft clays of Tertiary age rather than the Cretaceous chalk. These varying local environments would have produced different local ecologies and may have provoked different behavioural responses among the human groups occupying them – differences that we hope to investigate by excavation in the future. One testable hypothesis is that human groups would have curated and re-used flint tools more extensively in these marginal areas farther from local sources of raw material.

The results of the Raised Beach Mapping project show that Boxgrove should no longer be considered a single, isolated site. Instead, we now know that it is at the heart



**Figure 6** Sampling geological deposits with a borehole rig at West Stoke, 8 km west of Boxgrove. The sedimentary sequence in the core obtained here was found to be identical to that recorded at the Boxgrove quarry.

of a vast, preserved prehistoric landscape buried between 2 m and 20 m below the modern surface of the Sussex coastal plain. Although quarries such as Boxgrove still provide the best chance of investigating extensive tracts of this landscape, the discovery of several valley-side locations, where the deposits rest close to the surface, offers the possibility of discovering new locales rich in traces of human activity.

### The next phase: future excavations and a field school

In 2001 the closer relationship that had long existed between the gravel-extraction industry and Palaeolithic archaeology in the UK was cemented by the establishment of the Aggregates Levy Sustainability Fund. The fund was created by the government by taxing quarrying and landfills to provide financial resources for environmental improvements to old sites and also for archaeological investigations. One of the first benefits of the fund was the provision of a grant that enabled English Heritage to purchase part of the Boxgrove quarry in 2003. The resulting 9 ha property incorporates the waterhole site as well as several other areas of rich archaeological potential and it is now owned by English Heritage and managed by the Institute of Archaeology, which has assumed responsibility for its partial restoration, ecological management and development.

Throughout the winter of 2003–2004, plans drawn up by the Boxgrove project for the restoration of the site were implemented. This involved the movement of tens of thousands of tonnes of gravel, ameliorating the quarry edges and covering the site in a layer of topsoil sufficient to allow the establishment of coppice and pasture. In addition, the area around the waterhole site has been levelled to within 2 m of the underlying archaeological deposits to facilitate future excavation, increasing eightfold the area available for study. This enlarged area should be enough to include the interface between the edge of the waterhole and the nearby grassland environment, as well as being sufficient to trace the deposits that produced the dense concentrations of flint tools and animal remains. Working northwest from the area previously excavated, we hope to follow the margins of the stream channel to where the originating spring emerged from the beach at the base of the cliff. Artefacts, together with the remains of butchered animals, were densely concentrated around this channel and the human tibia was recovered from its upper fills. The new area is likely to merit years of excavation, aimed at gaining a more detailed understanding of human behaviour at this locality, including the possibility of recovering further bones or teeth of *Homo heidelbergensis*.

Excavation will be renewed in 2005, when we will try to determine the overall topographical setting of the waterhole, and

also establish basic on-site amenities essential to the running of a full season of excavation. It is hoped that in the future the project will attract sufficient external funding to allow the Institute to establish a permanent field school at the site. The school will provide training for undergraduate and postgraduate students in the running of modern scientific excavations as well as facilities for on-site post-excavation work. It will also function as an important resource for the Institute's teaching programmes in human origins, prehistoric archaeology, ancient technology and palaeoecology. While research will continue to focus primarily on the Boxgrove quarry, other sites, including those located by the Raised Beach Mapping project, will begin to be investigated through the field school, thus broadening the project into a wider investigation of the archaeology of the Sussex coastal plain.

In contrast to its humble beginnings, the opportunity now exists for the Boxgrove project to move into a new phase of potentially very rewarding research. The provision of permanent accommodation and facilities for laboratory work, teaching and site interpretation for visitors lie some distance in the future. Establishing a field school will consolidate the past 25 years of research at this unique site and provide a much-needed regional focus for Palaeolithic studies in a valuable new facility managed by the Institute of Archaeology. Through the restoration work already under way, the Boxgrove quarry is beginning to be transformed from a bleak post-industrial landscape into an appropriate base for modern Palaeolithic archaeology in Britain.

### Notes

1. The Boxgrove project is based at the Institute of Archaeology, UCL. Both continuing analysis of the site and the associated Raised Beach Mapping project are funded by English Heritage. Part of the site was purchased in 2003 by English Heritage through a grant from the Aggregates Levy Sustainability Fund.
2. See M. B. Roberts, C. B. Stringer, S. A. Parfitt, "A hominid tibia from Middle Pleistocene sediments at Boxgrove, UK", *Nature* **369**, 311–13, 1994.
3. See, for example, M. B. Roberts, "Excavation of a Lower Palaeolithic site at Amey's Earham Pit, Boxgrove, West Sussex: a preliminary report", *Proceedings of the Prehistoric Society* **52**, 215–45, 1986, and M. B. Roberts, & S. A. Parfitt, *Boxgrove: a Middle Pleistocene hominid site at Earham Quarry, Boxgrove, West Sussex* (London: English Heritage, 1999).
4. For a detailed account of the methods used in attempts to date the sediments at Boxgrove, see pp. 291–307 in Roberts & Parfitt (1999: n.3 above).
5. Variation in land use and tool use by humans in the Boxgrove landscape was studied as part of my doctoral research; see M. I. Pope, *The significance of bifacial assemblages: an examination of behavioural controls on lithic assemblage formation in the Lower Palaeolithic* (PhD dissertation, University of Southampton, 2002).
6. The Sussex coastal plain is crossed east-west by a series of approximately parallel former (raised) beaches, the oldest and most northerly of which is the Boxgrove raised beach. The results of the Raised Beach Mapping project will be published by English Heritage as a monograph within the next few years. New geological maps will be deposited with local planning authorities to assist in the management and protection of the preserved prehistoric landscapes in Sussex.
7. I would like to thank Mark Roberts, Jemima Mieville and Kate Russell for their comments on an earlier draft of this article. As a multidisciplinary project, the work at Boxgrove could not have been undertaken without the dedicated work of many specialists and students.