Iron, Landscape and Power in Iron Age East Yorkshire

PETER HALKON
with a contribution by David Starley

More iron objects have been found in East Yorkshire than in any other part of Iron Age Britain of comparable size, largely in the burials of the Arras Culture, named after the excavations at Arras near Market Weighton (1815–17). The region also contains one of Britain's largest prehistoric iron production centres, contemporary with the Arras Culture. This article aims to contribute to re-establishing early iron production and consumption, and its social and economic significance in the archaeological mainstream, and demonstrate the importance of understanding ironworking for the Iron Age landscape.

INTRODUCTION

The importance of iron has been somewhat underestimated in recent major surveys of the Iron Age in Britain. Although the first appearance and deposition of the metal in the form of artefacts is covered to some extent in the two volumes published after seminars on the Iron Age held at Durham in 2001 (Needham 2007; O'Connor 2007), only one article refers to its production in any detail (Bryant 2007, 76). Regional studies such as that by Ehrenrich (1994) for Wessex are scarce and the need for such research has recently been recognized at a European level (Halkon and Serneels 2010). Cunliffe (2005) provides a short survey in the latest edition of *Iron Age Britain*, acknowledging experimentation and fieldwork in Snowdonia (Crew and Crew 1995; 1997) and research on production sites in east Yorkshire (Halkon 1997a; Halkon and Millett 1999) whilst Giles (2007) has considered the social context of ironworking. However, the study of iron in the Iron Age can still be encapsulated in a comment from a report by the Iron Age Research Seminar and the Council of the Prehistoric Society (Haselgrove et al. 2001, 22), published as part of the English Heritage Prehistory Research Agenda:

> The divide between practical and theoretical sides of archaeology is well-illustrated here: scientists rarely consider the social use of iron, while many archaeologists do not understand the practical constraints on metalworking.

The extent to which early iron production in Britain has been studied hitherto is limited and there is still some way to go to match the level of integration between archaeologists and archaeometallurgists achieved on the Continent in Germany and France (e.g. Milcent 2007) or in central and eastern Europe, summarized by Pleiner

(2000, 6). However, an increasing amount of experimental work and conferences run by the Historical Metallurgy Society and other groups have begun to fill this gap.

The impetus for this paper was provided by the significant Iron Age discoveries made in Yorkshire, particularly the East Riding, in the last decade. The distinctive Iron Age burials of east Yorkshire under low mounds and surrounded by square ditches, known as 'square barrows', generally contain crouched inhumations. The most impressive were accompanied by chariots or carts which had generally been dismantled on burial. The first was discovered at the large cemetery excavated at Arras, near Market Weighton, in 1815–1817, which gave its name to the 'Arras Culture'. In recent years further chariot burials have been excavated at Wetwang in 2001 (Hill 2002) and Ferry Fryston, West Yorkshire in 2003 (Boyle et al. 2007). In addition, the first iron 'currency bar' or bar of trade iron in the region has been positively identified and analyzed. In 2002 a cache of five swords in decorated copper alloy sheaths and thirty-three iron spear heads was discovered at South Cave (Evans 2006). These artefacts all demonstrate a high level of proficiency in the working of both iron and copper alloys. Evidence for the working of copper alloys in the Iron Age has been found at a number of locations in the region. It is therefore an opportune moment to highlight the significance of these discoveries in relation to Iron Age iron production and consumption in its landscape setting and to consider what can be learnt about society in the later Iron Age of east Yorkshire.

LANDSCAPE SETTING

The location of east Yorkshire is very significant: situated mid-way along the east coast of England, it is demarcated by the North Sea and, to the south, by the River Humber (Illus. 1). The Humber Estuary, which drains around one fifth of the area of England (Ellis 1996), has been a key route of communication since the Neolithic period. With the River Derwent on its northern and western edges, east Yorkshire is a discrete entity, marked out by natural boundaries. The region can be divided into four topographical zones: Holderness and the Hull valley, the Yorkshire Wolds, the Vale of York and the Vale of Pickering.

Holderness is gently undulating with relief provided by glacial till deposits of clay, sand and gravel, rising to 30m OD, though most is below 10m OD. The valley of the River Hull and its wetland margins forms a subregion. The Yorkshire Wolds, hills of Cretaceous chalk, form a crescent running from Flamborough Head in the north to the Humber near Hessle. At the southern end the Wolds rise to 160m, they are up to 140m high in the east and reach 240m OD in the north at their highest point (Ellis 1996). The scarp slope of the Wolds faces the Vale of York to the west and Vale of Pickering to the north. The rolling hills are punctuated by glacial valleys and drained by the Gypsey Race in the Great Wold Valley, famous for its concentration of Neolithic ritual monuments. Below the western escarpment of the Wolds is a 'bench' of Lower Lias and Jurassic rock and a spring line forms at the junction between this and the chalk. To the east the chalk dips gently under the till deposits of Holderness. To the west is the low-lying Vale of York, which is mostly below 10m OD, although Church Hill, Holme-on-Spalding Moor, which consists of Triassic Mercia mudstone

ILLUS. 1 Location map (tone = land over 40m) (Helen Woodhouse)

and gravel, rises to 40m OD (Halkon 2008). The Vale of Pickering, between the Wolds and the North Yorkshire uplands, is low lying with peat and clay deposits derived from glacial Lake Flixton and the now largely canalized River Derwent. On each side of the valley are rises of gravel and sand.

The Vale of York is drained in the south-east by the River Foulness (or 'Foona' as it is pronounced locally), meaning 'dirty river' (Ekwall 1960), with its source in the springs of the western Wolds escarpment. It flows in an arc through the ridges and dunes of Aeolian sands and glacio-lacustrine clays derived from glacial Lake Humber. In the Iron Age, the river emptied into a tidal estuarine inlet formed between 800 and 500 BC by a marine transgression in the Humber estuary as a part of a cycle of sea-level change. Sea-levels reached their Holocene maximum in the Early and Middle Iron Age, estimated at around 1m above the present level (Halkon 1987a; 2008; Halkon and Millett 1999; Halkon and Innes 2005; Halkon et al. 2009). Recent investigation (Coles 2010) has shown that in the Iron Age, marine deposits within this inlet extended up to 12km north of the present Humber coastline towards Market Weighton and the inlet was around 8km wide where it joined the estuary. The inlet and its creek systems are vital to our understanding of the development of the Iron Age iron industry as they provided a major routeway into the east Yorkshire hinterland (Halkon 2008). Recent research along the Hull Valley (Coates 2010) has shown that marine transgression also affected its upper middle reaches up to around 12km north of the present Humber shore, confirming the results of earlier work (Long et al. 1998; Metcalfe et al. 2000). The whole of the northern Humber shore had a different configuration in the Iron Age from the present which allowed the opening up of the

region to waterborne trade. The low-lying valley of the River Foulness has been known as an important source of bog iron ore for some time and a source in the Hull Valley has been recognized recently.

IRON IN THE EARLY IRON AGE

Early iron objects from east Yorkshire include two pins from the fortified hilltop site of Staple Howe (Brewster 1963) dating from 753–402 (1 sigma), 765–350 (2 sigma) cal. BC (Dent 1995; 2010). At Scarborough Castle pieces of iron rod were found with Ewart Park phase copper alloy objects in pits (Smith 1927; Challis and Harding 1975, 46; Collard et al. 2006). Iron fragments were also discovered in the fills of ditches at the Grimthorpe Hillfort (Stead 1968, 166, 5–7) dating from 1150–400 BC. All the early iron objects in East Yorkshire have therefore been associated with fortified enclosures, hinting at elite control, though elsewhere in Britain early iron objects have been found in less prestigious settings (Collard et al. 2006).

The mechanism by which iron arrived in this region is uncertain. Brewster and Hawkes (1963) in the Staple Howe report viewed the appearance of iron as indicating the presence of continental invaders; their hypothesis was largely based on the presence of Hallstatt-style copper alloy razors on the site with close parallels on the European mainland. It has since become the orthodoxy to discount invasion as a mechanism for such introductions, indeed it has been suggested that the razors may be British in origin, albeit inspired by continental counterparts (O'Connor 2007). Cunliffe (1995,15) proposes some native iron production and presumes that an iron sickle associated with the Early Iron Age ritual deposit at Llyn Fawr (Glamorgan) was manufactured locally, an idea borne out by the discovery of iron smelting in Late Bronze Age contexts on sites such as Hartshill Copse, Upper Bucklebury, Berkshire (Collard et al. 2006). It has also been suggested (Cunliffe 1995) that iron technology may have been introduced from the European continent along the Atlantic seaways of western Britain, a hypothesis which would seem to be supported by the comparative distribution in Britain of Bronze Age iron objects and production sites with Carp's tongue style swords (Collard et al. 2006). A concentration of these swords in north-western France supports Cunliffe's idea of zones of influence and contact (2005, 72).

The importance of the Humber Estuary for cultural exchange in prehistory is well known. A number of Bronze Age and possibly Neolithic items, including AOC (All Over Corded) Beakers, which are quite common in the region, are thought to be continentally derived (Manby et al. 2003, 58). The Bronze Age Ferriby boats (Wright et al. 2001), with a date range for Boats 1–3 from 1940 to 1680 cal. BC, and the Kilnsea Boat (Van de Noort et al. 1999) dating from 1870–1670 cal. BC, provide a means by which such items and perhaps ideas may have travelled.

Although they are not seaworthy, the log boats clustered around the Humber Basin, such as the Hasholme log boat (Illus. 2; Millett and McGrail 1987), hewn from a tree with a felling date of 322–277 BC, and the destroyed examples from South Carr Farm (Halkon 1997b) and Brigg, Lincs. (McGrail 1990), make it probable that Iron Age seagoing vessels existed in this region and are yet to be found. Both the Hasholme and South Carr Farm boats sank in the tidal estuarine inlet and creek system mentioned

ILLUS. 2 The Hasholme logboat. Note the orange staining on the boat caused by iron in the soil. (Photo: P. Halkon)

ILLUS. 3 Bog iron ore or 'nosmun' at Spen Lane, Holme-on-Spalding Moor. This material had broken farm machinery (Photo: P. Halkon)

above. Running into this inlet was the River Foulness. First mentioned in a charter of AD 959 as *Fulanea* (Hart 1975), the rusty colour of the water, still apparent today, may have provided early prospectors with an indication of the presence of bog iron ore. Both iron ore and slag, known in local dialect as 'nosmun' or 'Nossman', perhaps an attribution to the 'Norsemen' (Keen 1955, 82), have been recognized here for many years. There is still sufficient bog ore present in the region to impede drainage and cultivation (Illus. 3). An approximate guide to the speed of deposition is indicated by the circumstances of the discovery of the Hasholme logboat (Millett and McGrail 1987) as the four inch (102 mm) diameter ceramic drainage pipes laid in 1976 had become completely blocked by iron-rich ochre by 1984, necessitating the drainage scheme which led to the boat's discovery. The boat itself had become discoloured in places by iron-rich deposits. The bog ore which forms on the edges of the sand ridges and peat carrs near the River Foulness was successfully smelted in an experimental shaft furnace by Peter and Susan Crew at Plas Tan y Bwlch, Snowdonia (Illus. 4).

ILLUS. 4 Experimental iron smelting by Peter and Susan Crew at Plas Tan Y Bwlch, Snowdonia National Park, using bog ore from the Foulness Valley (Photo: P. Halkon)

More recently bog iron ore has been recognized in the Hull Valley as well occurring in similar landscape settings. Palaeoecological studies (Turner 1987; Heath and Wagner 2009) demonstrate the presence of woodland comprising alder, oak and willow which was managed for charcoal, and quite large pieces of charcoal were preserved in the iron smelting slag, for example at Moore's Farm, Welham Bridge. Plentiful clay was available for the construction of furnaces and the watercourses provided a convenient means of communication.

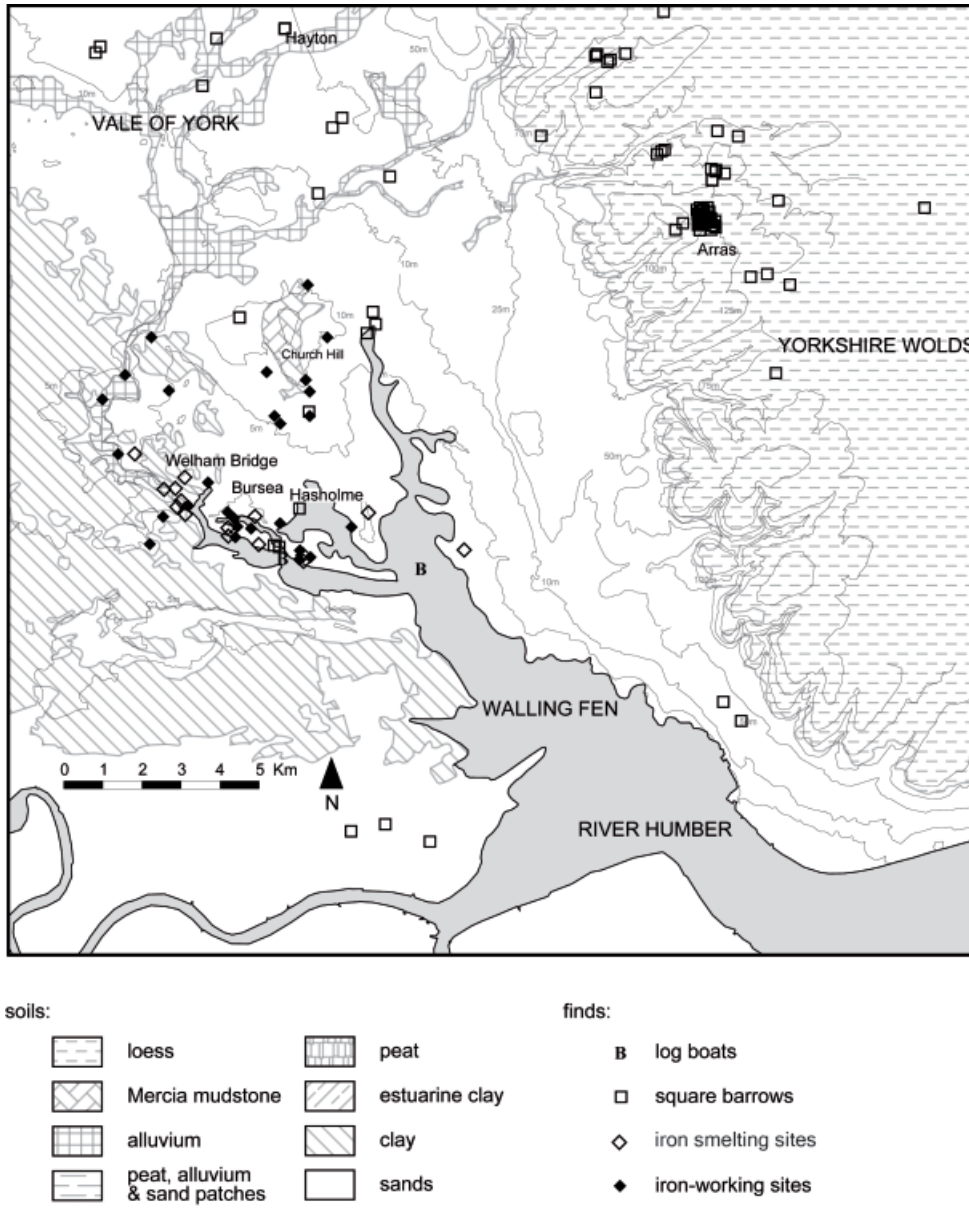
IRON PRODUCTION SITES

THE FOULNESS VALLEY

Field walking on the sand ridges along the River Foulness, particularly to the south of Holme-on-Spalding Moor, resulted in the discovery of an industry represented by nineteen smelting sites, presumed to be of Iron Age date (Halkon 1997a; 2003, 2008; Halkon and Millett 1999) (Illus. 5). At Moore's Farm, Welham Bridge, the largest slag heap yet found in Iron Age England was located and excavated; it comprised 5338 kg of slag (Illus. 6). During the construction of a new road and bridge nearby in 2003–04, a further 42.70 kg of iron slag was found (Mortimer 2005).

The large pieces of charcoal embedded in the slag from the Moore's Farm slag heap enabled C14 dates of 450–250 cal. BC (2 sigma) (HAR-9234) and 600–380 cal. BC (2 sigma) (HAR 9235) to be obtained (Halkon 1997a; Clogg 1999; Halkon and Millett 1999). It has been estimated that the creation of a slag heap of this size would have needed some 10 tons of ore and at least 35 tons of charcoal, equivalent, (based on Rackham 1980) to the annual product of around 47 ha of woodland. The slag probably represented the production of 1080 kg of billet and 540 kg of fully refined bar iron, enough for the manufacture of *c.* 800 bars of trade iron (currency bars) (Millett 1999, 223). According to Crew (pers. comm. and forthcoming), however, the amount of iron produced would depend on the quality of the ore smelted. Analyses of the ores found on the slag heap at Moore's Farm (Halkon and Millett 1999, table 4.8) show that they are all of too poor a quality to have been smelted and so are probably best regarded as having been discarded. Better quality ores could have resulted in the production of some 2 tons of bloom, which would have been refined to 1 ton of billet and 500 kg of bar iron.

Clogg (1999) sorted the slag from Moore's Farm into four main types on the grounds of appearance and morphology (Table 1). Although no furnaces were found at Moore's Farm, Slag Types 3 and 4 (Clogg 1999, 87; Halkon 2007) were almost certainly the products of non-tapping shaft furnaces or slag pit furnaces (Tylecote 1987, 154). This type of furnace, which consisted of a clay shaft over a pit in which slag collected during the smelt, is known from a number of northern European countries including France, Germany, Denmark and Poland in Iron Age contexts and is considered a precursor of furnaces from which the slag was tapped. It has been pointed out (Young 2003, 3) that the fact that the slag blocks at Moore's Farm were found in a dump shows that the technology undertaken here involved the clearing of the pits. Large slag blocks in their original pits were encountered in 1984 at Hasholme



ILLUS. 5 Iron production sites in the landscape of the Foulness Valley (Map J. Garner and J. Negus)

ILLUS. 6 The Moore's Farm slag heap under excavation (Photo: P. Halkon)

Hall, during the archaeological monitoring of the drainage trenches in the field immediately to the north of the Hasholme logboat itself, close to the shore of the estuarine tidal creek in which the boat had sunk (Illus. 7; Millett and McGrail 1987, 72). Further large blocks were found in the ditches of the Iron Age enclosure excavated at Hasholme Hall (Hicks and Wilson 1975; Halkon and Millett 1999, 75). Although the Hasholme slag blocks are yet to be dated, they may well be contemporary with the logboat itself. In any case, the Hasholme logboat dendrochronology dates fit well with the C14 dates from Moore's Farm slag blocks.The Moore's Farm and Hasholme slag blocks closely resemble those found 5 km away, directly across the Walling Fen tidal inlet from Hasholme, at Dryham Lane, North Cave (Dent 1989, 29). Described by the excavator as 'huge', they had been dumped in Pit 57. A furnace with an internal diameter of 750 mm at its base was found nearby. No direct dating evidence was available but typology, stratigraphy and pottery suggest that it was of Iron Age date and contemporary with other sites in the Foulness Valley. The South Carr Farm logboat (Halkon 1997b; Illus. 2b) discovered around 1 km to the west of the North Cave settlement may also be contemporary with the Hasholme boat.

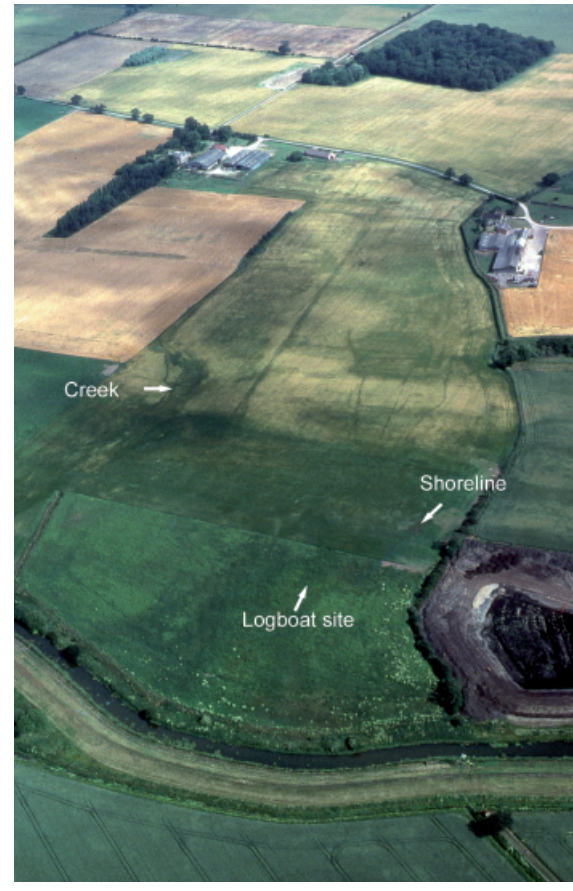
TABLE 1 Slag types from Moore's Farm, Welham Bridge

GROUP	WEIGHT (AV.)	LENGTH (AV.)	BREADTH (AV.)	DEPTH (AV.)	MAX RADIUS (AV.)
	Kg	mm	mm	mm	mm
1	12.68	353.27	283.59	187.92	181.95
2	26.3	525.11	372.69	245.79	278.50
3	47.5	467.06	405.64	386.23	254.50
4	59.71	606.83	488.49	354.13	327.43

Encountered during drainage operations in the 1970s and subsequently destroyed, the only surviving records of this vessel are two photographs. From these pictures and the testimony of the contractors, the South Carr Farm logboat had sunk in the same estuarine clay as the Hasholme boat and shared some typological similarities (Halkon 1997b).

This evidence, together with the distribution of smelting slag found during field survey (Halkon and Millett 1999; Halkon 1987, 2008), suggests that Iron Age iron production clustered around the Foulness creek system and tidal inlet, perhaps serviced by boats. The Arras cemetery itself with its chariot burials, possibly dating from the fourth century BC onwards (Stead 1979) lies at the top of Sancton Dale, a dry valley which forms a natural route down to the tidal inlet. The dates of the Hasholme logboat, Moore's Farm slag blocks and Arras culture burials show that they are likely to be contemporary. As the grave goods contained in the Arras culture burials represent the most substantial consumption of iron within the region, a connection with the iron-producing Foulness Valley is probable.

The dense clustering of sites around the River Foulness is likely to represent a zone of specialist production benefitting from easy access to transport and raw materials



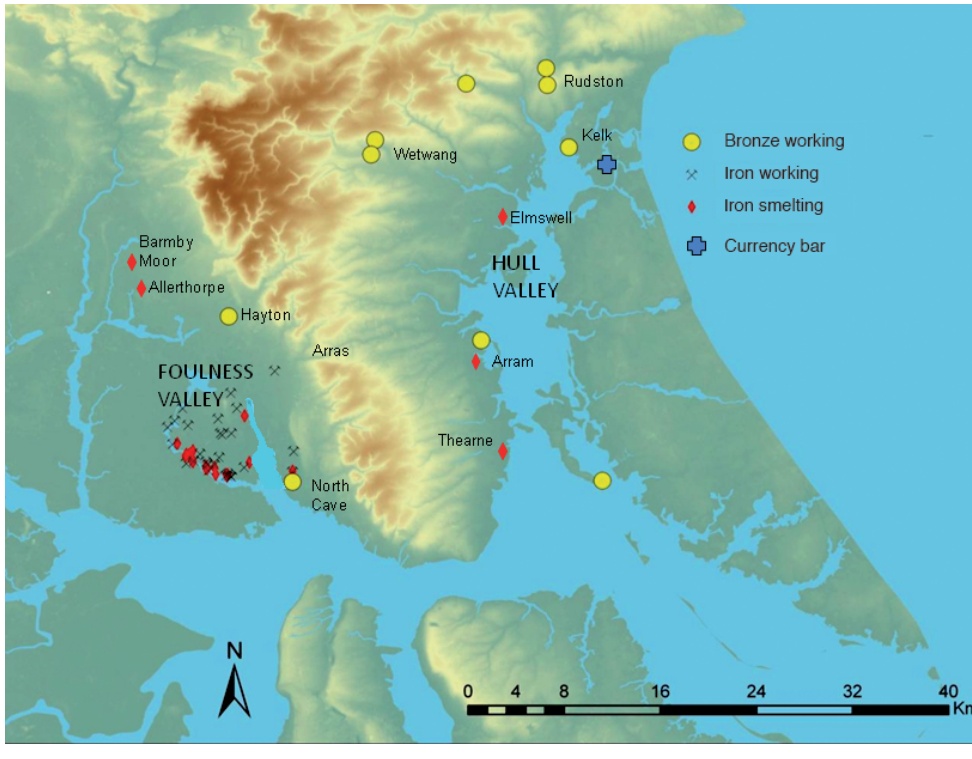
ILLUS. 7 Aerial photograph showing the enclosures at Hasholme, the shoreline and creek and the Hasholme boat location in 1996. The section of the large irrigation pond revealed a major phase of marine transgression in the early Iron Age. (Photo: P. Halkon). Note the cropmarks of the Iron Age and Romano-British settlement showing in the field above the shore line.

(Halkon and Millett 1999; Halkon 2006 and 2008; Illus. 5). Smaller scale iron production has been located elsewhere in the Vale of York, for example at Barmby Moor (Cowgill et al. 2003) during an evaluation associated with the Teeside-Saltend Ethylene pipeline in 1999. More slag blocks were found at Allerthorpe Common, during a field visit to inspect a crop mark site during the English Heritage National Mapping Programme of the Vale of York (Dave McCleod pers.comm.). Both sites are in wetland areas with soil conditions suitable for the development of bog ore and are in the 20 km × 30 km Foulness study area (Halkon 2006; 2008).

THE HULL VALLEY

In comparison to the Foulness Valley, despite large-scale field walking in the Hull Valley by Peter Didsbury (1990) and during the Humber Wetlands project (Van De Noort and Ellis 1995; 2000), little evidence for early iron production or even iron working has been reported. In recent years, however, iron slag has been found in Iron Age contexts at several sites around Beverley in the Hull Valley (Illus. 8).

At Arram, (Wilson et al. 2006) iron smelting slag and fragments of clay moulds and sprue cups for copper alloy casting were found in Iron Age contexts on a late Iron Age and Romano-British settlement with round houses and ditched enclosures. Other



ILLUS. 8 A map showing sites with Iron Age iron production and bronze working

finds included wheel-thrown Dragonby type pottery and a coin of the Corieltauvi providing evidence for cross-Humber contact in the later Iron Age.

Further downstream at Thearne, near Beverley (Campbell 2007; 2008), large slag blocks similar to those from Moore's Farm have been identified on a spit of land protruding eastwards towards the River Hull. There are bog ore deposits here and, in the early summer of 2009, tree planting resulted in the discovery of the remains of a furnace (Illus. 9). As it has been only partially excavated, it is not clear at this stage whether it is of slag tapping or slag pit type, though much slag was recovered around it. At first this was identified as tap slag, but a preliminarily inspection suggested that the slag may have been formed by residues collecting on the inside of the furnace dripping down its wall (J. Cowgill and G. McDonnell pers. comm.). Iron was not the only heat-based industry here as Thearne has also produced important evidence for the manufacture of glass bangles in the first century AD.

The new evidence for Iron Age copper alloy working at Arram in the Hull Valley and Hayton in the Foulness Valley (Halkon et al. 2000) combined with what is already known of iron production, make it probable that swords and other items were produced in the region. In the Hull Valley at Kelk, *c.* 20 km, north of Arram, seventy-three fragments of material associated with copper alloy casting were excavated, including moulds for casting objects including bridle rings, during the Humber

ILLUS. 9 The furnace at Thearne (Photo: P. Halkon)

ILLUS. 10 The Gransmoor currency bar (Photo: M. Park)

ILLUS. 11 Drawing of the Gransmoor currency bar (John Marshall)

Wetlands Project survey of the Hull Valley (Van de Noort et al. 2000). These finds become all the more significant when an iron 'currency bar' found in the vicinity by the Granthams (GC36.1) early in the 1960s (Dent 1995; Peter Makey pers. comm.) is taken into account (Illus 10–11).

THE GRANSMOOR CURRENCY BAR
by PETER HALKON *and* DAVID STARLEY

This object has not been previously published in any detail and its identification as a currency bar was only confirmed by one of the writers (PH) in 2007. As the only example known from the east Yorkshire region and one of the few found north of the Humber, it is of some significance. Found at Gransmoor in Holderness, to the east of the River Hull, with Iron Age pottery and querns, the currency bar was originally 420 mm in length, a maximum of 33 mm wide and 9 mm thick. Since it was first drawn in the 1970s the socketed 'handle' has been damaged. The bar was made from two pieces of iron, welded together some 290 mm from the tip. There was no attempt to fully close the weld and the presence of the feature is probably best regarded as a demonstration of how suitable the iron would be for welding. The only other currency bars in Great Britain known with similar welds are those from the Llyn Cerrig Bach hoard, which also have welded tips (Crew 1994, Type N).

X-ray fluorescence analysis detected small peaks of arsenic and phosphorus. Metallography showed both the pieces from which it was made may have come from the same heterogeneous bloom (Illus 12a and b; Table 2). The alloy used was phosphoric iron, although the core of Sample 1 contained about 0.25% carbon, just enough to be classified as a steel. Sample 2 only contained about 0.1% carbon, insufficient to allow hardening by quenching. The Gransmoor currency bar was therefore typical of many bars examined by metallography as it was not fully refined and still contained large quantities of slag inclusions. Many of the British currency bars are similar in being made from phosphorus-rich ores, typical of iron from bog ore, and are low in carbon, making them suitable for a range of purposes (Starley 2009). Ores from the Foulness area analyzed so far have too little phosphorus for them to have been a source for the Gransmoor bar, although, of course, higher phosphorus ores may have been available there in antiquity. It is most likely, however, that this bar was made in the area in which it was found and represents the only object between an iron billet and finished item from a region of extensive iron manufacture.

The currency bar was found in the northern arm of an embankment or earthwork with a cross-shaped plan, corresponding to a type of monument once thought to be the foundations of a medieval post mill. However, although it is far too large for a mill, the origins of such monuments remain mysterious (Coles 1899; Mortimer 1905). Notes concerning the discovery of the currency bar refer to fragments of the burnt clay walls of a 'kiln' 90–100 mm thick which may be from a furnace or hearth, although no slag is reported. It is possible, given the distinctive location of its discovery on a low hill surrounded by alluvium, that the bar along with burnt querns, Iron Age pottery and bones, had been deposited in a ritual context. This has been

ILLUS. 12 The metallography of the Gransmoor currency bar after nital etching (see Table 2). A (above), Sample 1 (tip end). Heterogeneous microstructure with slight phosphorous ghosting visible in the top of the image and low carbon (pearlite and ferrite) steel below. Width of Field 1200 μm. B (below), Sample 2 (socket end) Another heterogeneous structure. The only carbon present was in the form of agglomerated pearlite (centre of image). The black areas are voids caused by corrosion penetration. Width of Field 600 μm. (Photography and analysis by D. Starley)

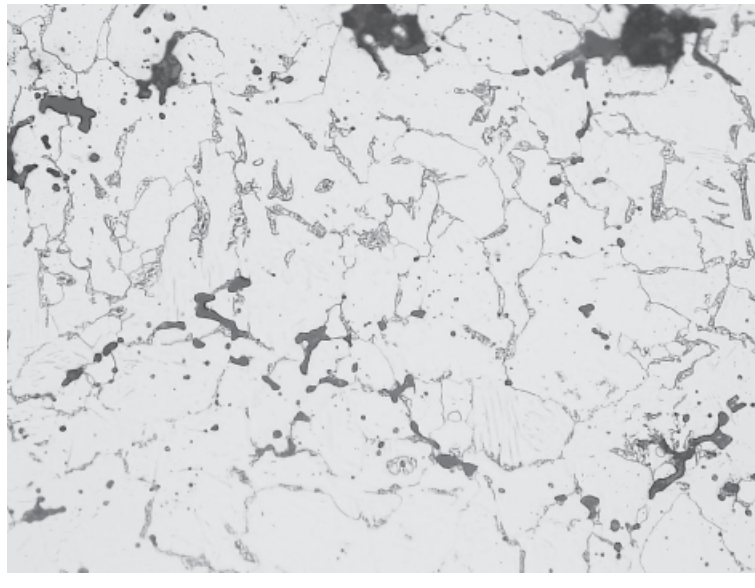


TABLE 2 Summary of metallographic structures

SAMPLE	STRUCTURE	ASTM GRAIN SIZE	GHOSTING	FERRITE HARDNESS	PILED	QUENCHED	DRAWN DOWN?
1. Tip of bar	Heterogeneous phosphoric iron/ low carbon steel	6-0	yes	190 Hv	no	no	yes
2. Near socket	Heterogeneous phosphoric iron/ carbon below steel composition	6-0	yes	204 Hv	no	no	yes

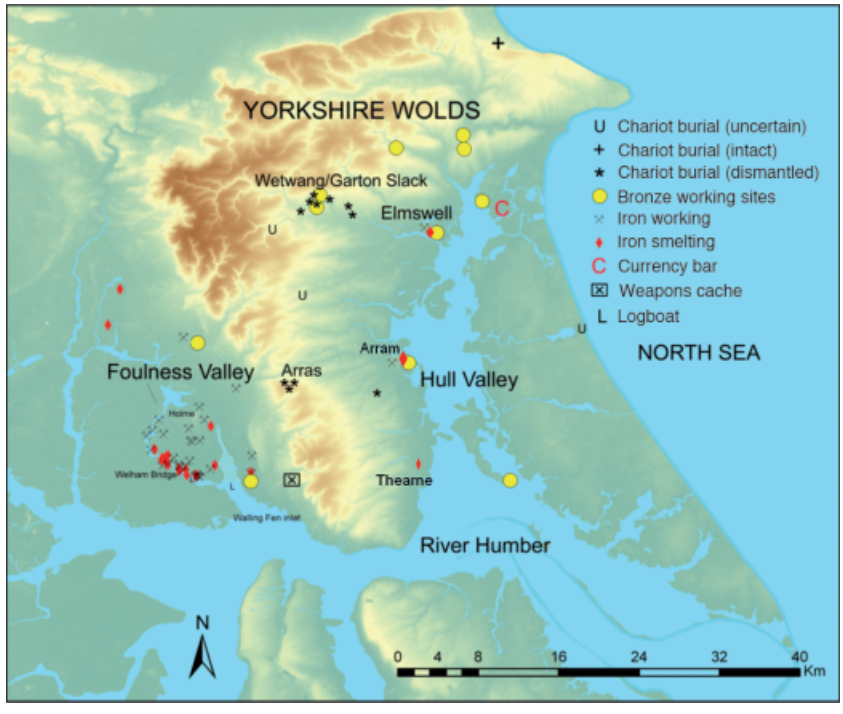
suggested for currency bars found elsewhere in Britain (Hingley 1990). Future discoveries will show whether or not the Gransmoor bar is a distinctive regional type.

IRON AND THE CHARIOT BURIALS

At Kelk and Gransmoor the combination of evidence for the working of copper alloy and possibly iron, is reminiscent of the settlement of Gussage All Saints in Dorset where chariot fittings were made (Wainwright 1979) — a reminder that there is archaeological evidence for these vehicles elsewhere in Iron Age Britain. The presence of a 'Dane's Grave Wood' close to Arram and Gransmoor make this part of the Hull Valley worthy of further investigation, as the place-name may refer to an unexplored square barrow cemetery. Dane's Graves was the name given to a large Iron Age cemetery on the northern Yorkshire Wolds excavated by Greenwell, Mortimer and Boynton which included a chariot or cart burial (Mortimer 1905).

The most extensive evidence for iron smelting found in the Hull valley so far was on the Iron Age to early medieval settlement at Elmswell, at the head waters of the River Hull (Congreve 1938). Here a heap of what the excavator described as bloomery slag weighing about 1.5 tonnes was found and analyzed (Smythe 1938). Although the slag heap could not be dated directly, a cobbled surface overlain by a humic soil 15 m away contained Iron Age coins. Slag was scattered across the site and in a number of pits which contained burnt clay and ash. Were these the remains of slag pit furnaces? The assemblage of Iron Age, Roman and Anglian iron objects on the site included a ladle, knives, shears, hooks and awls. One structure was interpreted as a Roman smithy. A piece of crucible found in a pit indicated that copper alloy casting had been undertaken here in the Iron Age. It is perfectly possible that the Elmswell Plaque, a very fine, decorated copper alloy panel covered with a flowing, embossed Celtic decoration (Corder 1940, fig. 16) could have been made here.

If the iron working at Elmswell was taking place in the Iron Age, the site's location within the landscape is significant for it lies at the head waters of the River Hull at the



ILLUS. 13 A map of Iron Age east Yorkshire showing the distribution of copper alloy and iron working sites, and chariot burials. Note the effect of high Middle Iron Age sea levels in the Foulness and Hull valleys.

mouth of the valley known as the 'Great Slack' (Dent 1995; 2010). In the valley there are large Iron Age cemeteries, which included seven chariot burials, each containing large numbers of copper alloy and iron objects (Illus. 13). Just as Elmswell overlooks the Hull valley, the type-site Arras square barrow cemetery, with three chariot burials (Stead 1979), overlooks Sancton Dale, a valley which forms the easiest route between the iron-producing lowlands and the Wolds (Illus. 14–15). This relationship provides support for the idea that there may have been a link between those buried in the richer graves, some of which contained objects decorated with gold and coral, and control of iron production, routeways and other resources (Halkon 2007). On each side of the Yorkshire Wolds valleys along which chariot burials were placed eventually lead down to river systems and their associated iron industries.

The slag blocks from the Foulness Valley sites resemble those produced in the well-preserved slag-pit furnaces of the final Hallstatt and earliest La Tène periods, excavated in the Bassin Parisien (Cabboi and Dunikowski 2004; Cabboi et al. 2007). Although much more research is needed to confirm this connection, the apparent expansion of iron production identified on the Continent *c.* 300 BC (Collard et al. 2006) may correspond with a similar phenomenon in the east Yorkshire region and the two may have been connected in some way. Advances in the technology of iron production could

ILLUS. 14 The Arras square barrow cemetery from the air in July 2009 (Photo: P. Halkon)

well have been introduced through the Humber Estuary and by a similar mechanism as the square barrows and chariot burials. There is insufficient space here to enter the complex debates concerning the relationship between east Yorkshire and France in the Iron Age, or about whether the vehicles buried are chariots or carts, but the well-known and distinctive graves of east Yorkshire provide one of the largest samples of Iron Age iron objects in the British Iron Age (Illus. 16).

It should be noted, however, that a recent study of the iron tyres in chariot burials has found close parallels in the style and method of manufacture between those of the Paris basin and examples from east Yorkshire (Anthoons 2007). It has been argued (Verger 1994) that the flat, wide tyres attached by shrinkage to the felloes without the use of nails developed from narrow, curved examples using many nails to secure them. Anthoons (2007, 145) has proposed that the new technique developed in the Aisne/Marne region of France, arriving in the area around Paris and in east Yorkshire at about the same time in the later fourth century BC. It is interesting that only the non-nailed type has so far been found in the east Yorkshire region with no evidence for any intermediate phase. Might this represent contact of some kind across the North Sea and English Channel? Again, more research is needed to elucidate this issue.

ILLUS. 15 Finds from the King's Barrow Arras: part of an iron tyre, bridle bit, nave ring, linch pin, rings and terrets. All these objects apart from the iron tyre (top) are encased with copper alloy. (Photo: M. Park, courtesy Yorkshire Museum, York)

ILLUS. 16 Chariot burials from East Yorkshire. Left: (top) Garton Slack, 1971 (Photo: T. C. M. Brewster (courtesy ERART); (bottom) Garton Station, 1985 (Stead 1991; photo: V. Fell). Right: (top) Wetwang Slack 1, 1984, burial with sword (photo: A. L. Pacitto, courtesy A. L. Pacitto Collection); (middle) Wetwang 2, woman's burial with 'bean can' and mirror (Dent 1985; 2010) (photo: A. L. Pacitto, courtesy A. L. Pacitto Collection); (bottom) Kirkburn, 1987, male with a mail tunic visible as a rectangular stain (Stead 1991; photo: P. Halkon)

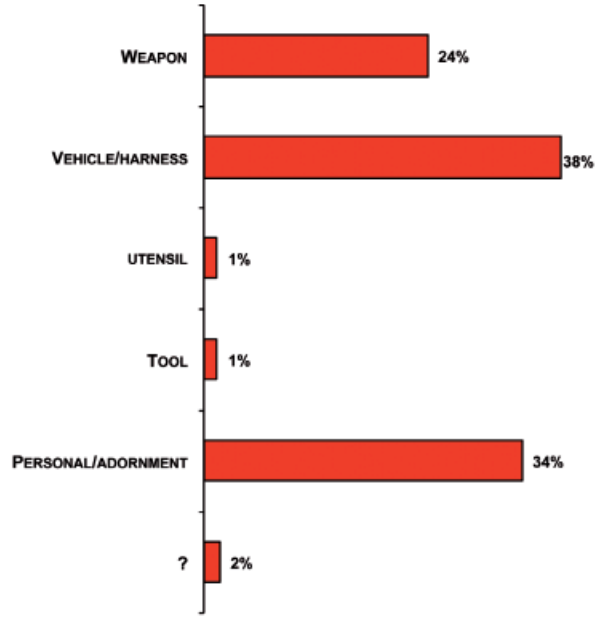
IRON OBJECTS IN BURIALS

The socio-economic impact of iron, and its production and utilization, have been identified as factors worthy of greater consideration (Serneels 2007). Some reference has already been made to the way in which iron may have been perceived in Iron Age Britain. Most authorities agree that iron objects might have had a significance beyond their practical use and, on occasions, were ritually deposited. This might have arisen from a relationship between blacksmithing and aspects of political authority, although Giles (2007) has questioned the idea that there was elite control of the smelting process.

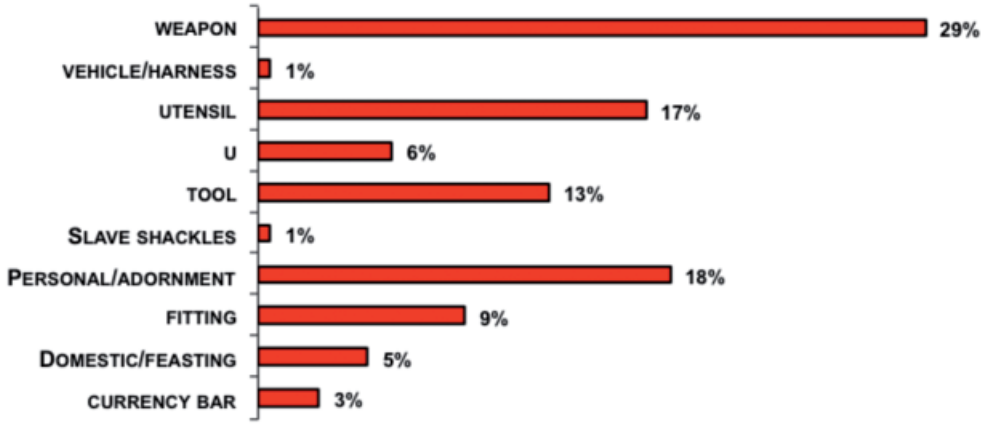
The results of experimental iron smelting and smithing, however, provide a different perspective on the role of iron in Iron Age society by confirming the considerable time and effort needed to produce even a relatively small quantity of iron using the methods available at the time. It has been estimated that the production of 1 kg of fully refined bar iron would have needed a total of 8 to 25 man-day's work, depending on the ore type and the technology used (Crew forthcoming). The iron tyres made for a recent experimental reconstruction of a chariot by Don Barker, sponsored by the Yorkshire Museum, York, weighed 12 kg and a total of 36 kg of iron was needed for all the chariot fittings (http://www.yorkshiremuseum.org.uk/Page/CPArchSub6.aspx). It is clear therefore, that interments such as the Kirkburn chariot burial (Illus. 16), which also contained a mail shirt (Stead 1991), represented a considerable investment in time, supporting the idea that the people accompanied by such objects enjoyed some control over both the commodity and its working, and probably enjoyed elevated status within their society.

With this in mind, a database of all iron objects in Iron Age burials in east Yorkshire was compiled by Walker (2007) with the assistance of the writer, based on all published material (Illus. 17). Out of a total of 858 burials, 21% contained iron objects. A total of 421 iron artefacts was recorded which were subdivided into various classes: personal adornment (34%), vehicle/harness fittings (38%), weapons (24%), the remainder being tools and unidentified objects. As expected the cemeteries containing the chariot burials, such as Wetwang, included the most iron artefacts. The vast majority of the personal adornment items were brooches, and of weapons the commonest were spearheads (16% of the total corpus). The sex of the individuals in the graves in the database was determined from the skeletons (Stead 1991), although in a small number of cases, survival of the bones and other factors made it impossible to determine whether they were male or female. Weapons were almost exclusively found in male burials and items of personal adornment found most frequently in female burials.

In order to place the east Yorkshire burials into a wider context, they were compared with those in the rest of Iron Age Britain catalogued by Whimster (1981) (Illus. 17), with some updates from more recent finds. Clear differences can be seen. The fact that there are far more Iron Age burials in east Yorkshire than anywhere else must be borne in mind, however. Burials with weapons can be found all over Britain, although a complete set consisting of shield, sword, and spear is rare. It is intriguing to note that two of the most recently discovered burials with weapons, from Brisley Farm, Ashford, Kent (Stevenson and Johnson 2004), were in square barrows. Although they were accompanied by pottery vessels, which are very unusual in east

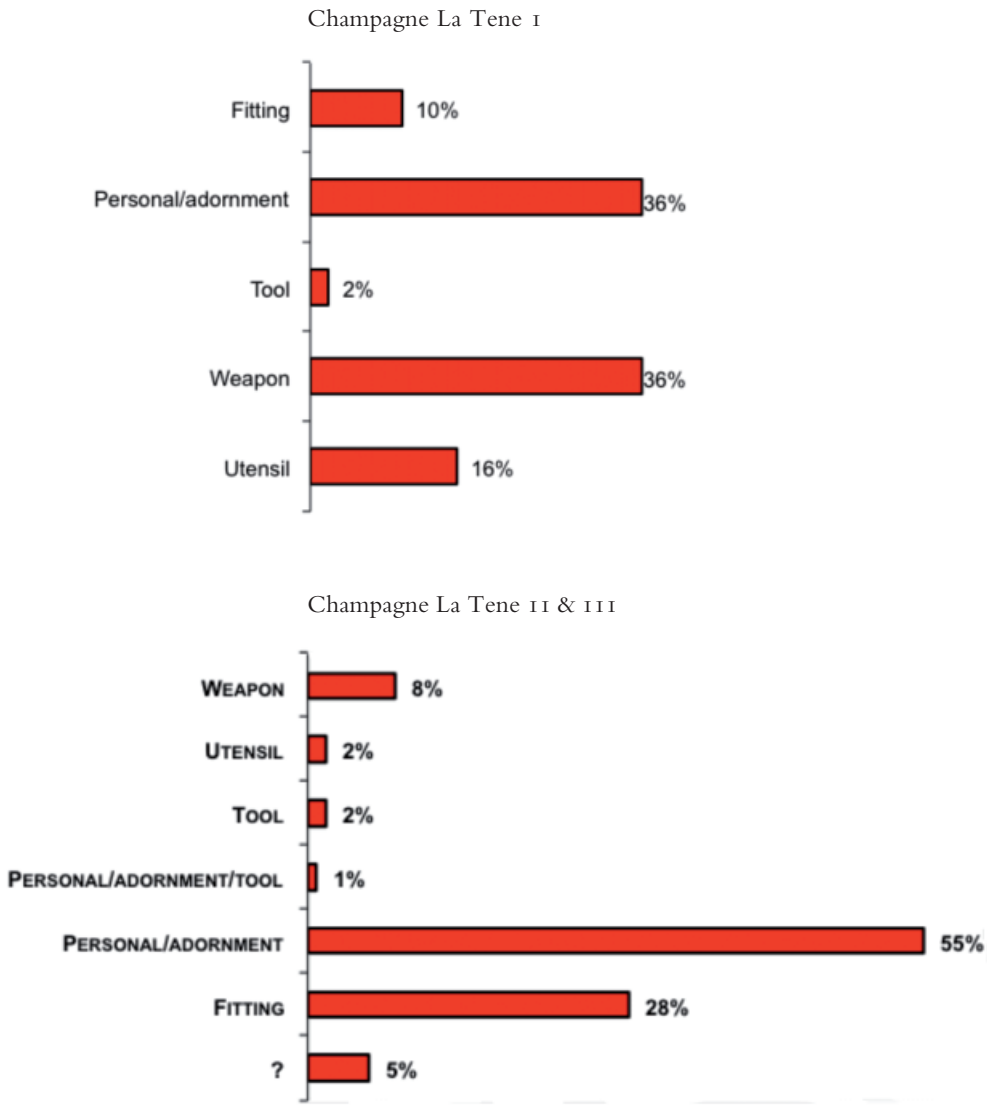


Iron artefacts from burials in Eastern Yorkshire
Total number of burials 858
Burials with iron artefacts 183
Total no. of iron artefacts 421



Iron artefacts in UK Iron Age burials excluding Eastern Yorkshire (Whimster 1981)
Total number of burials 1952
Burials with iron artefacts 100
Total no. of iron artefacts 189

ILLUS. 17 Categories of iron objects in east Yorkshire burials compared with iron objects from burials in Iron Age Britain



Iron artefacts in Iron Age burials in Champagne (Stead 2007)

	La Tene I	La Tene II/III
Total number of burials	28	91
Burials with iron artefacts	21	59
Total number of iron artefacts	50	274

ILLUS. 18 Categories of iron objects in Iron Age burials from northern France

Yorkshire weapons burials, one of them did contain half a pig's head, a trait which is also typical of high status east Yorkshire graves. Dated to the latter half of the first century AD, they were considerably later than those of east Yorkshire, the latest of which is thought to date from the later second/earlier first century BC (Stead 1991). The Kent burials have close parallels with those from France.

Out of 1952 burials recorded by Whimster (1981) (excluding those from Yorkshire) only around 100 contained iron objects. Of the 189 iron items noted, 29% were weapons and 18% items of personal adornment including brooches.

As a comparison, the iron objects from a group of Iron Age cemeteries in the Champagne region of northern France were also quantified ((Stead et al. 2006; Illus. 18). Although fewer graves (28), have been excavated in the three French La Tène I cemeteries thought to be chronologically equivalent to the Yorkshire examples, it is interesting to note that 75% of them contained iron objects. Furthermore, the percentages of objects in the artefact classes were broadly similar to those in east Yorkshire: personal adornment (35%) and weapons (36%). Most burials had one item, though one contained twelve. Of the ninety-one French La Tène III burials excavated, 65% contained iron objects covering a much greater type range than in the La Tène II burials. Again the quantity of objects per burial may indicate social differentiation. There is a very striking decline between the La Tène I and La Tène II and III burials in the number of weapons included but a growth in the use of iron for fittings.

ILLUS. 19 The ironworking tools from a pit at Garton Slack (Photo: M. Park, courtesy Hull and East Riding Museum)

What of the iron workers themselves? A set of tools, including tongs, a poker and what is described as a 'paddle', were deposited in a former grain storage pit at Garton Slack (Illus. 19; Brewster 1980; Giles 2007). The tongs were 673 mm long, constructed from two wrought iron bars with an iron rivet acting as swivel. The poker was deposited just above and resting on the tongs. It was 780 mm in length and had a loop handle and a flattened sword-like lower end. The section between the loop at the end of the handle and the blade had been twisted in three directions. Such twisting demonstrates the skill of the blacksmith and the good quality of iron which was able to stand such working without snapping. On top of the tongs and poker was the paddle, 836 mm long, with a loop at the top and a paddle-like end 130 mm long and 40 mm wide. The manner of disposal of these well-made tools is reminiscent of the ritual deposition of iron tools and other items in the grain pits at the Iron Age hillfort of Danebury in Hampshire (Cunliffe 2003).

At Rudston (Stead 1991) a pair of blacksmith's tongs and a hammer were found in Grave 154, the burial of a male aged around 20 (Illus. 20). The tongs which were 513 mm long, had bowed jaws, closing to within 4 mm at the tips, which were rectangular in section near the rivet and round elsewhere. There were traces of mineralized textile on the handles and a lump of slag near the rivet (Fell 1991). Associated with the tongs was what might have been a coupler to fit on the arm ends to allow the tongs to grip a piece of iron firmly during the smithing process, giving the blacksmith a free hand. The tips of two spears had been jammed between the arms of the

ILLUS. 20 Rudston Burial 154: a twenty-year old male with a sword and metalworking tools (Stead 1991) (Photo: courtesy I. Stead and J. Joy, British Museum)

tongs. The burial also contained a short sword. This combination of metal working tools and weapons is most interesting but enigmatic: did the deposition of these tools in his grave reflect the deceased's status in life? Was he a smith or smelter himself and did the weapons indicate that he was also warrior? Did the objects represent his mastery of iron either through direct expertise or control of its production? Unfortunately his skeleton was fragmentary and insufficient remained of the upper arms to assess his physique. Possible craftsman burials are rare in Britain but include an example from Whitcombe, Dorset, which included a spearhead, a sword, a file and an iron hammerhead (Stead 1990 and pers. comm.).

THE SOUTH CAVE WEAPONS CACHE

The high quality of workmanship displayed in objects such as the sword sheath from Kirkburn (Stead 2006) demonstrates the expertise of east Yorkshire metalworkers in the Middle and Late Iron Age. One of the finest examples is the remarkable cache of five iron swords in copper alloy scabbards and thirty-three iron spearheads (Evans 2006; Illus. 21) found at South Cave on the eastern side of the Foulness tidal inlet in

ILLUS. 21 The South Cave weapons cache under excavation
(Photo: courtesy York Archaeological Trust)

2002. Buried in the upper levels of a settlement ditch, under sherds of Dressel 20 amphora, it was probably deposited around AD 70, the period of the Roman conquest of Yorkshire. It may be an example of structured ritual deposition, or perhaps, as the dating from the pottery suggests, was deliberately hidden for later recovery during decommissioning of weapons in the early stages of Roman rule (Illus. 22a–b).

Iron smelting continued in the Foulness Valley, though there seems to have been a switch from slag-pit to slag-tapping furnaces as tap slag has been found on a number of sites. Although smelting seems to have ceased at Moore's Farm by this time, iron production continued at Hasholme Hall, Bursea and other sites into the Roman period with products being traded along the Foulness tidal creeks and estuarine inlet (Halkon and Millett 1999). This evidence, together with that for contemporary copper alloy working, make it likely that the swords from the South Cave weapons

ILLUS. 22 Details of the South Cave swords: a, Sword 16, copper alloy sheath with a sword grip and guard made from the tooth of a sperm whale; b, Sword 17, repoussé panels decorated with silver overlay and red and blue glass mounts, the iron blade is visible through the damaged sheath. (Photos: East Riding of Yorkshire Council)

cache were made in the region. In terms of their stylistic character, they mainly fall into Stead's (2006) Northern Group. The decorative elements of both the swords and their sheaths are truly exceptional, although the iron was in poor condition and the blades could not be extracted from their sheaths for analysis. The sword handles were remarkably well preserved and made from a variety of organic materials including elephant and whale ivory (Illus. 22a; O'Connor 2010). Although the elephant ivory was traded from some distance, the whale bone, probably from the teeth of a sperm whale, could have been obtained from an animal beached on the Humber foreshore or North Sea coast. Horn, antler and glass were also used in the decoration of the scabbards (Marchant and Halkon 2008; Powell et al. forthcoming).

CONCLUSIONS

As we have seen, the results of experimental archaeology have demonstrated the considerable length of time taken to produce a single kilogram of bar iron. At Crew's lowest estimate, the iron needed for a chariot would have involved around 288 person days. If time spent in labour can be used as a measure of value, the quantity of iron in chariot burials marks those interred as being of high status. It is surely significant that the two major square barrow cemeteries of east Yorkshire which contain the most chariot burials lie at the head of natural routeways leading down to iron producing river valleys. Control of raw materials and production by the largest consumers of iron is therefore a distinct possibility. The 12.5m long Hasholme logboat (Millett and McGrail 1997), which is contemporary with both the Arras Culture and Foulness Valley iron industry, may have played a part in this relationship and embellished with decorative elements may have been considered as much an item denoting the status of its owner, as a trading vessel.

One of the strangest features of several of the burials from the region is the inclusion of iron spearheads which were apparently thrown into the graves during interment. Chariot Burial 1 at Wetwang Slack contained seven spearheads, Rudston Burial R174, a male with a sword, contained nine and Grave GS10 at Garton Station which also included a sword, contained fourteen spearheads (Stead 1991). Deposited as much as a century or more later, the South Cave weapons cache included a bundle of thirty-three spearheads. Although place-name evidence from the ancient world must be treated with care and is often disregarded by archaeologists, is it a coincidence that the east Yorkshire region contains the place name *Delgovicia*, listed in the Antonine Itinerary, which is thought to derive from *delgo* meaning a thorn, or spear (Isaacs 2004), hence 'the town or settlement of the spear fighters' (Jackson 1948, 57). An old Welsh word for spear is *par* (Pughe 1832, 396) and the tribal name of the region, *Parisi* has been interpreted as 'the spear people' (Falileyev 2007, 164). The number of Iron Age burials in east Yorkshire is much larger than any other region in Britain which distorts statistical analysis. Nevertheless, over twice as many iron spears have been found in the burials of this region than in the rest of Iron Age Britain.

Rather than being peripheral to the study of Iron Age Britain, it may be concluded that the study of iron can provide important insights into life and death in the Iron Age. Expertise in the manufacture and working of iron enabled the production of

better tools and more effective weapons. Iron axes facilitated the clearance of woodland and its management, and iron plough shares enabled the cultivation of heavier soils. At death certain people were marked out by the inclusion of weapons in their graves and the swords which accompanied burials at Wetwang and Kirkburn are amongst the finest in Europe. The throwing of spears into graves during burial is unique to this region and may even have contributed to the naming of the tribe. It is tempting to see the five swords and thirty-three spears from South Cave as belonging to groups of warriors and the fine craftsmanship displayed in the sheaths, especially, demonstrates the continuation of expertise in metal working in east Yorkshire into the Roman period. The weapons themselves appear to emphasize the importance of warfare in Iron Age society. Another feature of the Iron Age graves of east Yorkshire is that they contain large numbers of iron brooches, apparently preferred to copper alloy. An iron fastener from the burial of a woman with a chariot at Wetwang was decorated with gold and coral, and there are elaborate iron brooches from Dane's Graves and Arras decorated with coral. In the modern era iron is regarded as a cheap disposable material; in the Iron Age it was a commodity considered worthy of such embellishment.

The quantity of iron objects and the presence of major iron production centres make east Yorkshire an ideal laboratory for further research. Much more scientific analysis is needed linking ores, slag and objects. The possible relationship between iron technology on both sides of the English Channel and North Sea is also worthy of further investigation. The detailed exploration already undertaken demonstrates the importance of taking a holistic approach to understanding the production and consumption of iron within the landscape and in its role in Iron Age society.

ACKNOWLEDGEMENTS

I would like to thank the Royal Archaeological Institute for funding the analysis and illustration of the Gransmoor Currency Bar through the Tony Clark Memorial fund, David Starley for its analysis and Peter Makey for its loan and allowing its publication. Helen Woodhouse and John Marshall produced maps and drawings for which I am most grateful. Peter and Susan Crew inspired and encouraged this research and Peter Crew commented on the currency bar and improved an early draft of this paper. Thanks are due to Martin Millett, my collaborator in the Foulness Valley project and Phil Clogg who did the analysis on the slag from Moore's Farm. I would particularly like to acknowledge Matthew Walker, formerly of the History Department, Hull University, for allowing me to use the results of his dissertation and for his assistance. Greta Anthoons, John Dent, Jane Cowgill, Richard Campbell, Richard Coates, Gerry McDonnell, Rod Mackey, Ken Steadman and Fiona Wilson kindly allowed me to use information from their research and excavations prior to full publication. Terry Manby negotiated the use of Tony Pacitto's unpublished photographs. I am grateful to the farmers and landowners involved for allowing access and showing such enthusiasm, and all those who took part in fieldwork. Andrew Fitzpatrick kindly sent me his article on Iron Age burials prior to publication. Ian Stead and Jody Joy of the British Museum supplied the information and photographs of Rudston Burial 154. I am most grateful to Paula Gentil at the Hull and East Riding Museum, David Marchant of the East Riding of Yorkshire Museums service, Beverley and Andrew Morrison from the Yorkshire Museum, York, for all their help. I am most grateful to Dr Gerry McDonnell for reading this article and making helpful suggestions.

BIBLIOGRAPHY

ANTHOONS, G. 2007. The origins of the Arras Culture: migration or elite networks? in R. Karl and J. Leskovar (eds) *Interpretierte Eisenzeiten, 2, Fallstudien, Methoden, Theorie*, 141–151, Tagungsbeiträge der 2. Linzer Gespräche zur interpretativen Eisenzeitarchäologie, Studien zur Kulturgeschichte von Oberösterreich, Folge, **19**, Linz: Oberösterreichisches Landesmuseum

BOYLE, A., EVANS, T., O'CONNOR, S., SPENCE, A. AND BRENNAND, M. 2007. Site D (Ferry Fryston) in the Iron Age and Romano-British period, in F. Brown, C. Howard-Davis, M. Brennand, A. Boyle, T. Evans, S. O'Connor, A. Spence, R. Heawood and A. Lupton, *The Archaeology of the A1 (M) Darrington to Dishforth DBFO Road Scheme*, 121–59, Lancaster: Lancaster Imprints, **12**

BREWSTER, T. C. M. 1963. *The Excavation of Staple Howe*, Scarborough: East Riding Archaeol. Res. Trust

BREWSTER, T. C. M. 1980. *The Excavation of Garton and Wetwang Slacks*, Malton: Prehistoric Excavation Reports, **2** (unpublished in paper form but published as microfiche by Royal Commission on Historical Monuments for England)

BRYANT, S. 2007. Central places or special places? The origins and development of *oppida* in Hertfordshire, in C. Haselgrove and T. Moore, *The Later Iron Age in Britain and Beyond*, 62–80, Oxford: Oxbow Books

CABBOI, L. AND DUNIKOWSKI, C. 2004. Les systèmes de production sidérurgiques chez les Celtes au nord de La France, *Pre-Actes XXVIIIe colloque international AFEAF*, Toulouse

CABBOI, S., DUNIKOWSKI, C., LEROY, M. AND MERLUZZO, P. 2007. Les systèmes de production sidérurgique chez les Celtes du Nord de la France, in Milcent 2007, 35–62

CAMPBELL, R. 2007. *A Possible Romano-British Glass Bangle Production Site at Thearne, East Yorkshire*, unpublished BA Dissertation, Hull University

CAMPBELL, R. 2008. Manufacturing evidence of Romano-British glass bangles from Thearne, near Beverley, East Yorkshire, *Yorkshire Archaeol. Soc., Roman Antiq. Sect. Bull.*, **24**, 12–17

CHALLIS, A. J. AND HARDING, D. W. 1975. *Later Prehistory from the Trent to the Tyne*, Oxford: Brit. Archaeol. Rep. Brit. Ser., **20**

CLOGG, P. 1999. The Welham Bridge slag, in P. Halkon and M. Millett, *Rural Settlement and Industry: Studies in the Iron Age and Roman Archaeology of Lowland East Yorkshire*, 81–94, Leeds: Yorkshire Archaeol. Rep., **4**

COATES, R. J. 2010. *Archaeological and Environmental Evidence of Human Utilisation and Landscape Change in the River Hull Valley*, unpublished MA Dissertation, University of Hull

COLES, A. 2010. *Palaeogeographical and Relative Sea-level Changes at Hotham Carrs, East Yorkshire: Reconstruction of a Holocene Landscape in the Inner Humber Estuary*, unpublished BSc Dissertation, Department of Geography, University of Durham

COLES, F. 1899. Antiquarian notes on various sites in the neighbourhood of Edinburgh, *Proc. Soc. Antiq. Scotland*, **33**, 330–35

COLLARD, M., DARVILL, T. AND WATTS, M. 2006. Ironworking in the Bronze Age? Evidence from a 10th century BC settlement at Hartshill Copse, Upper Bucklebury, West Berkshire, *Proc. Prehist. Soc.*, **72**, 367–421

CONGREVE, A. L. 1938. *A Roman and Saxon site at Elmswell, East Yorkshire*, Hull: Hull Museums Publ., **198**

CORDER, P. 1940. *Excavations at Elmswell, East Yorkshire 1938*, Hull: Hull Mus. Publ., **207**

COWGILL, J., GODFREY, E. AND MCDONNELL, G. 2003. *Evidence for iron production — the slags from TSEP site 238 (incorporating comments on TSEP sites 222 and 908)* — unpublished report.

CREW, P. 1991. The experimental production of prehistoric bar iron, *J. Historical Metallurgy Soc.*, **25 (1)**, 21–36

CREW, P. 1994. Currency bars in Britain, typology and function, in M. Mangin (ed.) *La sidérurgie ancienne de l 'Est de la France dans son context européen*, 345–350, Besançon

CREW, P., forthcoming, Twenty five years of bloomery experiments: perspectives and prospects, in D. Dungworth and R. Doonan (eds) *Accidental and Experimental Archaeometallurgy. Proceedings of the 2010 Conference*. London: Historical Metallurgy Soc.

CREW, P. AND CREW, S. (eds) 1995. *Iron for Archaeologists, a Review of Recent Work on the Archaeology of Early Ironworking Sites in Europe*, Plas Tan y Bwlch Occas. Pap., **2**

CREW, P. AND CREW, S. 1997. *Early Ironworking in Europe, Archaeology and Experiment* (abstracts), Plas Tan y Bwlch, Occas. Pap., **3**

CUNLIFFE, B. W. 2003. *Danebury Hillfort*, Stroud: Tempus.

CUNLIFFE, B. W. 2005. *Iron Age Communities in Britain*, London: Routledge (fourth edn)

DENT, J. S. 1989. Settlements at North Cave and Brantingham, in P. Halkon (ed.) *New Light on the Parisi. Recent Discoveries in Iron Age and Roman East Yorkshire*, 26–32, Hull: East Riding Archaeol. Soc. and University of Hull

DENT, J. S. 1995. *Aspects of Iron Age Settlement in East Yorkshire*, unpublished PhD Thesis, University of Sheffield

DENT, J. S. 2010. *The Iron Age in East Yorkshire*, Oxford: Brit. Archaeol. Rep. Brit. Ser., **508**

DIDSBURY, P. 1990. Exploitation of the alluvium of the lower Hull valley in the Roman period, in Ellis and Crowther 1990, 199–210

EHRENREICH, R. M. 1994. Ironworking in Iron Age Wessex, in A. P. Fitzpatrick and E. L. Morris (eds) *The Iron Age in Wessex: Recent Work*, 16–18, Salisbury: Trust for Wessex Archaeology

EKWALL, E. 1960. *The Concise Oxford Dictionary of English Place-names*, Oxford: Oxford University Press (fourth edn)

ELLIS, S. 1996. Physiography, in S. Neave and S. Ellis, *An Historical Atlas of East Yorkshire*, 2–3, Hull: University of Hull Press

ELLIS, S. AND CROWTHER, D. R. (eds) 1990. *Humber Perspectives: a Region Through the Ages*, Hull: Hull University Press

EVANS, D. 2006. Celtic art revealed. The South Cave weapons hoard, *Current Archaeol.*, **203**, 572–77

FALILEYEV, A. 2007. *Dictionary of Continental Celtic Place-Names*, Aberystwyth: Aberystwyth University

FELL, V. 1991. Tools, in Stead 1991, 79–80

GILES, M. 2007. Making metal and forging relations: ironworking in the British Iron Age, *Oxford J. Archaeol.*, **26**, 395–413

HALKON, P. 1997a. Fieldwork on early iron working sites in East Yorkshire, *J. Historical Metallurgy*, **31(1)**, 12–16

HALKON, P. 1997b. A log boat from South Carr Farm, Newport, in D. H. Evans (ed.) An East Riding Miscellany, *East Riding Archaeol.*, **9**, 7–10

HALKON, P. 2003. Researching an ancient landscape: the Foulness Valley, East Yorkshire, in Manby et al. 2003, 261–74

HALKON, P. 2006. *Archaeology and Environment in a Changing East Yorkshire Landscape: The Foulness Valley c. 800 BC to c. AD 400*, unpublished PhD Thesis, University of Hull

HALKON, P. 2007. Valley of the first iron masters, recent research on Iron Age iron production and its significance in the Foulness Valley, East Yorkshire UK, in Milcent 2007, 151–163

HALKON, P. 2008. *Archaeology and Environment in a Changing East Yorkshire Landscape: The Foulness valley c. 800 BC to c. AD 400*, Oxford: Brit. Archaeol. Rep. Brit. Ser., **472**

HALKON, P. AND MILLETT, M. 1999. *Rural Settlement and Industry: Studies in the Iron Age and Roman Archaeology of Lowland East Yorkshire*. Leeds: Yorkshire Archaeol. Rep., **4**

HALKON, P., MILLETT, M., EASTHAUGH, E., TAYLOR, J. AND FREEMAN, P. 2000. *The Landscape Archaeology of Hayton*, Hull: University of Hull

HALKON, P. AND INNES, J. 2005. Settlement and economy in a changing prehistoric lowland landscape — an East Yorkshire (UK) case study, *European J. Archaeol.*, **8 (3)**, 226–59

HALKON, P., INNES, J., LONG, A., SHENNAN, I., MANBY, T., GAUNT, G., HEATH A., WAGNER, P., SCHOFIELD, J., SCHREVE, D. AND ROE, D. 2009. Change and continuity within the prehistoric landscape of the Foulness Valley, East Yorkshire, *East Riding Archaeol.*, **12**, 1–66

HALKON, P. AND SERNEELS, V. 2010. *Iron and Change in Europe — the First 2000 Years*, Scientific Report European Science Foundation Exploratory Workshop, London, UK, 26–28 March 2010, Strasbourg: Standing Committee for the Humanities, European Science Foundation

HART, C. R. 1975. *The Early Charters of Northern England and the North Midlands*, Leicester: Leicester University Press

HASELGROVE, C., ARMIT, I. AND CHAMPION, T. 2001. *Understanding the British Iron Age: an Agenda for Action*, Salisbury: Prehistoric Society / Wessex Archaeology

HASELGROVE, C. AND POPE, R. (eds) 2007. *The Earlier Iron Age in Britain and the Near Continent*, Oxford: Oxbow Books

HEATH, A. AND WAGNER, P. 2009. Coleopteran evidence from the Foulness valley, in P. Halkon et al. Change and continuity within the prehistoric landscape of the Foulness valley, East Yorkshire, *East Riding Archaeol.*, **12**, 36–38.

HICKS, J. D. AND WILSON, J. 1975. *The Romano-British Kilns at Hasholme*, East Riding Archaeol., **2**, 49–70

HILL, J. D. 2002. Wetwang chariot burial, *Current Archaeol.*, **178**, 410–12

HINGLEY, R. 1990. Iron Age 'currency bars'; the archaeological and social context, *Archaeol. J.*, **147**, 91–117

ISAAC, G. R. 2004. *Place-Names in Ptolemy's Geography*. Aberystwyth: Aberystwyth University, CMCS Publications, CD-ROM

JACKSON, K. 1948. On some Romano-British place-names, *J. Roman Stud.*, **38**, 54–58

KEEN, G. I. 1955. Carrot growing in the East Riding of Yorkshire, *Agriculture* **6 (2)**, 82–86

LONG, A. J., INNES, J. B., KIRBY, J. R, LLOYD, J. M., RUTHERFORD, M. M., SHENNAN, I. AND TOOLEY, M. J. 1998. Holocene sea-level change and coastal evolution in the Humber estuary, eastern England: an assessment of rapid coastal change, *The Holocene*, **8**, 229–47

MANBY, T. G., KING, A. AND VYNER, B. E. 2003. The Neolithic and Bronze Ages: a time of early agriculture, in Manby et al. 2003, 35–116

MANBY, T. G., MOORHOUSE, S. AND OTTAWAY, P. 2003. *The Archaeology of Yorkshire: an Assessment at the Beginning of the 21st Century*, Leeds: Yorkshire Archaeol. Soc. Occas. Pap., **3**

MARCHANT, D. AND HALKON P. 2008. *Heavy Metal in the Iron Age: the South Cave Weapons Cache and Other Treasures*, Beverley: East Riding of Yorkshire Council

MCGRAIL, S. 1990. Early boats of the Humber basin, in Ellis and Crowther 1990, 109–113

METCALFE, S. E., ELLIS, S., HORTON, B. P., INNES, J. B., MCARTHUR, J., MITLEHNER, A., PARKES, A., PETHICK, J. S, REES, J., RIDGWAY, J., RUTHERFORD M. M., SHENNAN, I. AND TOOLEY M. J. 2000. The Holocene evolution of the Humber Estuary: reconstructing change in a dynamic environment, in I. Shennan and J. E. Andrews (eds) *Holocene Land-ocean Interaction and Environmental Change around the North Sea*, 97–118, London: Geological Society

MILCENT, P-Y. 2007. (ed.) *L'économie du fer protohistorique: de la production à la consommation du métal.* Actes colloque AFEAF (Association Française pour l'Etude de l'Age du Fer), Toulouse: Aquitania Supplement, **14/2**

MILLETT, M. AND MCGRAIL, S. 1987. The Archaeology of the Hasholme logboat, *Archaeol. J.*, **144**, 69–155

MORTIMER, C. 2005 The slag, in G. Dean, *A614 Welham Bridge to Spaldington. Assessment Report on an Archaeological Watching Brief and Excavation*, York: York Archaeological Trust

MORTIMER, J. R. 1905. *Forty Years Researches in the British and Saxon Burial Mounds of East Yorkshire*, London: Brown

NEEDHAM, S. 2007. The great divide, in Haselgrove and Pope 2007, 204–228

O'CONNOR, B. 2007. Llyn Fawr metalwork in Britain: a review, in Haselgrove and Pope 2007, 64–79

O'CONNOR, S. 2010. Exotic materials used in the construction of Iron Age sword handles from South Cave, UK , in BoneCommons, Item #1424, http://www.alexandriaarchive.org/bonecommons/items/show/1424

PLEINER, R. 2000. *Iron in Archaeology, the European Bloomery Smelters*, Prague: Archeologický Ústav Av Cr

POWELL, N., NORTHOVER, P., O'CONNOR, S., CAMERON, E. AND DOHERTY, A. forthcoming. A hoard of Iron Age weapons from South Cave, Yorkshire, *Britannia*

PUGHE, W. O. 1832. *A Dictionary of the Welsh Language. . . to which is prefixed a Welsh Grammar*, Denbigh: Thomas Gee

RACKHAM, O. 1980. *Ancient Woodland in History, Vegetation and Uses in England*, London: Edward Arnold.

SERNEELS, V. 2007. Remarque conclusive. L'économie du fer protohistorique (VIIIe- 1e s.a.C). De la production a la consommation du metal 2007, in Milcent 2007, 425–34

SMITH, R. A. 1927. Pre-Roman remains at Scarborough, *Archaeologia*, **77**, 179–200

SMYTHE, J. A. 1938. Note on the Elmswell slag, in A. L. Congreve, *A Roman and Saxon Site at Elmswell, East Yorkshire*, 1937, Hull Museums Publ., **198**, 15–19

STARLEY, D. 2009. *The Metallographic Analysis of an Iron Age Currency Bar from Gransmoor, East Yorkshire*, Archaeometallurgy Report 07/09

STEAD, I. M. 1968. An Iron Age hillfort at Grimthorpe, Yorkshire, *Proc. Prehist. Soc.*, **34**, 148–90

STEAD, I. M. 1975. The La Tène cemetery at Scorborough, East Riding, *East Riding Archaeol.*, **2**, 1–11

STEAD, I. M. 1979. *The Arras Culture*, York: Yorkshire Phil. Soc.

STEAD, I. M. 1990. Whitcombe Burial 9: the grave goods, in G. M. Aitken and G. N. Aitken, Excavations at Whitcombe, 1965–1967, *Proc. Dorset Natur. Hist. Archaeol. Soc.*, **112**, 75

STEAD, I. M. 1991. *Iron Age Cemeteries in East Yorkshire*, London: English Heritage

STEAD, I. M. 2006. *British Iron Age Swords and Scabbards*, London: British Museum Press

STEAD, I. M., FLOUEST, J-L., AND RIGBY, V. 2006. *Iron Age and Roman Burials in Champagne*, Oxford: Oxbow Books

STEVENSON, J. AND JOHNSON, C. 2004. Brisley Farm: the last Iron Age warriors of Kent, *Current Archaeol.*, **191**, 490–94

STOERTZ, C. 1997. *Ancient Landscapes of the Yorkshire Wolds*, London: RCHME

TURNER, J. 1987. The pollen analysis, in Millett and McGrail 1987, 85–88

TYLECOTE, R. F. 1987. *The Early History of Metallurgy in Europe*, London: Longman

VAN DE NOORT, R. AND ELLIS, S. 1995. *Wetland Heritage of Holderness: an Archaeological Survey*, Hull: University of Hull

VAN DE NOORT, R., MIDDLETON, R., FOXON, A. AND BAYLISS, A. 1999. The Kilnsea Boat and some implications from the discovery of England's oldest plank boat remains, *Antiquity*, **73**, 131–35

VAN DE NOORT, R. AND ELLIS, S. (eds) 2000. *Wetland Heritage of the Hull Valley*, Hull: University of Hull

VERGER, S. 1994, Les tombes à char de La Tène ancienne en Champagne et les rites funéraires aristocratiques en Gaule de l'est au Ve siècle avant J.-C. Doctoral thesis, University of Dijon

WAINWRIGHT, G. J. 1979. *Gussage All Saints. An Iron Age Settlement in Dorset*, London: HMSO

WALKER, M. 2007. *A Study of Iron Objects in the Burials of the Arras Culture, East Yorkshire*, unpublished BA Dissertation, University of Hull

WHIMSTER, R. 1981. *Burial Practices in Iron Age Britain*, Oxford: Brit. Archaeol. Rep. Brit. Ser., **90**

WILSON, F., WILSON I., MYERS, G. AND MACKEY, R. 2006. Excavations at Chapel Garth, Arram, *Yorkshire Archaeol. Soc. Prehist. Res. Sect. Bull.*, **43**, 44–45

WRIGHT, E. V., HEDGES, R. E. M., BAYLISS, A., AND VAN DE NOORT, R. 2001. New AMS radiocarbon dates for the North Ferriby Boats — a contribution to dating prehistoric seafaring in north-western Europe, *Antiquity*, **75**, 726–34

YOUNG, T. P. 2003. Is the Irish iron-smelting bowl furnace a myth? A discussion of new evidence for Irish bloomery iron making, *GeoArch Report 2003/09*, Caerphilly

---

Peter Halkon, Department of History, University of Hull, HU6 7RX
Email: A.P.Halkon@hull.ac.uk