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STONEHENGE, WILTSHIRE
STONEHENGE WORLD HERITAGE SITE SYNTHESIS: PREHISTORIC LANDSCAPE, ENVIRONMENT AND ECONOMY

Edited by Matthew Canti, Gill Campbell and Susan Greaney

INTERVENTION
AND ANALYSIS

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Stonehenge, Wiltshire

Stonehenge World Heritage Site Synthesis: Prehistoric Landscape, Environment and Economy

Edited by Matthew Canti, Gill Campbell and Susan Greaney

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SUMMARY

This report is a synthesis of the archaeological evidence for the environment and economy of the prehistoric period in the Stonehenge landscape. It draws together existing information and analyses from a variety of specialist areas of archaeology and science. The synthesis has been produced in order to inform the interpretation content of the new visitor centre at Stonehenge, feeding particularly into reconstructions and graphics depicting the area around Stonehenge in different time periods.

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Chapter 1. Introduction

Susan Greaney and Gill Campbell

Summary

This report is a synthesis of the archaeological evidence for the environment and economy of the prehistoric period in the Stonehenge landscape. It draws together existing information and analyses from a variety of specialist areas of archaeology and heritage science. The synthesis has been produced in order to inform the interpretation content of the new visitor centre at Stonehenge, and will feed particularly into reconstructions and graphics depicting the area around Stonehenge in different time periods.

Introduction

English Heritage is planning a new visitor centre for Stonehenge as part of the Stonehenge Environmental Improvements Project. The centre will contain a high-quality and full accessible interactive exhibition and introduction to Stonehenge within the context of its prehistoric landscape. Innovative displays will engage and inspire visitors, whilst equipping them to explore Stonehenge and its landscape in completely new ways. The visitor centre will act as the gateway to the World Heritage Site and an intellectual gateway to Britain's distant past (see Carver 2010 and 2011 for more details).

In order to produce high quality information for our visitors, the interpretation needs to be based on the latest available archaeological information. No recent synthesis of archaeological information about the Stonehenge landscape, environment and economy has been attempted. The most comprehensive summaries appear in the volume on 20th century excavations at Stonehenge (Allen 1995a-f) and more recently other studies have been published on specific aspects (eg Allen 1997a; Cleal *et al* 2004). Darvill also provides a brief summary of the changing environment in the Stonehenge WHS (2005, 96-7).

A wide range of archaeological specialists have contributed to this report, each bringing their own expertise to bear on the research questions posed in the project design. Each has been asked to contribute a chapter summarising the evidence of their specialism, presented in relation to the chronological periods given below. The exception to this is the geology and natural landforms chapter, which is not divided by period. There are inevitably several areas of overlap between the different chapters; where possible these are cross-referenced.

With any synthesis of this scope and size, it is difficult to know where to draw the boundaries. Some have inevitably been set by the deadlines for this project, in order for it to feed into the development of the visitor centre exhibition. Chronological and geographic parameters are set out below, but it will be noted that some areas of prehistoric life are covered in more detail than others. The general steer has been the information required by the interpretation team for the visitor centre project, particularly to inform large-scale reconstructions of the landscape. Full references and comprehensive bibliographies indicate sources of further information.

Phase	Date (all approx.)	Period	Environment/ land use and lifestyle	Lifestyle	Technology	Stonehenge	Stonehenge Landscape	Avebury Landscape
	9500-4000 BC	Mesolithic	Large areas of woodland, some open grassland on upland chalk.	Mobile, seasonal patterns of hunting and gathering.	Flint (microliths, transverse arrowheads) and wooden tools, no pottery.	Car park post holes	Occupation camp sites and flint scatters	Flint scatters.
Phase 1 – before Stonehenge	4000-3500 BC	Early Neolithic	Continually changing mosaic of woodland and more open areas. Some clearance of woodland.	Animal husbandry begins, possible small-scale cultivation of cereals. Transhumance, largely mobile lifestyle.	Flint tools (e.g. leaf-shaped arrowheads), first pottery - early Neolithic carinated bowls and later Windmill Hill pottery	No definite activity.	Pits (e.g. Coneybury Anomaly). First monuments 3,700 BC[1] - long barrows; oval barrows; causewayed enclosure at Robin Hood's Ball	Long barrows and causewayed enclosure at Windmill Hill.
	3500-3000 BC	Middle Neolithic	Grassy with scrub, wooded river valleys.	Domestic animals, no settlements known but flint scatters suggest occupation areas.	Flint tools, Windmill Hill pottery develops, introduction of Peterborough Ware	No definite activity.	Long barrows continue to be built, mortuary enclosure (Normanton Down), various pits, Greater and Lesser cursus monuments.	Long barrows continue.
Phase 2 – the time of building Stonehenge	3000-2500 BC	Late Neolithic	Grass downland, some scattered woodland. Extensive and maintained/ grazed grassland, still minimal impact from cultivation, largely devoid of trees.	Increasing amounts of cultivation. Domestic animals but wild resources still important. Human remains rare – people are not buried in formal modes.	Flint tools, Peterborough Ware, Grooved Ware pottery begins to be used in Stonehenge area.	Circular bank and ditch constructed, Aubrey Holes dug, probably some wooden structures. Cremation burials.	Pit and pit clusters (e.g. Plaque Pit), henges (e.g. Coneybury Henge)	
	2500-2200 BC	Chalcolithic	Grass downland, some scattered woodland. Extensive and maintained/ grazed grassland, still minimal impact from cultivation, largely devoid of trees.	Occasional evidence for houses but not usual. Major monuments constructed. New modes of individual burial (Beaker burials) arrive from 2400 BC onwards.	Oblique arrowheads, Grooved Ware becomes exclusive. Flint tools (e.g. barbed and tanged arrowheads), stone wrist guards, new Beaker pottery arrives from 2400 BC onwards. First metals – copper and gold, arrive from 2500 BC.	Major stone structures erected c.2500 BC, including double bluestone arc, sarsen circle and horseshoe. Avenue constructed 2300 BC.	Settlement and avenue at Durrington Walls. Timber structures – North and South Circles, Woodhenge, timber structures south of Woodhenge. Construction of henge at West Amesbury and henge at Durrington Walls. Early Beaker burials (e.g. Amesbury Archer).	Henge (Avebury), enclosure (Longstones). Timber and stone circles (e.g. Sanctuary, Avebury stone circle), avenues, Silbury Hill, West Kennet palisade enclosures.
Phase 3 – honouring Stonehenge	2200-1500 BC	Early Bronze Age	Grassland, some shrubs. Grazing, tillage taking place in some areas.	Settlement evidence remains elusive but likely organised pastoral economy and mixed agriculture.	Beakers develop further. Development of bronze as the principal metal. Pottery disappears from domestic contexts, but get miniature vessels Collared urns and Food Vessels in funerary contexts.	Bluestones now re-arranged into circle and oval. Y and Z holes, carvings of daggers on the stones.	Round barrows in great numbers, Beaker burials continue, richly furnished 'Wessex Culture' graves (Wessex I) appear from c.2000 BC.	Round barrows also cluster around Avebury but not as dense as around Stonehenge.
	1500-1150 BC	Middle Bronze Age	Blocks of co-axial fields laid out. Established field systems although permanent settlement not always clear.	No ceremonial monuments, move away from ostentatious burials. Non funerary deposition.	Flint tools found much less frequently, metal dominates. New pottery (e.g. Deverel Rimbury wares).	No construction activity.	Settlement activity (e.g. Palisade Field). Field systems (e.g. near Fargo Plantation).	Settlement activity (e.g. Dean Bottom) Field systems (e.g. Overton Down.)

[1] **The date of 3700 BC is taken as the start of the World Heritage Site chronological period of significance, which continues until 1600 BC.**

Fig 1.1 Timeline showing the major prehistoric environmental and cultural changes in the Stonehenge area

Further research will be undertaken by the visitor centre team to answer any further more specific questions.

Chronological and geographic parameters

As an interpretive device to enable visitors to understand the broad chronology of the Stonehenge landscape and the monuments visible today, a timeline has been developed (Fig 1.1). This divides the prehistoric period into three key phases:

Phase 1 - 4000-3000 BC, Early Neolithic, before Stonehenge
Phase 2 – 3000-2200 BC, Late Neolithic/Chalcolithic, the time of Stonehenge
Phase 3 – 2200-1500 BC, Early Bronze Age, honouring Stonehenge

The broad chronology will be delivered through a large wall-mounted 'landscape interactive' which will enable visitors to view the landscape in different time periods and at different scales. Graphics (reconstruction drawings, audio-visual or CGI based computer models) will bring the story of Stonehenge alive by illustrating the lives of people who lived during our three phases in the Stonehenge landscape. Specifically the information in this report will inform aerial reconstructions of the landscape and also smaller vignettes of 'everyday life' for the three phases.

In order to set these three chronological phases in context, it has been necessary to contrast them with the appearance of the landscape and the activities of people from both *before* our main period of focus (ie in the Mesolithic) and *afterwards* (ie in the Middle Bronze Age). Likewise, although the geographic parameters of the interpretation are broadly the boundaries of the Stonehenge World Heritage Site (Fig 1.2), analogies and information drawn from across Wessex, southern England and even Britain have been used where necessary. For example whereas the molluscan evidence for the Stonehenge WHS is fairly comprehensive there is a considerable dearth of pollen and other plant evidence from within the WHS meaning data from Wiltshire has been brought into play.

Method of collating synthesis

No new research has been conducted for the chapters in this report. Instead it is a synthesis of existing knowledge, drawing on published work and reports. Where possible, aspects of current or recent projects that have not yet been published have been included. For this we thank in particular the specialists involved in the Stonehenge Riverside Project for information about their preliminary findings.

The task to collate a report detailing various aspects of the Stonehenge landscape, environment and economy, was divided up into areas of archaeological specialism and distributed amongst the relevant experts. Where possible, this project has drawn on in-house English Heritage expertise, recognised internationally as experts in archaeological science. Where external advice or expertise was necessary, other specialists were asked to provide sections of the report. For this we extend our thanks to Dr Mike Allen, Dr Alison Sheridan, Dr Richard Brunning, Dr Hugo Anderson Whymark and Dr Glyn Davies; also to those who contributed additional advice; Dr Julian Murton for geology advice; Lorrain Higbee for access to unpublished and data for Boscombe Down; Ellen Simmons for information relating to recent work at Durrington Walls; also Roy Entwistle for information on molluscs; and Daryl Garton for advice on settlement.

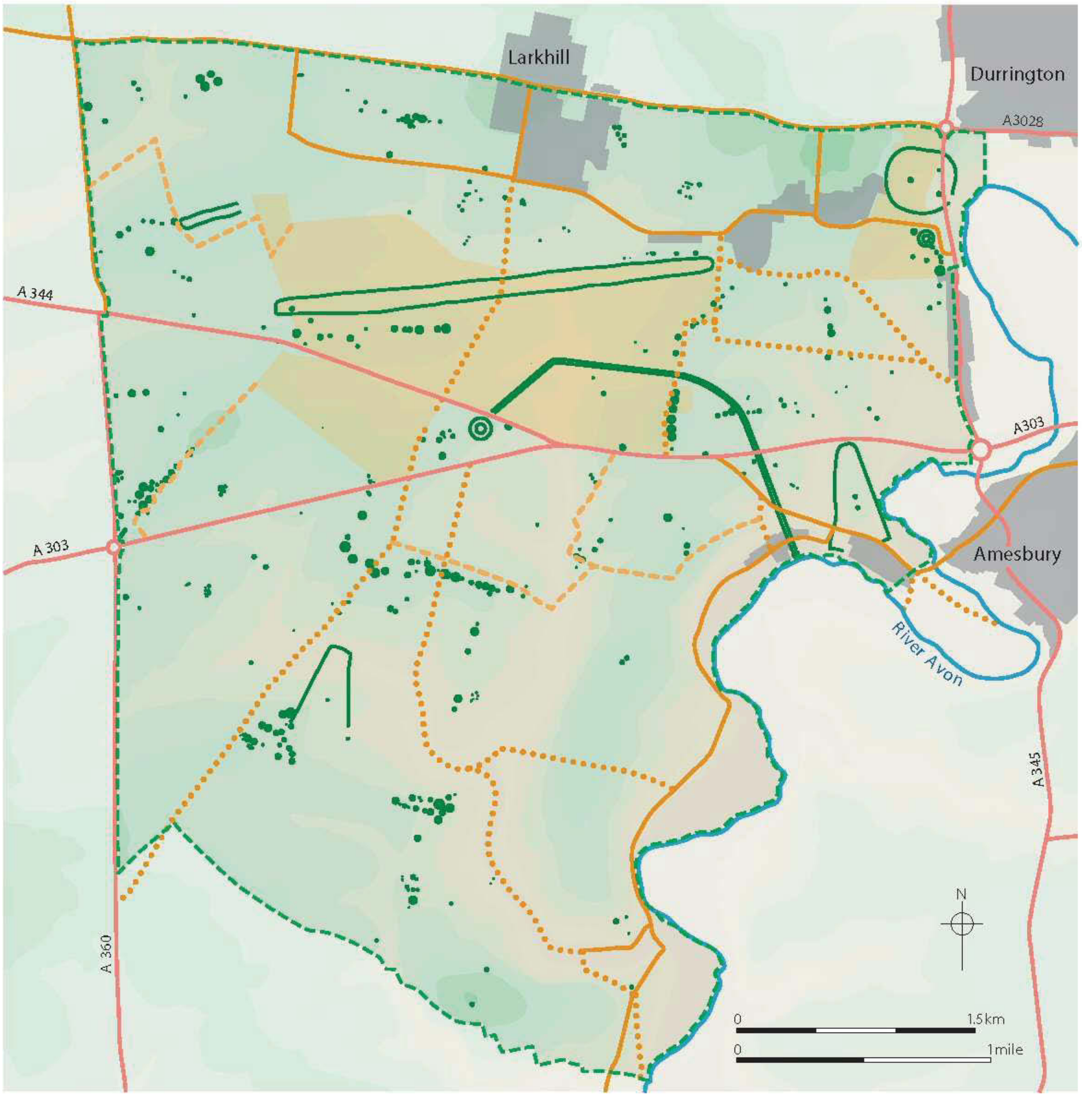

Fig 1.2 Stonehenge World Heritage site map

In order to maintain focus, the synthesis only covers information that could be used to create overall aerial reconstructions of the landscape and also smaller vignettes of 'everyday life' for our three phases for the landscape interactive. Some of the areas of research encompass very large subjects and matters of great debate; we have tried to keep each chapter as concise as possible, with clear references to further information.

Figures 10.4, 10.6, 10.7, 10.9a, 10.10a, 10.11, 11.20 and 12.2 are reproduced by permission of the Trustees of National Museums Scotland.

Chapter 2. Geology, Landscape and Soils

Matthew Canti

1. Solid geology and drift

Stonehenge sits on a gently undulating surface of Upper Chalk. The immediate area around the monument is drift-free (British Geological Survey (BGS) maps 282 and 298, see Fig 2.1), but cappings of Clay-with-flints are mapped on top of the chalk *c* 5 miles to the north on Urchfont Down, and *c* 2 miles to the south on the hills above Wilsford, Durnford and the Woodfords. These map units are only delineated where 1m or more of the drift is present, so they will inevitably have uncertain edges where the thinner periphery of the deposits have not been included. Shallower patches often go unrecorded on BGS maps, such as the Clay-with-flints found near Fargo Wood and Durrington Down by Richards (1990, 6). This is a widespread phenomenon on the chalk, and similar unmapped patches occur in the vicinity of Silbury Hill (Canti 2011).

The river valleys (Till and Avon) contain Valley Gravel consisting of broken flints, chalk, flint pebbles, sarsen fragments and alluvium (Reid 1903; Jukes-Browne 1905). Valley Gravel also extends up the two spurs (east and west) of Stonehenge Bottom dry valley.

Periglacial weathering would have been the major erosive agent acting on this chalk surface throughout the glacial periods. It produced the gently rolling landforms we see today by freeze/thaw action on the easily denuded chalk slopes (see Murton 1996; Murton *et al* 2003), and the concomitant build up of head (or coombe rock) deposits in the dry valleys (Ballantyne and Harris 1994). It is only during the final frozen stages that the topographic lows such as Stonehenge Bottom could have held any water, and this would have rapidly disappeared once warming rendered the chalk fully porous again. The Till and Avon rivers that border the Stonehenge area to the east and west would be established in their valleys by this stage. Also during the late Devensian, loess deposition probably mantled many areas with 30cm or more of silty material (Catt 1978; 1984) but this was then either eroded or worked into the upper subsoils so that it nowhere exists today as a separate horizon.

The resulting surface on which the modern soils developed would therefore have consisted mostly of chalky head variably mixed with loess in the topographic lows, and bare chalk, frost shattered chalk or chalky head on the higher ground, with patchy areas of Clay-with-flints and occasional thin loess deposits.

2. Landscape Development through Time

2.1 The periglacial landscape

The Stonehenge landscape at the end of the last glacial maximum would have been free of an ice-sheet as such, but strongly influenced by permafrost conditions (Ballantyne and Harris 1994). As the climate warmed slightly, erosion resulting from freeze/thaw action would have predominated, producing thicknesses of coombe rock from frost-shattered chalk as was found, for example, in the excavations at Durrington Walls (Evans in

Fig 2.1 Geology around Stonehenge, combined from BGS sheets 282 (Devizes) and 298 (Salisbury). Green is Upper Chalk; note Clay-with-flints (brown) to the south; also Valley Gravel (orange) and Alluvium (yellow) in the river valleys. © British Geological Survey

Wainwright and Longworth 1971, appendix 1) and beside the A344 (Pitts 1982). Although technically a drift material, head is generally not recorded on British Geological Survey maps (Hopson *et al* 2007; Booth *et al* 2010).

The same periglacial conditions also produced a range of phenomena which come under the heading of cryoturbation or frost-heave structures (Fig 2.2), and which are notably well-preserved in chalk subsoils. They generally involve the systematic upward transport of coherent masses of material within the subsoil, producing visible geometric patterns in sections where there was a pre-existing particle size or colour differentiation. On flat ground, the resulting patterns are usually polygonal in plan, while on steepening slopes they tend more and more towards parallel stripes (Evans 1968a; 1968b; Julian Murton pers comm).

Fig 2.2 Periglacial involutions from Harnham, Wiltshire. Photograph from Hopson *et al* 2007. © British Geological Survey

Patterns of these periglacial involutions have regularly been found during archaeological work on Salisbury Plain. They occurred in the coombe rock underlying the excavations at Stonehenge (Evans 1984), at Durrington Walls (Evans 1968a) and beneath Amesbury barrow 39 (Ashbee 1981). Cryoturbation polygons were reported in the A344 excavations by Pitts (1982); some of these showed elongation interpreted as slope-induced. Similar features were also found in the 1988 -1989 car park excavations (see Allen 1995a, 43); and the subsoil under the barrow (Grinsell no. 45) at Greenland Farm, Winterbourne Stoke (Christie1970) contained roughly parallel gullies formed of coarse chalk rubble in a matrix of coombe rock, and referred to as 'brodel structures' by J.G. Evans. Similar sorting has also been found on the chalk in Yorkshire (Ellis 1981).

Considerable interest has arisen from the discovery of parallel ditch and ridge features (Fig 2.3) recorded in Atkinson's 1956 excavation of the Avenue (Cleal *et al* 1995, 309), and relocated by the Stonehenge Riverside excavations in 2008 (Parker Pearson *et al* 2008a). The question of whether these are periglacial features that were visible as parch marks to the Stonehenge builders (Parker Pearson *et al* 2008a), or ruts associated with the previous use of the avenue as a by-way (Chadburn pers comm) remains open but recent results showing their extension northeastwards along a line towards Durrington supports the latter interpretation (Darvill and Leuth, in prep).

Fig 2.3 The parallel ridge features as seen in the 2008 excavations. Aerial photograph by Adam Stanford © Aerial-Cam/SRP 2007

2.2 The Holocene landscape

2.2.1 The river valleys

The river Till, although probably more substantial in the past (McOmish *et al* 2002), is now only a winterbourne north of Shrewton. Auger transects carried out in the mid 2000s (Norcott *et al* 2008) revealed its floodplain to consist of shallow colluvial and alluvial deposits, rarely more than 1m deep and with the alluvium clearly accreting from gentle regular deposition events.

The Avon valley is infilled by sandy gravels, sandy muds and peats with additional solifluction deposits interdigitating from the steeper valley sides. The alluvium generally reaches 4 – 5m thick, with the upper 2 – 3m being composed of fine-grained sandy muds representing overbank deposits that have slowly accreted from flood events. Peat can be found as beds, lenses or fragments within these overbank deposits (Hopson *et al* 2007). Scaife (2004) found typically 1 -1.7m of grey alluvial silts or fen peats on a basal layer of glauconitic sand (probably Greensand-derived) or gravel in an auger transect close to Durrington Walls. Although a date was obtained for the base of this sequence (8280-7200 cal BC (8640±200 BP; GU-3239) see **Chapter 3 – Vegetation History**), the absence of other dates makes any reconstruction of the alluvial history uncertain.

2.2.2 Holocene soil development on the Stonehenge chalk lands

The idea has previously been put forward for the English chalk lands in general, that the relatively shallow rendzina soils we see today are often a remnant of previous deeper soil cover that has been eroded as a result of human activity. Fisher (1991) followed Limbrey (1975) in suggesting that argillic brown earths would once have been more widespread than they are at present, and the ease with which the light loess-rich woodland soils would be eroded on clearance and tillage was emphasised by Allen (1992).

However, subsequent detailed work on Cranborne Chase has led to significant questioning of the validity of this idea based on the widespread discovery of buried thin rendzinas, showing that they represent the predominant soil cover of the last 5000 years on the Dorset chalk; also, where deeper brown earths occur they are nearly always associated with drifts such as Clay-with-flints (French *et al* 2005a).

Those buried soils that have been found in the Stonehenge area appear mostly to confirm this view, but they are not always easily classified due, in some earlier studies, to unstandardised descriptions. The record of the pre-enclosure soil at Robin Hood's Ball, for example, suggests a well-formed grassland soil profile, and is probably a rendzina. The soil under the outer bank was "Dark brown, almost black soil free of flint and chalk, but with a concentration of the latter at its base; lying directly on undisturbed chalk" (Thomas 1964). Similarly, the buried soil beneath Amesbury barrow 39 was a "Black stone-free layer about [6.4cm] in depth which rested upon …dirty angular chalk fragments, the subsoil" (Ashbee 1981). Under Amesbury barrow 51, there was a "Stone-free dark reddish brown layer little more than [6.4cm] in depth which rested upon [16.2cm] of lighter material which contained angular weathered chalk and flint fragments." (Ashbee 1978). Earl's Farm Down buried soil was described as a rendzina by Kerney (in Christie 1967, 365), as were the buried soils at Durrington Walls (Evans in Wainwright and Longworth 1971, Appendix 1; see Fig 2.4) and at Woodhenge (Evans and Jones 1979).

More recently, Entwistle (1990b) described the buried soil under Amesbury 42 long barrow as a typical shallow rendzina, having a sorted horizon and supporting grassland for some time prior to construction. Soils examined underneath the King barrows (Cleal and Allen 1994) were "compacted ….rendzinas of the Icknield series, all of which were largely stone-free."; similar findings were recorded from buried soils under the Wilsford Down North Kite enclosure (Allen 1990) and the bank at Stonehenge itself (Allen 1995a, 60-1).

Exceptions to this rendzina predominance are occasionally found. There appears to have been an argillic brown earth found in a test pit 350m south of Stonehenge during the A303 improvement works (Norcott *et al* 2008). However, the pit was dug into a natural depression which would collect sediment, potentially over a long period of time, so the argillic soil is unlikely to be representative of a previous widespread soil cover. More recently, a truncated argillic brown earth was reported from West Amesbury, surviving under the outer bank of a small hengiform monument (French *et al* 2012).

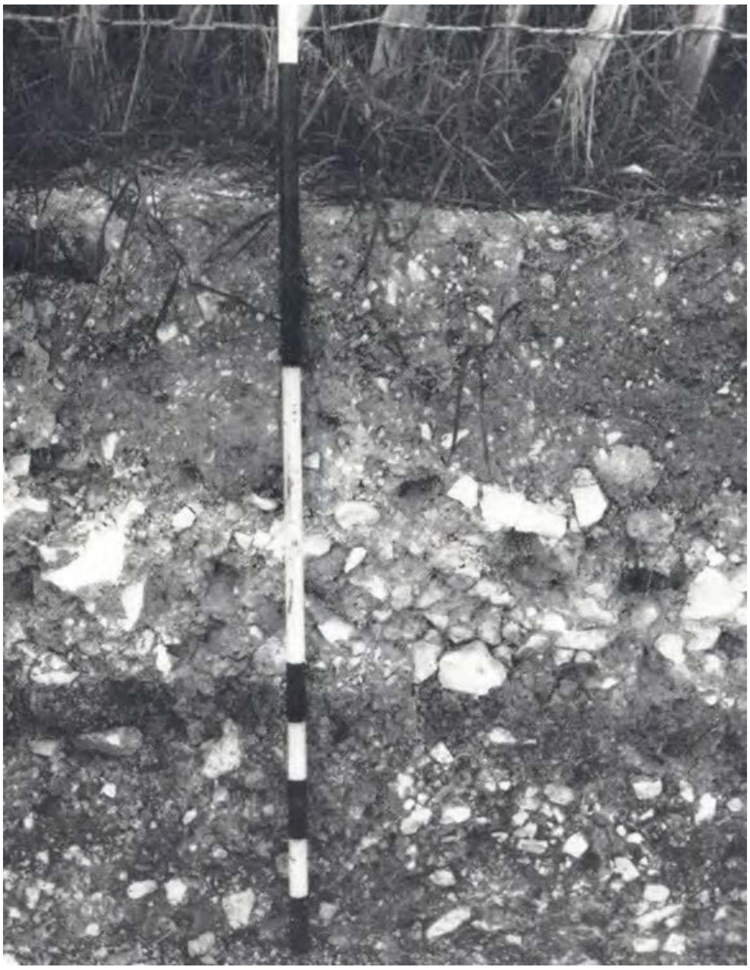

Fig 2.4 The pre-enclosure soil (the dark topsoil layer is *c* 1/3 up from the bottom of the photograph) at Durrington Walls. Photograph from Wainwright and Longworth (1971). © Society of Antiquaries

2.2.3 Colluvium

During the 1980s, Bell (1981; 1982; 1983) demonstrated the potential of colluvial deposits to preserve environmental and economic data from catchments with adjacent settlement. Additional information on southern English deposits has subsequently been produced by Allen (1992) and can be found in recent summaries by Wilkinson (2003; 2009). The success of this approach meant that considerable effort was directed at discovering colluvium in the Stonehenge area during the 1980s. A series of eight excavations in low-lying ground around Stonehenge (Richards 1990, 210-211) and additional auger holes (Richards 1990, tab 113) unfortunately failed to produce any signs of the colluvial build-up that would be expected if significant erosion of the surrounding slopes and tops had occurred in the past. This was thought to indicate either limited superficial material available for erosion, or minimal cultivation of the area in general (Richards 1990, 210-11). However, one small dry valley near Coneybury Hill has a shallow (0.75m) colluvial sequence, and Allen (1997a) pointed out that areas such as Figheldean and Durrington Walls also had considerable depths, probably correlating with localised arable activity.

3. Soils and land-use

3.1 Modern soil cover

The modern soil cover at Stonehenge has not been mapped at a detailed scale, but appears on the 1:250,000 scale (Sheet 5: South West England) as Icknield association humic rendzinas. These are shallow, mostly dark, humic well-drained calcareous soils over chalk on steep slopes and hilltops. The Icknield soils are surrounded by Andover 1 association brown rendzinas, which are less humic and have a brown topsoil. The silty texture and mineralogy of these soils differs significantly from the insoluble residue of the chalk (Cope 1976, appendix 1). From this primary evidence, and through the widespread UK mineralogical and particle size comparisons carried out by Catt (1978; 1984) and Perrin *et al* (1974), it can be confidently assumed that the soils are developed in weathered loess (Cope 1976). Solifluction strongly affected the soil profiles, and the loess tended to be eroded or mixed into chalky head moving downslope.

Upton 1 association grey rendzinas are mapped to the east on the western slope of the Avon valley. These have a greyer topsoil resulting from a lower loessic content than the Icknield and Andover series, but also from subsoil mixing by cultivation (Cope 1976; Findlay *et al* 1984). As well as these classic chalk soils, argillic brown earths have been recorded in small patches on the Clay-with-flints near Fargo Wood and Durrington Down (Richards 1990, 7)

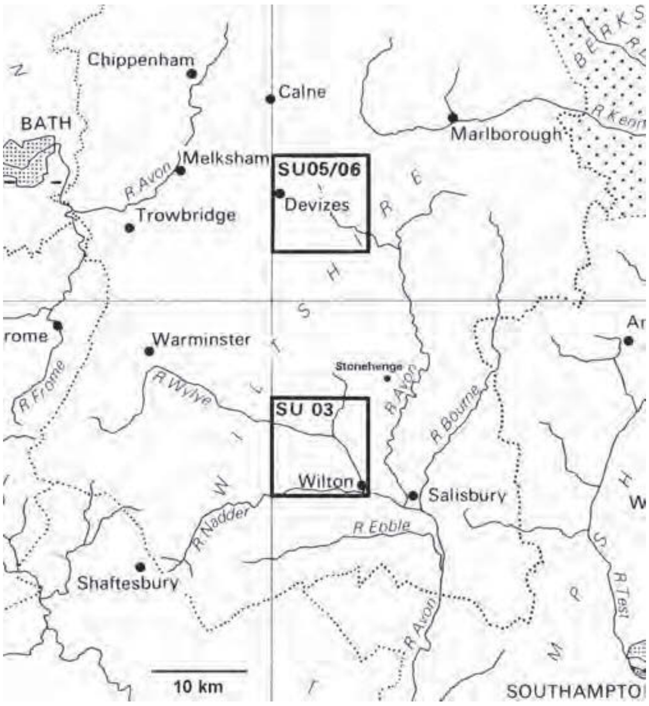

Fig 2.5 Existing detailed soil maps around Stonehenge. Reproduced from National Soil Resources Institute: Findlay (1986). © Cranfield University 2013

Detailed maps have been produced for two nearby 10km squares. One is SU 05N/06S, west of Devizes (Findlay 1986); and the other is SU03, north-west of Wilton (Cope

1976). Stonehenge is located only 2.5km from the north-east corner of this latter map (see Fig 2.5), so useful information can be gained with minimal extrapolation. In particular, the block diagram showing the landscape relations of the chalkland soil types (Fig 2.6) can be easily visualised applied to the Stonehenge geomorphology.

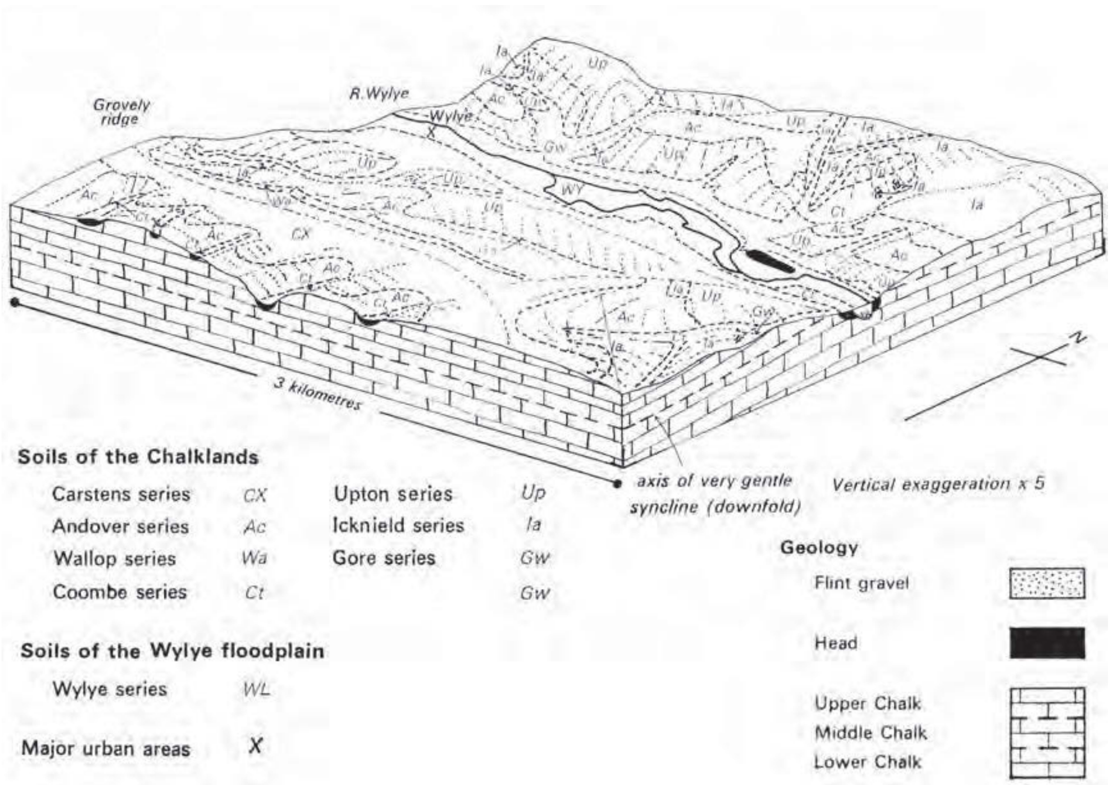

Fig 2.6 Block diagram showing the landscape relations of the chalk land soil types. This pattern of individual soil series recurring in particular landscape situations is similar to the Stonehenge area. Reproduced from National Soil Resources Institute: Cope (1976). © Cranfield University 2013

3.2 Land use

In Richards' (1990) view, the earlier Bronze Age landscape around Stonehenge appeared consistently to be grassland, but with the evidence coming mainly from the western side of the Stonehenge Environs study area (Richards 1990, 274). He cited Entwistle's (1990b) description of the Amesbury barrow 42 buried soil together with the lack of colluvium in Stonehenge Bottom as evidence that cultivation was not happening on Coneybury Hill and King Barrow Ridge in the later Bronze Age. Allen (1997a), on the other hand, has argued for the existence of arable plots within a pastoral landscape by the Late Neolithic based on molluscan evidence and colluvial upper fills of ditches. Also on the eastern side, the pre-enclosure settlement soil at Durrington Walls indicated a grassland environment, part of a cleared and maintained zone with some evidence for cultivation (Wainwright and Longworth 1971), but this has been questioned (Richards 1990, 265).

To a large extent the issue of presence or absence of arable agriculture is not so much a controversy as a question of degree. However, there is clearly little hard stratigraphic evidence for cultivation in the Stonehenge area before the Late Bronze Age, excepting the possible Late Neolithic (or earlier) ard marks found at the Amesbury 71 barrow (Christie 1967, 347).

Chapter 3. Vegetation History

Zoe Hazell and Mike Allen

Introduction

This review of the palaeoenvironmental data from the Stonehenge area comes at an exciting time in the research and interpretation of prehistoric chalkland landscapes. Early research was largely set within the academic framework defined by Tansley (1939) and Godwin (1975), by Evans (1971a; 1972; 1975) and cf Kerney (1968) for the molluscan evidence; that is that there was a broadly uniform postglacial, closed deciduous woodland that blanketed the landscape, and this was initially tampered with by Mesolithic people, and latterly locally (then progressively) cleared by Neolithic and then Bronze Age communities (Evans 1971a; Evans and Jones 1979, table 26; Table 1) and see Smith (1970). Thus, subsequent research and interpretations of landscape and land-use history were predicated on this view (cf Allen *et al* 1990; Allen 1997a), and the presence of open landscape conditions required removal of the postglacial woodland forest as a result of human deforestation and clearance. However, evidence is increasingly emerging to suggest that the woodland was in fact more open than previously suggested, and this review of the palaeoenvironmental data from the chalklands around Stonehenge hopes to shed light on this debate.

The chapter presents and synthesises the main palaeoenvironmental and palaeovegetational data (pollen, plant macrofossils (for archaeobotanical records, see **Chapter 4 – Plant Resources**) and charcoal, insects, molluscs) available from the Stonehenge region, in order to help inform on the wider landscape characteristics of the Stonehenge environment from the Mesolithic to the Early Bronze Age. Where necessary, when evidence from the Stonehenge region itself has been scarce (more so for pollen and charcoal than for molluscs) the geographical scope of the review has been extended, particularly to the North Wiltshire Downs.

Palaeoenvironmental data types

Pollen

Pollen data is most commonly interpreted as providing a picture of the regional vegetation, except in the case of sites where there is clearly a small pollen catchment that will reflect a very local flora, such as a peat hollow within a forest. Although mollusc data provides better local information on past vegetation, it is of a broader nature, such as open, closed, grassland or wooded. Pollen data can supplement this by providing information on the individual plant components of the vegetation communities within the landscape.

Production, dispersal and preservation

The different dispersal methods of pollen types (whether wind or insect pollinated) influence the amount of pollen that is produced; wind pollinated plants tend to produce more pollen than those that are insect pollinated, and this will affect the interpretation of relative pollen abundances within a sample eg *Tilia* (lime) produces relatively little pollen. Vegetation structure can also affect the amount of pollen production, for example, grass doesn't flower as much in shady conditions (Dimbleby 1997, 31), and hazel also requires sunlight to flower (see Scaife 1995a, 55). Cereal pollen is not widely distributed as the flowers are largely cleistogamous, ie self pollination occurs in the non-opening flower (Dimbleby 1965b, 37). The morphology of pollen grain types also affects pollen dispersal, for example, *Pinus* (pine) pollen (wind pollinated) is capable of dispersing over long distances due to its two air sacs (see Fig 3.1a), and so is often found at low background levels within pollen profiles. Also, the nature of the vegetation structure and wind speeds will affect how far pollen will travel.

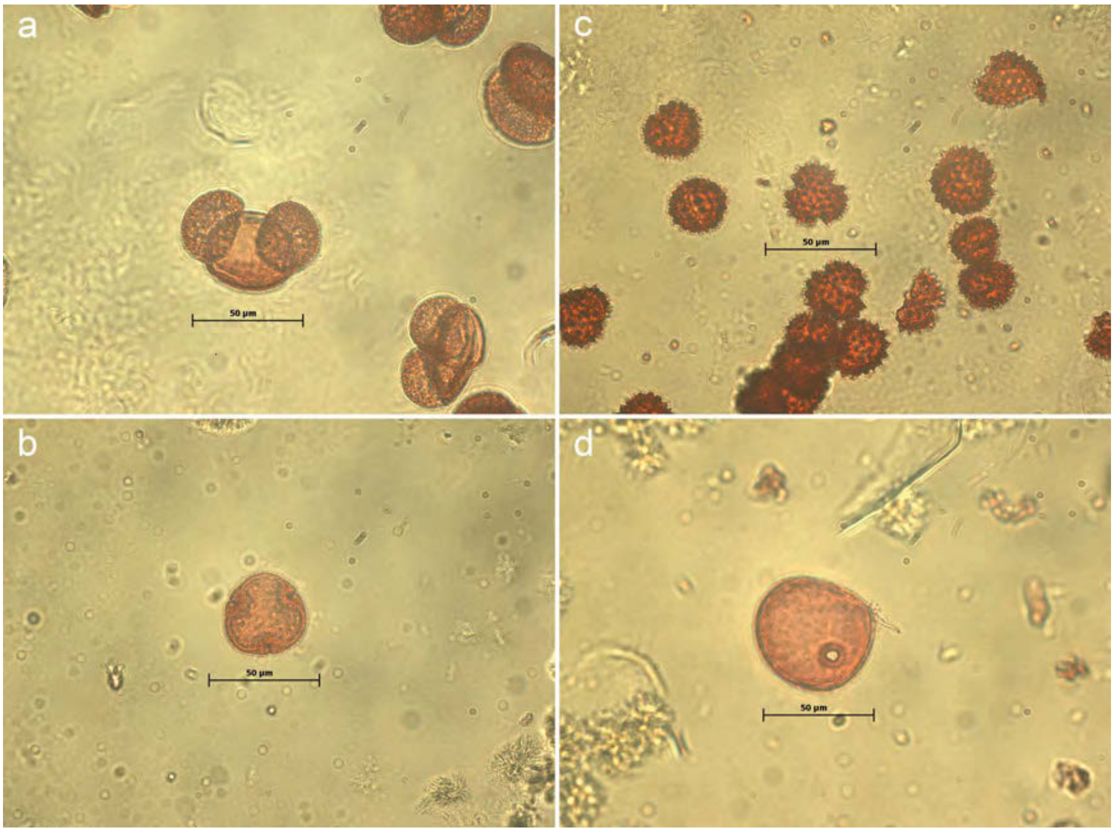

Fig 3.1 Pollen grains showing a variety of apertures and textures: a) *Pinus sylvestris*, b) *Tilia platyphyllos*, c) *Aster tripolium*, d) *Triticum spelta*. Pine pollen is dispersed over long distances due to the air sacs forming part of the structure. Large, heavy grains such as those of cereals are only dispersed over short distances. Photographs by Zoe Hazell

Poor pollen preservation on calcareous (chalk) soils is a common characteristic – a combination of the alkaline conditions as well as aerobic conditions of soils generally – which can have important implications for the interpretation of the subfossil pollen assemblages. Walker (1999, 163) critically stated of previous work on buried soils that "as there is no way of knowing the extent to which post-depositional processes within these calcareous soils have combined to change the nature of the original pollen assemblage, any palaeoecological inference that is drawn from such a data set must rest on very insecure foundations". This has important implications for interpreting the pollen assemblages from these types of deposits, and applies to the majority of pollen data within this review.

Different pollen taxa vary in their resistance to decay; and some are more readily identifiable than others even if poorly preserved, eg degraded Asteraceae (Lactucae) and *Tilia* (see Fig 3.1b) are often distinctive and still recognisable. Pollen of *Corylus* is also relatively resistant to decay – see Havinga (1967, tables I and II). It is typical of calcareous sites that the more robust Asteraceae (Lactucae) and fern spores (especially *Pteridium aquilinum* (bracken)) are frequently recorded. This was observed at multiple sites by Dimbleby and Evans (1974), and more recently by Scaife (1995a; 1995b) at Stonehenge.

Pollen movement through soil deposits is a particular problem. This can occur as vertical mixing and stratification of layers through earthworm action (bioturbation) (see Keatinge 1983) and as downwash by water percolation, particularly down old root channels. The pollen investigation at Overton Down experimental mound by Crabtree (1996b) showed that the sediments throughout the sampled profile (below the chalk bank) had become homogenised, even within the space of 32 years, as a result of earthworm activity. Study of the *Lycopodium* spores that had been scattered over the land surface prior to the construction of the experimental mound suggested that they had travelled up the profile (as well as down) through faunal mixing eg earthworms (Crabtree 1996a); '*Considerable numbers*' were found at 90mm above the buried soil surface ie within the overlying chalk bank. This appeared to be more pronounced (or at least to have happened faster) at the site where chalk was laid directly on the land surface than the site where a turf layer had been laid down
The greatest potential for good pollen preservation in chalkland regions is in alluvial organic/peat deposits), although even these can be problematical. For example, Waton (1982) assessed 70 cores from riverine peats within chalkland valleys, to find only one in which pollen was sufficiently abundant to allow meaningful interpretation meriting full analysis.

Of the sites reviewed for this chapter, there were some from which samples were retrieved and processed, but no pollen was recovered; these were Great Barn, near Avebury by Balaam in (Evans *et al* 1985, 305), Wayland's Smithy Neolithic long barrow, east of Swindon by Dimbleby and Evans (1974, 128), Knap Hill, Alton Priors by Dimbleby (in Connah 1965, 21) and Amesbury barrow G70, Earl's Farm Down, Amesbury by Dimbleby (in Christie 1964, 42).

Wood

The presence of wood remains (waterlogged and charcoal) in most archaeological contexts results from selection by humans for a particular purpose. This makes the assemblages somewhat unrepresentative of the surrounding vegetation as a whole. The source of the wood exploited is also not clear although it is often assumed to have been brought in from near-by. Wood and charcoal records are therefore probably best used as supporting evidence for palaeoenvironmental reconstructions.

Land and freshwater molluscs

While pollen provides direct evidence of the vegetation, land snail data provides indirect evidence. The ecological preferences of different mollusc species are defined by the vegetative characteristics of the micro-environments which they inhabit. This includes the amount of moisture (shade) afforded, the micro-habitats, and sources of food available (Boycott 1934; Evans 1972). The vegetation character or structure can be suggested by the palaeomolluscan assemblages from which we can infer land-use activities such as woodland clearance, rough pasture, grazed pasture and arable. Actual interpretations of palaeomolluscan assemblages are much more complex (Evans 1970; 1972; Thomas 1985; Davies 2008) but are summarised in Fig 3.2. More significantly, long sequences of archaeological or colluvial deposits allow local land-use histories to be constructed. By mapping a series of local, dated site-specific land-use histories, an interpretative picture of the land-use development of an area, region or landscape, may be built up.

Despite a long history of molluscan analysis, until the recent Stonehenge Riverside Project, there has been a surprising lack of emphasis on environmental studies, particularly in an area where monuments are both densely concentrated and investigated. The lack of previous environmental analysis was due partly to the relative youthfulness of land snail analysis as a discipline, but also reflects the material and structural approach of some previous archaeological investigators. In some cases within the Stonehenge Environs, round barrows appear to have been comprehensively sampled during excavation, but this has not been followed by appropriate, or indeed any, analysis. This appears to be the case, for example, with the majority of the 12 round barrows excavated by the Vatchers between 1959 and 1961 (Gingell 1988, 23) and those excavated on Earl's Farm Down and New Barn Down, Amesbury by Ashbee in 1956 (Ashbee 1985).

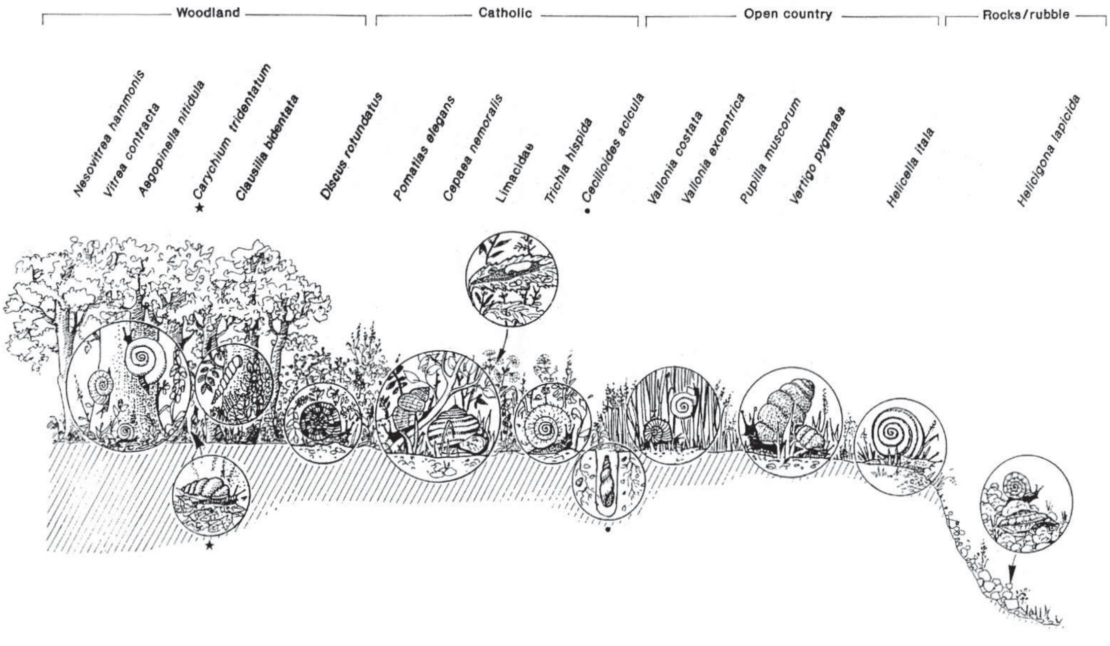

Fig 3.2 Schematic and generalised representation of snail habitat preferences © M J Allen

Thus, although there is '*some sort of regional background available*' (Evans *et al* 1984, 7) and land-use maps have been produced (Allen 1997a) these are still far from comprehensive. Nearly all the suites of mollusc samples taken within the Stonehenge area are derived from identified monuments, assumed to be centres of human activity, and therefore, by their very nature, are biased towards managed and open country areas within the landscape. Any overall interpretation of the molluscan evidence may, therefore, over-estimate or over-emphasise the open nature of the area. This bias can be partially overcome by the use of other sources of environmental information, and by the examination of Mollusca from buried soils and hillwash sequences.

Unfortunately there is still a paucity of such evidence, despite the potential which clearly exists in those old land surfaces beneath the many extant barrows in the study area (see **Chapter 2 – Geology, Landscape and Soils**). The Stonehenge Environs Project provided few opportunities to examine buried soils with the exception of the Amesbury 42 (Entwistle 1990b) and North Kite (Allen 1990). Other buried soils have included those at Woodhenge (Evans and Jones 1979), Stonehenge (Evans *et al* 1984,s 7-10), Durrington Walls (Evans 1971b; Allen 2010; in prep a), the buried soil and turves beneath the large barrows along the King Barrow Ridge (Allen and Wyles 1994) and the excavation of the Amesbury 42 buried soil (Allen 2010; in prep a). Endeavours to provide suites of off-site data and non-site-specific data were attempted via the dry valley research projects. These demonstrated the absence of typical chalkland colluvial deposits as described by Bell (1983) and Allen (1988; 1991) in a number of dry valleys in the area, and consequently forced reliance upon the site-specific data. However, the relatively large number of individual sequences in the Stonehenge area allow some reconstruction of spatial and chronological patterning on a landscape scale.

Insects

Although insects are a very large class, only two types are discussed within this chapter: beetles (Coleoptera) and ants (Hymenoptera: Formicidae) (see Robinson (2001) for details of these and other insect orders and see Robinson (2002) for a discussion of Coleoptera and their archaeological applications). Different species inhabit limited ecological ranges covering terrestrial, fresh or brackish water, and are generally considered to give information of a sub-regional level. Together with the good preservation of their remains in waterlogged conditions (due to their chitinous exoskeletons that are extremely resistant to decay) and their potential for identification to species level, the recovery of their subfossil remains can be used for palaeoenvironmental reconstructions. They provide a local environmental signal and they are able to migrate and respond quickly to changing environmental conditions.

Limitations of previous excavations

Early antiquarian archaeological excavations often did not consider investigating the palaeoenvironment; wood and charcoal was recovered from sites only for the purpose of radiocarbon dating and was rarely identified and reported. Early sequences were often not dated directly, using methods such as typology or pollen zones, and unfortunately, many records from the region still suffer from a lack of secure and/or rigorous dating programmes. Often, detailed methodologies were not reported; for example, it is not clear what soil sample sizes were used in early pollen work eg by Dimbleby (Dimbleby and Evans 1974).

Formats and conventions

For comparability, where specific radiocarbon samples have been quoted, they have been recalibrated using CALIB v6.0 (Stuiver and Reimer 1993) (95.4 per cent confidence intervals quoted, rounded to the nearest 10 years); this applies to the pollen, charcoal and beetle sections.

For comparability and consistency throughout the document, plant nomenclature follows Stace (1997) as far as possible; pollen taxonomy conventions follow Moore *et al* (1991) and Bennett *et al* (1994). Worthy of particular note here are the 'Asteraceae (Lactucae)' which refers to Tribe 2 of the Lactucoideae (Subfamily 1) of Stace (1997) and includes, amongst others, dandelions, sow-thistles and hawkweeds. It is equivalent to the previously used term 'Compositae (Liguliflorae)'. Pollen of this tribe can be divided into four group types (see Moore *et al* 1991, 91-3) and in the case of *Taraxacum* type, this is now referred to as *Cichorium intybus* type; see Moore *et al* (1991). In the case of wood identifications, as most genera cannot be differentiated to species on the basis of microscopic wood taxonomy, only genus names are referred to in the text (even if species names were reported in the original reports). An exception is that of blackthorn that can sometimes be identified to species; it is referred to here as *Prunus* cf *spinosa* (ie possible blackthorn). In some cases, certain genera cannot be distinguished, so are referred to as their higher-level group even if genera had supposedly been identified at the time. This is the case for Maloideae (previously Pomoideae) (Pomaceaous fruits) which is Subfamily 4 of the Rosaceae Family of Stace (1997); it includes pears, apples, *Sorbus* type (service-tree and rowan) and hawthorns. All wood groupings follow Schweingruber (1990).

Site Summaries

The Pre 3700 cal BC background (late glacial and early Holocene)

Although this chapter concentrates on the period 3700-1600 cal BC, the early postglacial vegetation history that goes before that (ie 8300-3700 cal BC) not only sets the scene but defines the landscape history and archaeology.

Molluscs

One of the most important sequences is that from the Mesolithic pits (Allen 1995a; 1995b) dating to 8500-7650 and 7500-6700 cal BC (Allen and Bayliss 1995, 528), from the Stonehenge car park. These indicate the presence of open woodland; both the snails (Allen 1995b) and pollen (Scaife in Allen 1995a) indicate deciduous and coniferous components consistent with an early Boreal landscape (Table 3.1). The open nature of this woodland is indicated by the presence of the *Vallonia* species and of *Pupilla muscorum* and confirmed by the pollen data. Although significant, such data have only been recovered from this one location, and in land snail terms no other dated assemblages exist.

A number of undated or pre-monument tree hollows exist with a variable data; most are, however, very poorly dated. Nevertheless, some can provide information such as those at Durrington Walls (DWI and DWII) analysed by Evans (1971a) which indicate deciduous woodland with leaf litter which pre-dated the development of the shallow rendzina-type soil under the henge bank. Similar results were recovered from the recent analyses (Allen 2010). Similar woodland conditions existed in a subsoil hollow beneath the soil under the Woodhenge bank (Evans and Jones 1979); data not replicated by recent work. This tends to indicate earlier Neolithic deciduous woodland

Climatic zone	*Godwin Pollen zone*	*Interglacial chronozone*	*Archaeological period*	*Climate and vegetation*	*Approximate date calibrated BC (BP)*
				Deterioration	
Sub-atlantic	VIII		Roman period Iron Age Late Bronze Age	Cold and wet, general deterioration. High rainfall. Decline of lime. Increase of ash, birch and beech	
		Flandrian III			1250 cal BC (*2900 BP*)
				Stable	
			Middle Bronze Age Early Bronze Age Final Neolithic	Warm and dry, low rainfall, wind-blown deposits. Woodland regeneration in southern England	
Sub-boreal	VIIb				3200 cal BC (*4500 BP*)
			Late Neolithic Middle Neolithic Early Neolithic	Declining warmth. Landnam and first agriculture. Elm decline 3800 cal BP (*5050BP*)	3800 cal BC (*5050BP*)
					4000 cal BC (*5200 BP*)
				Optimum	
Atlantic	VIIa	Flandrian II	Later Mesolithic	Climatic optimum, warm and wet. Increase of 2°C, poly-climax forest. Increase of alder, some clearances	
					6300 cal BC (*7500 BP*)
				Ameliorating	
Boreal	VI V		Mesolithic	Continental climate, warm and dry. Asynchronous expansions of mixed oak forest with hazel and successional from pine	
		Flandrian I			8900 cal BC (*9500 BP*)
				Rapid Amelioration	
Pre-boreal	IV		Early Mesolithic	Sharp increase in warmth at 10,000 BP. Birch, juniper and pine woodland	
					10,000 cal BC (*10,000 BP*)

Table 3.1 Outline of climatic zonation (after Sir Harry Godwin and Richard West), interglacial chronozone, archaeological periods and basic vegetational change for southern England. This allows pollen zones quoted in many specialist pollen and quaternary geography reports to be equated to the archaeological chronology and activity

existing along the higher western valley sides of the Avon at least. Other tree hollows have been less informative. An undated tree hollow (040) on the Avenue (SAV08) indicated open conditions (Allen 2010; in prep a), as did another on the east of the River Till and at Scotland Lodge (Wyles 2008).

Although Evans took the consistent data from under the Woodhenge and Durrington Walls henges as representative evidence of a wider postglacial deciduous (Atlantic) woodland covering much, if not all, of the landscape, it seems likely that this postglacial woodland was very patchy (see below), perhaps covering the Avon Valley sides. The lack of well-developed postglacial and post Mesolithic woodland elsewhere in the Stonehenge landscape, despite the relatively large programmes of analysis, tend to suggest a lack of complete woodland cover. Our understanding of the precise nature and distribution of any woodland is, however, woefully poor.

Pollen and charcoal

The earliest pollen data (Late Devensian–Early Holocene transition) comes from the humified peat at the base of a core – within which multiple hiatuses were identified – taken from the river valley floodplain at Durrington Walls (Scaife in Cleal *et al* 2004), not far from Stonehenge. At the start of the record, dated to 8280-7200 cal BC

(8640±200 BP; GU-3239) (the sole radiocarbon date from the core), the interpretation was of an open, herbaceous vegetation dominated by Poaceae (wild grasses) and Cyperaceae (sedges), but over time, birch and pine, and then *Quercus* (oak), *Ulmus* (elm) and *Corylus* (hazel) increased as the climate improved. From the Stonehenge site itself a pollen record was produced (Scaife 1995a) from Mesolithic Pit 9580 (dated to 8250-7750 cal BC (8880±80 BP; GU-1509)) using pine charcoal. Although this pit had a complex development, with multiple recuttings and a suspected hiatus, it was suggested that Early Holocene (Boreal Phase) pine-hazel 'open' woodland dominated (with some *Betula* (birch), elm and oak), with a herb component dominated by Asteraceae (Lactucae) and Poaceae, as well as fern spores, including *Pteridium aquilinum* (bracken). The presence of pine was supported by the Mesolithic pine charcoal remains at Stonehenge identified by Gale (in Allen 1995b) and, together with Maloideae, by Limbrey (1973) (and dated to 8810-7740 cal BC (9130±180 BP; HAR-455) and 7450-6650 cal BC (8090±140 BP; HAR-456) although these dates could be unreliable (Walker *et al* 1987, 79)); and also from Strawberry Hill, northern Salisbury Plain (Allen and Scaife 2007), where pine, juniper, oak and hazel charcoal were found in what was interpreted (from mollusc evidence) as a Boreal phase deposit. At the Mesolithic settlement at Castle Meadow, Downton, Higgs (1959) reported wood charcoal remains of oak and *Rhamnus* (buckthorn). In the Avebury region, pollen from the subsoil tree hollow at South Street long barrow was interpreted as a woodland environment, dated, by the absence of *Tilia* (lime), to the Boreal Phase (Mesolithic) (Dimbleby and Evans 1974); unfortunately, no further detail of the pollen was presented there.

Late Mesolithic–Early Neolithic

Pollen

Within the same core taken from the river valley site of Durrington Walls, immediately above the Late Devensian–Early Holocene sediments (see above), was a hiatus – thought to represent a Mesolithic phase. From the sediments directly above the hiatus, pollen (analysed by Scaife (in Cleal *et al* 2004)) suggested a dominance of herbs, with much fewer tree and shrub taxa (although *Tilia* (lime) was present). The taxa indicated a floodplain (fen peat) environment; notably Poaceae (grasses) and Cyperaceae (sedges), with *Caltha* type (probably *Caltha palustris* (marsh-marigold)), *Filipendula* (meadowsweet), *Valeriana officinalis* (valerian) and *Typha/Sparganium* type (reedmace/bur-reed). There was also evidence of arable activity through the presence of cereal pollen and the arable-associated weeds (segetals) including *Fallopia convolvulus* (black bindweed) and *Polygonum aviculare* (knotted bindweed). Other indicators of cleared/waste ground and pastoral habitats were present eg Chenopodiaceae (goosefoots and oraches), Papilionaceae (clovers), *Rumex* (docks), *Plantago* spp (plantains) and Asteraceae (the daisy family). Altogether, this was taken to infer a period of intensified land clearance, possibly during the Neolithic (as based on other palaeoenvironmental data from the area, including pollen (Dimbleby in Evans 1971b) and molluscs (Evans 1971b) at Durrington Walls (Wainwright and Longworth 1971)); but it is a pattern also typical of Bronze Age (or later) deforestation (Scaife in Cleal *et al* 2004). Given the lack of dating within the profile, the timing of this remains unclear.

Phase 1 - 4000-3000 BC, Early Neolithic, before Stonehenge

Early Neolithic (4000-3500 cal BC)

Molluscs

Typically Neolithic long barrows and causewayed enclosures provide evidence of the local landscape and land-use *c* 3900-3700 cal BC (Whittle *et al* 2011). Excavations by Julian Richards at Robin Hood's Ball did not section the causewayed enclosure, while snail samples taken from Neolithic long barrow at Netheravon Bake, although processed, have never been analysed (Allen in prep b). The recent investigations of Amesbury 42 indicate that this is later than many of the southern English long barrows (Bayliss and Whittle 2007); a recent date from an antler on the base of the ditch of 4698±33 BP (OxA-20594) dates this monument to 3640-3370 cal BC in the middle of the fourth millennium BC. Evidence from another long barrow (W483) south of Stonehenge indicates pre-existing open conditions (Allen in prep c). Once again direct evidence for this phase is scant, though potential exists from both existing samples, and upstanding long barrows in the landscape. The analysis of a single sample from the Coneybury Anomaly – a pit about 10m to the north west of the Coneybury Henge dated to 4040-3640 cal BC (5050±100 BP, OxA-1402) – indicated open woodland conditions (Bell and Jones 1990).

The buried soil under the Amesbury 42 long barrow pre-dates 3640-3370 cal BC, and indicates the presence of long established open downland conditions with a mature molluscan fauna of short-grazed grassland conditions (Allen in prep a). The evidence for any local shade-loving conditions here is slight, suggesting that a more open landscape existed at this time than might otherwise have previously been assumed. We can, therefore, only guess at the extent of woodland in this phase, but we would now indicate less woodland than has been suggested previously (Allen *et al* 1990, fig 155a) (Allen 1997a, pl. 2).

Pollen and charcoal

Quercus (oak), *Corylus* (hazel) and Maloideae charcoal were recovered from Fussell's Lodge long barrow (Dimbleby 1966); notably oak from the buried soil beneath the burial complex and from the mortuary house collapse (dated to 4330-3680 cal BC (5180±150 BP; BM-134) (Ashbee 1966)), and hazel and Maloideae from primary infill deposits of the ditches (with both only occurring together in the northern ditch). Hazel charcoal was also found in the old land surface (rendzina) beneath the outer bank (trench 2) at Robin Hood's Ball (Balfour-Browne 1964) and from the same site (Robin Hood's Ball, site W83) 'earlier' Neolithic charcoal of *Prunus*, Maloideae, maple, ash and elm was recovered (Gale 1990). Earlier Neolithic contexts of another two sites examined by Gale (1990) found only *Prunus* at The Lesser Cursus (site W55) and oak, *Prunus*, Maloideae, hazel and yew at the Coneybury Anomaly pit (site W2, 1981 on Coneybury Hill).

At Castle Meadow, Downton, evidence of Neolithic activity was identified (Rahtz 1962). The charcoal identified (Patterson 1962) was: oak from pit 139, *Betula* (birch), *Carpinus* (hornbeam) and probable *Rhamnus* (buckthorn) from other Neolithic contexts.

Pollen was analysed from samples of the infilled recut of the enclosure ditch at Whitesheet Down (Scaife in Rawlings *et al* 2004), the base of which was dated to 4230-3390 cal BC (5020±150 BP; BM-2783). All showed a dominance of herbs and only a minor tree component, suggesting an open landscape, with Asteraceae (Lactucae) (*Cichorium intybus* type), *Ranunculus* type (buttercups), *Plantago lanceolata* (ribwort plantain), *Poterium sanguisorba* (salad burnet), *Scabiosa* (scabiouses), *Centaurea* (knapweeds) and Poaceae (wild grasses); but no cereal type. The tree contribution consisted of *Pinus* (pine), oak, *Fagus* (beech), *Tilia* (lime) and *Alnus* (alder) and was interpreted as distant woodland. Abundant fern spores, including *Pteridium aquilinum* (bracken), were ascribed to the presence of associated woodland at the time of earlier deposits (note also that these spores are commonly preferentially preserved), and the bracken was also suggested as being linked to burning as part of clearance episodes at the site. Interestingly, whilst Scaife (in Rawlings *et al* 2004) noted the low contribution of hazel pollen (a profuse pollen producer) Gale (2004) highlighted the predominance of hazel charcoal from the Early Neolithic contexts at this site and Hinton (2004) reported the presence of hazelnuts in every sampled feature.

Other charcoal taxa from the site included ash, Maloideae, and less commonly oak and *Prunus* (Gale 2004). Two pits from the interior of the enclosure were radiocarbon dated from hazelnuts; these were i) pit 1295 which contained hazel, *Fraxinus* (ash), Maloideae and *Prunus*; the basal fill of which was dated to 3640-3380 cal BC (4740±35 BP; BM-2823), and ii) pit 1303 which contained hazel, ash and Maloideae; the basal fill of which was dated to 3660-3380 cal BC (4790±50 BP; BM-2822). Pit 1303 did not show evidence of burning *in situ*, suggesting that material could have been brought to the site later.

The remaining pollen records of the phase derive from buried soil deposits, which should be interpreted with extreme care (see above). Unusually, at Avebury Henge, the buried soil below the henge bank seemed to suggest a transition from an earlier treeless environment (with dominant fern spores, charred Pteridophyte tracheids, and some grass, ribwort plantain and Asteraceae (Lactucae)), to an increasingly wooded (but still generally open) one, with more tree and shrubs, especially hazel (Dimbleby and Evans 1974, 122-3). The same seemed to apply to a buried soil profile from below Horslip long barrow, where Dimbleby and Evans (1974, 125-6) and Dimbleby (1979a) inferred an upwards shift from grassland (grass dominant, with some ferns and a little oak), followed by the presence of cereal and then by woodland (with the trees/shrubs consisting mainly of hazel with some lime and pine, and slightly increased bracken and fern spores) (Dimbleby and Evans 1974). Although pollen from the buried rendzina at Knap Hill (Dimbleby and Evans 1974, 126) was very sparse (and consisted mainly of *Dryopteris* type (fern) spores) hazel pollen gave some indication of hazel woodland increasing in density; a radiocarbon date from the primary rubble of the ditch (Layer 6) in Cutting 1 was 3710-3100 cal BC (4710±115 BP; BM-205). Dimbleby (1979a) commented that the shift from an open (cleared) area to woodland suggested a recolonisation; a pattern that would seem to counter the usual picture of woodland clearance during this phase; but there was no indication from the soil stratigraphy (at Horslip) that it had been inverted in any way. The initial open landscape seemed to have been used for agriculture, seen from the cereal pollen together with typical arable weeds (*Rumex* (dock), Apiaceae (carrot family)) and low values of ribwort plantain that is associated with pasture.

At Beckhampton Road long barrow (Dimbleby and Evans 1974) pollen from a buried soil was also interpreted as an open landscape (dominated by grasses, ferns and bracken) but with some hazel and trees represented, together with cereal pollen and arable-associated weeds suggesting farming nearby. A radiocarbon date from below undisturbed stacked turves, thought to date the burial of the soil, was 3370-2910 cal BC (4467±90 BP; BM-506b) (Barker *et al* 1971; Evans 1972, 248). Charcoal fragments from the old ground surface (in order of decreasing abundance) were of: oak, hazel, Maloideae, ash and *Prunus* cf *spinosa* (possible blackthorn) (Ashbee *et al* 1979, 280). At Easton Down long barrow (Cruise 1993) hazel was dominant – probably growing at or very close to the site (although it could have been over-represented in the pollen record) – occurring with grasses, bracken and other fern spores. The large numbers of herbs and very low contribution of trees, suggested an overall absence of woodland; the charcoal present at this site (Cartwright 1993) was mainly of scrubland taxa (notably Maloideae and elder in the pre-monument and early monument deposits), but some ash and/or oak were present in the earlier (subsoil and primary ditch fill) contexts. The mollusc evidence was interpreted as the site's location being on the boundary where scrub/woodland and grassland met (Rouse and Evans 1993). At South Street long barrow (Dimbleby and Evans 1974; Dimbleby 1979b) the pollen profile across the buried soil indicated an initial open (hazel-birch scrub) woodland with clearings of bracken, Asteraceae (Lactucae) and grass (some cereal type); the presence of ribwort plantain, devil's-bit scabious and knapweed suggested that the grassy areas were used for pasture, to more open conditions (less hazel and birch) with continuing pastoral land-use indications. Evidence of pre-monumental human activity was present from possible plough marks below the buried soil (Fowler and Evans 1967), throughout the buried soil itself from the pollen (initially as pasture but then with arable) (Dimbleby and Evans 1974; Dimbleby 1979b) and then as a second 'cultivation zone' further up in the sub-monument sediments (Dimbleby and Evans 1974). The surface of the buried soil beneath the barrow mound was dated to 3900-3100 cal BC (4760±130 BP; BM-356) (Evans and Burleigh 1969; Barker *et al* 1971).

At Windmill Hill, in the (?truncated) buried soil examined by Dimbleby (1965b) grass, Asteraceae (Lactucae), bracken, hazel and plantains were most abundant, together with very few trees, although this included lime. Clusters of cereal pollen grains were observed, possibly suggesting agricultural activity close-by, as it would not have travelled far and remained intact, nor would it have survived down-washing through the profile (Dimbleby 1965b). However, it is possible that it could have derived from cereal processing (rather than cultivation) nearby, or even be the result of modern contamination, especially given that Dimbleby (in Smith 1959, 156) highlighted that worm activity had mixed the soil profile thus preventing detailed dating of the sediment based on pollen assemblages. Evans (1972, 243) and Barker and Mackey (1961) reported radiocarbon ages from the site: i) from (the occupation surface) beneath the outer (of three) banks, as 4040-3360 cal BC (4910±150 BP; BM-73), thought to date the initial occupation phase of the site, and concurred with by Whittle *et al* (2011), and ii) charcoal of 2270-1450 cal BC (3500±150 BP; BM-75) from a well preserved old turf line in an outer ditch cutting. Other pollen samples from buried land surfaces at the site yielded very little pollen and preservation was poor and biased towards the more robust types (see above); however these assemblages were also consistent with a generally open landscape (grass, hazel and bracken) (Walker 1999). Charcoal was summarised for the site and showed a greater taxonomic diversity than the pollen, consisting of hazel, *Prunus* cf *spinosa* (possible blackthorn), oak, Maloideae, ash, elder, birch and broom/gorse (Dimbleby 1965a). Cartwright's (1999) identifications showed a dominance at the site of oak and hazel. The old land surface (trench BB) was dominated by oak roundwood (twigs and small branches), with hazel roundwood also present mostly towards the base, as well as Maloideae, birch and *Taxus* (yew) roundwood. Cartwright (1999) also examined charcoal from ditch fill deposits, which variously included the taxa found in the buried soil (except for birch and yew) with diversity seeming to decline from the outer, to middle to inner ditches.

Dimbleby and Evans (1974, 128) stated that wood charcoal of hazel, cf blackthorn, oak, Maloideae, ash, elder, birch, broom/gorse, brambles and alder were found at all the sites they examined.

Middle Neolithic (3500-3000 cal BC)

Molluscs

The data for the Middle Neolithic is sparse, excepting the buried soils beneath the henge monuments (Durrington Walls, Woodhenge and Stonehenge), which may relate to this phase. If those soils can be argued to relate to activity nearly 500 years earlier then open grassland prevailed. A date for woodland clearance is however unknown and remains ambiguous in our landscape and land-use histories.

The buried soil under the Stonehenge bank clearly relates to the period prior to 2950 cal BC, and although the land snail evidence is poor (Evans *et al* 1984) this clearly indicates open established, grassland, possibly with bare patches. Open, probably dry grazed grassland, existed at Amesbury 42 as indicated by the, albeit poor, assemblages from the early ditch fills.

More conclusive are the sequences of land snails from both the Greater (Stonehenge) and Lesser Cursus ditches (Entwistle 1990a; 1990c) (Allen 1997a; in prep a), and these monuments were built and survived in open downland. There are hints of disturbance (*Pomatias elegans* = ?cultivation), and of localised longer grassland (?reduction in grazing pressure), but these are highly localised along the length of the monuments rather than wider landscape phenomena. There are, therefore, indications of large tracts of open downland, particularly on Normanton Down (inferred), Stonehenge Down, and from King Barrow Ridge to Woodhenge and Durrington, and probably extending to Durrington Down and Winterbourne Stoke Down. Unfortunately the Normanton Down Neolithic mortuary enclosure was excavated too early (Vatcher 1961) for comprehensive sampling for land snails through the ditch fills.

Pollen and charcoal

Pollen analysed from the buried soil below the henge bank at Durrington Walls (Dimbleby in Evans 1971b, 332-4) was interpreted as a shift from hazel-dominated vegetation (with *Betula* (birch), *Pinus* (pine), *Quercus* (oak), *Tilia* (lime) and *Ulmus* (elm), and occasional ferns, *Pteridium aquilinum* (bracken), Poaceae (grasses) and

Asteraceae (Lactucae)) towards a more open environment with declining hazel and other tree types, but dramatic increase of the bracken and ferns, and low grass. The low grass and high bracken and fern counts towards the surface were thought not to result from differential preservation because Asteraceae (Lactucae), also a robust pollen grain, was rare (Dimbleby in Evans 1971b, 332-4); but it is possible that it could have resulted from the use of bracken eg as a fertiliser or through contamination (down-washing) from an overlying Late Neolithic occupation/midden layer. Charcoal of oak and Maloideae was recovered from the old land surface (Morgan 1971); given that charcoal from the base of the ditch was radiocarbon dated to 2840-2140 cal BC (3927±90 BP; BM-398) (Barker *et al* 1971) the old land surface will pre-date this. Most of the Southern Circle post holes contained solely oak, of which many were large in size (10cm plus), and occasional post holes contained solely Maloideae or ash.

Phase 2 – 3000-2200 BC, Late Neolithic/Chalcolithic, the time of Stonehenge

Late Neolithic (3000-2500 cal BC)

Molluscs

The principal analyses referring to the Late Neolithic (3000-2500 cal BC) are the ditch fills from the Coneybury Henge (Bell and Shackleton 1982; Bell and Jones 1990), the Stonehenge ditch (Evans *et al* 1984) and the continuing fills of the Amesbury 42 long barrow (Allen 2010; in prep a). The henge monuments, dated to 2920-2610 cal BC (4200±110BP, OxA-1408) and *c* 2950 cal BC respectively, were constructed in different local environments; Coneybury in recently-cleared but possibly still scrubby land, whilst Stonehenge was probably in established open grazed grassland. What happened in terms of land-use soon after construction of both monuments is difficult to determine; concentrations of snail shells are typically low in the primary fills of the ditch sequences, themselves poorly-dated deposits, and may reflect the rock-rubble micro-environments (Evans and Jones 1973). While the ditch around the Durrington timber structure (western enclosure, WE06) is also dominated by shade-loving species (Allen 2010; in prep a), in all three cases care must be taken when interpreting how much of these shade-loving elements represent i) vegetation regeneration in the ditch, and long grass becoming established on the banks, as opposed to ii) reflecting wider landscape phenomena of lessening of land-use and regeneration of scrubby downland (cf Evans 1972). Bell and Jones (1990, 157) commented "... that there is no evidence that the Early Neolithic environment was dramatically different to that of later Neolithic and Beaker period and that areas of shade are likely to have existed".

Chalcolithic (2500-2200 cal BC)

This phase saw the construction of Durrington Walls, clearly in a, by now established, open grassland combe (Evans 1971b; Allen 2010; in prep a). However, this is precisely the phase where we can define more local shady conditions in the Coneybury Henge ditch (Beaker pottery) and Stonehenge ditch (Beaker burial); the environmental interpretations of which are discussed above. It is likely, however, that open conditions prevailed at Amesbury 42 (Entwistle 1990b; Allen 2010), and the large enclosure of North Kite on Wilsford Down is attributed to this phase, and was constructed in open short-turved grassland (Allen 1990). Similarly the Stonehenge Avenue (Thomas 1973; Evans *et al* 1984; Allen 2010; in prep a) was built and existed on open grazed downland. Even on the Avon valley side west of Vespasian's Camp, despite poor shell assemblages, the evidence does not contradict this (Thomas 1973). Many Bronze Age (Beaker) barrows were also built in similar conditions; unfortunately, no suitable samples were taken from the Amesbury Archer, nor the Boscombe Bowman.

Although there is evidence of local vegetation regeneration, especially within the monument ditches, we tend to suggest that much of the downland was open and grazed pasture. The presence and extent of cultivation is ambiguous. The fact that most of the Early Bronze Age barrows where analysis has been conducted (eg Kerney 1964; Kerney 1967; Allen and Wyles 1994) were built on well established grazed short-turved downland indicates that this has been established and prevailed during the Chalcolithic at least.

Pollen, charcoal, plant macrofossils and insects

From within the Stonehenge region, charcoal was recovered from later Neolithic contexts at Coneybury (Gale 1990). Interestingly, the two proximal sites there were quite different in terms of taxa; the Coneybury Anomaly pit proffered yew and buckthorn, whereas Coneybury Henge had *Quercus* (oak), *Prunus* sp, Maloideae, *Corylus* (hazel) and *Cornus* (dogwood), which was more similar to the assemblage recovered from King Barrow Ridge (Gale 1990), of oak, *Prunus* sp, Maloideae, hazel, *Acer* (maple), *Carpinus* (hornbeam) and *Rhamnus* (buckthorn).

Much palaeoenvironmental data comes from the Silbury Hill; pollen analysis by Dimbleby (1997) on the old land surface buried beneath the mound implied a shift from i) an open landscape (grass dominated) with some woodland nearby (mostly hazel with some oak, lime) to ii) a local reoccurrence of hazel woodland or discrete hazel thickets (together with increasing oak and *Alnus* (alder), but declining *Tilia* (lime). The herbs were summarised as "a grazed grassland community, rich in perennial herbs" (Dimbleby 1997, 32) with no cereal pollen recovered. More recent pollen analysis (for which differential preservation was considered a factor) of sub-mound sediments showed hazel, with grasses, plantain and Pteropsida (monolete) (spores), and some alder and Asteraceae (Lactucae) (Robinson 2003). From the old land surface itself, pollen of grass and hazel, together with fern spores and some alder pollen was present (see Campbell *et al* in press); beetle remains were solely grassland taxa (Campbell *et al* in press; Robinson 2011a). Charred remains from a hearth feature cut into the old land surface contained hazelnuts and wood charcoal of hazel, Maloideae, *Prunus* sp and indeterminate root wood (see Campbell *et al* in press). Radiocarbon dates on the hearth (phase 2 of use) were i) 2620-2470 cal BC (4012±29 years BP; OxA-20808) and ii) 2830-2470 cal BC (4030±35 years BP; SUERC-24089) on a single Maloideae branchwood charcoal fragment (Marshall *et al* in press). Pollen from the later 'mini-mound' showed similar dominant pollen taxa to the old land surface (grass, hazel, fern spores), but with heathland (Ericaceae (heather) family) and wetland components (see Campbell *et al* in press); beetles were mainly of grassland habitats and stagnant water, but with some woodland and some pastoral dung beetles too (Campbell *et al* in press; Robinson 2011a).

The presence of hazel at Silbury was reinforced by the finding of hazel fragments (used for radiocarbon dating) from the stacked turves (Atkinson 1969). As well as hazel, other wood and charcoal recovered from the site were of *Prunus* cf *spinosa* (possibly blackthorn), Maloideae and pine (but only one fragment, and likely to be residual). The moss macrofossil remains from the turves indicated a predominantly open, mature, calcareous grassland (Williams 1976; 1997), supported by the beetle remains (Robinson 1997) which suggested an open chalk, grazed grassland, with any woodland at least a few 100m away. Additional evidence of animals in the area was inferred from dung beetles (Robinson 1997) and moss remains of a nitrophilous taxon (Williams 1976; 1997).

Also within the Avebury region, at the West Kennet palisade enclosures oak, hazel, Maloideae, *Prunus* sp, ash, maple, *Sambucus* (elder), *Salix/Populus* (willow/poplar), alder and beech were recorded (Cartwright 1997) although it is possible that there is contamination from Medieval deposits (see Campbell *et al* in press). At Easton Down long barrow, remains of Maloideae, ash and blackthorn were recovered from the ditches' upper secondary fill and incipient soil (Cartwright 1993); these deposits were dated to 2480-2140 cal BC (3860±60; OxA-3761). At Longstones Enclosure Gale (2008) identified Maloideae from a soil at the base of the enclosure ditch; of the most reliable radiocarbon dates from the base/primary fills of the enclosure ditch (F20) (Gillings *et al* 2008) the oldest was 2910-2680 cal BC (4233±38 BP; OxA-10949) and the youngest was 2860-2470 cal BC (4060±50 BP; Beta-140988).

Late Neolithic–Early Bronze Age (LN–EBA)

Pollen and charcoal

The main pollen evidence for this time phase comes from two pollen spectra from Stonehenge itself. The tertiary fill of the recut of Pit 9580 (Scaife 1995a) showed an increasing component of herbs, from which a Sub-Boreal Phase of activity was inferred; open grassland with some cereal cultivation (inferred from cereal pollen and associated herbs), and possible local bracken and wetland (from sedges and a few *Sphagnum* spores). Asteraceae (including *Cichorium intybus* type) pollen and *Pteridium* spores were well represented, suggesting their differential preservation here. The uppermost levels contained well preserved *Pinus* pollen and an *Abies* (fir) pollen grain, interpreted as i) possible contamination down through the profile (by worm mixing and/or downwashing), or ii) rapid sealing of the deposit contributing to the good preservation of what was contemporaneous pollen. Given that fir is recently introduced to the British Isles, and was thus absent for most of the Holocene (see Huntley and Birks 1983), the former explanation is probably favoured here; processes which are applicable to all the pollen. Scaife (1995a, 54) acknowledged that "pollen obtained originated from the former soils which had become incorporated in to the upper fills of the 'recut"'. From the buried soil under the bank (Scaife 1995b) the predominance of grass pollen was tentatively interpreted as the presence of grassland at the site prior to the bank's construction. This was having considered the deposit's clear inadequacies with differential pollen preservation and contamination; it was only sealed by a small thickness of bank deposits and most of the pine pollen was thought to be recent, incorporated down into the buried soil by earthworm action; and the samples were taken from a gouge auger – with an open chamber – making the sediment susceptible to contamination during retrieval. There was no direct dating from the buried soil deposit, but the pollen assemblage was equated temporally (Scaife 1995b) with the upper tertiary fill of Pit 9580 (Scaife 1995a). The A303 pollen data from a buried soil deposit, from just south of Stonehenge suffers from a lack of dating evidence; however, the paucity of tree pollen (oak, hazel and alder; thought to represent woodland further away, or nearer, small remnant tree stands) compared to the dominant herbs suggested a post-clearance age, and a landscape of common chalk grassland taxa, of *Cichorium intybus* type (dominant), *Aster* type (daisies), *Ranunculus* (buttercups), Caryophyllaceae (pink family), *Helianthemum* (rock-rose), *Plantago lanceolata* (ribwort plantain), *Rumex acetosa* type (sorrels), *Succisa pratensis* (devil's bit scabious), *Sanguisorba minor* ssp *minor* (salad burnet), *Campanula* type (bellflowers), Rubiaceae (bedstraws) and *Lotus* type (bird's-foot trefoil) (Peglar 2008). Of these, the anthropogenically-associated ribwort plantain and *Rumex acetosa* (common sorrel) could be indicative of pastoral activity. In addition, ferns were common, especially bracken, that could have originated from grazing or remnants from cleared woodland (although it is also suggested that this identification could be confused with other ferns (Peglar and Grant 2008)).

The quality of charcoal evidence is highly variable. Oak charcoal from Stonehenge (Aubrey Holes A31 and A32) indicates its probable growth in the area (Orr in Atkinson *et al* 1952, 18); within A32 oak charcoal from a secondary disturbance cremation deposit was radiocarbon dated to 2920-1510 cal BC (3798±275 BP; C-602) (Libby in Atkinson *et al* 1952, 20). Oak, birch and possible hornbeam were found from various contexts at Woodhenge (postholes, ditches) (Cunnington and Cunnington 1929) and although pine was also recovered, the fact that this was only from the ditches implies that it is residual (Mesolithic) material. However, regularly occurring taxa at most of the sites were oak, ash, hazel and Maloideae. All of these were recovered from the Amesbury sites at Ratfyn (Maby 1935) and Amesbury barrow G71, Earl's Farm Down (Christie 1967) and from Dunch Hill, Tidworth (Gale 2006) where remains were dominated by Maloideae (hawthorn/apple/pear/rowan-service tree-whitebeam). All except ash were recovered from Camp Hill near Old Sarum (Powell *et al* 2005, 258). The presence of hazel was reinforced by the hazelnut shells recovered from Crescent Copse, Shrewton (Higgins 2000) and from Dunch Hill, Tidworth (Hinton 2006) (charred). A different charcoal assemblage was found at Castle Meadow, Downton (Patterson 1962) where remains of lime (rarely encountered as charcoal in early archaeological contexts), probable *Prunus* sp, alder, oak, hornbeam and probable maple were present in Beaker contexts. This could reflect the fact that it was an occupation site and/or that it is located on the River Avon floodplain (particularly from the presence of alder).

Worthy of note is that there are multiple references to oak charcoal remains identified from funerary contexts: i) a cremation within Aubrey Hole 32 at Stonehenge, ii) the central grave of Amesbury barrow G71's second phase (possible oak plus a second, unidentified taxon but not ash) (Christie 1967, 339) dated to 2870-2140 cal BC (3960±110 BP; NPL-77) (Callow *et al* 1965), and iii) a possible artefact within a child's inhumation (Christie 1967, 343) from the third phase of Amesbury barrow G71 dated from charcoal from a hearth to 2200-1690 cal BC (3590±90 BP; NPL-75) (Callow *et al* 1965). This echoes Thompson (1999) who identified a similar predominance at Barrow Hills, Radley, Oxfordshire, where 10 out of 11 Neolithic funerary contexts were dominated (>60 per cent by weight) by oak.

Phase 3 – 2200-1500 BC, Early Bronze Age, honouring Stonehenge

Molluscs

By the Early Bronze Age open downland conditions seem not only to have been established over large parts of the Stonehenge landscape, but to have been well-established, indicating prior longevity of this land-use. Apart from the micro-environment of the shaft itself, the Wilsford Shaft was dug, and survived in a pre-existing long term open downland (Bell 1989). The turf-built round barrows on New King Barrow Ridge indicate short turved well-grazed downland, with some scrub (Allen and Wyles 1994), but the size of the turf mounds themselves, indicate the extensive nature of the downland pasture stripped for their construction (Cleal and Allen 1994).

Some localised disturbance and arable (arding) events have been postulated within a number of sequences in this and later periods. Detailing their location and discussing the extent of pasture versus arable conditions is beyond the scope of this review, but does form part of ongoing research and reporting associated with the Stonehenge Riverside Project (Allen 2010; in prep a). We have yet to define the presence of persistent woodlands from this phase onwards; but they must exist. Activities (both prehistoric and archaeological research) have been concentrated in areas of former and long-established open downland.

Pollen and charcoal

Indications of the past vegetation for this phase are mostly based on charcoal evidence. The only pollen data were from an old land surface below a treehole on Amesbury barrow 32 (Scaife 1994) which showed Asteraceae (Lactucae), *Polypodium*, ribwort plantain and Cereal type. No direct dating was undertaken, but the buried soils were assigned to the Early Bronze Age landscape (Allen and Wyles 1994). However, the previously discussed (possible Neolithic) intensification of land clearance as inferred from the pollen profile at Durrington Walls could also relate to activity typical of the Bronze Age (or later) (Scaife in Cleal *et al* 2004).

At Stonehenge itself, Maloideae, *Prunus* sp and buckthorn were recovered from EBA samples (Keepax 1980) and Pitts (1982, 100-1) (although the date has since been considered unreliable by Allen and Bayliss (1995, 519)). In the Stonehenge locality, at Durrington Down round barrow, North Kite enclosure and Coneybury Henge, Gale (1990) found EBA occurrences of oak and *Prunus* sp at all three sites analysed, with variable occurrences of hazel and Maloideae. Interestingly, these earlier Bronze Age remains were less diverse than the earlier and later Neolithic charcoals recovered from the region (Gale 1990). Charcoal from features below two barrows near Amesbury (barrows 39 and G70) (Christie 1964; Dimbleby 1981) and charcoal from two at the Greater Cursus (barrows G51 and G30) sites (Cornwall 1963; Cutler 1978) all yielded oak. Of the Greater Cursus sites, barrow G51 also contained ash (Cutler 1978) and barrow G30 also contained sticks of pine (from an ashy soil from an oval hollow on the berm to the northeast of the barrow mound) (Cornwall 1963), a taxon most commonly associated with the Mesolithic deposits from the region.

Sites from this phase also contained oak charcoal remains identified from funerary contexts: i) from a cremation pit cut into bedrock on the floor of Amesbury barrow G70 (Christie 1964, 36), ii) from the central cremation at barrow G30, Winterbourne Stoke (Cornwall 1963), and iii) from Burial A within the mound (a wooden object and tapered board) of Amesbury barrow G51 dated to 2330-1970 cal BC (3738±55 BP; BM-287) (Burleigh *et al* 1976; Ashbee 1978).

Conclusions

1. What, as far as we can tell, is the natural vegetation that chalk downland can support without human intervention?

Antiquarian theories on the vegetation of the chalk downlands of southern Britain suffered from a lack of suitable palaeoenvironmental data; it was assumed that the landscape had always been clear of woodland, and therefore that it was its openness and accessibility that made it favourable for use by early inhabitants (Waton 1982; Allen and Scaife 2007). Then, models were proposed of complete, uniform coverage of closed (deciduous) forest (eg Tansley 1939) prior to (Neolithic) human clearance for agricultural activity of the landscape that then remained open, despite clearance-regeneration phases from the rest of England (Waton 1982), towards one of 'open' woodland. Pollen studies indicating that early and mid Holocene chalk landscapes were wooded include i) Snelsmore, Berkshire - interpreted as dominant tree cover with very little forest clearance until the Early Iron Age (Waton 1982), ii) Lewes, East Sussex - interpreted as well wooded chalk downland from the early postglacial through to the Middle Bronze Age (albeit with minor, temporary Neolithic clearances) (Thorley 1981) (see below), iii) Winnall Moors, Hampshire (Waton 1986) - interpreted as an initial forest phase that was cleared in the Late Mesolithic–Early Neolithic (dated to 5630±90 BP (HAR-4342) (4690-4330 cal BC) and assigned to the Elm Decline). However, many such records have been criticised for deriving from peripheral chalkland sites and/or for being of small, limited pollen catchments, meaning that they may not actually represent the chalkland vegetation (eg that from Lewes, East Sussex (Thorley 1981)); or that they are incomplete sequences and/or inadequate chronologies, such as a single radiocarbon age from a profile (eg at Winnall Moor, Hampshire (Waton 1986)).

Based on pollen data, generalised vegetation maps for NW Europe were produced by Huntley and Prentice (1993) that show the dominant vegetation type of the research area as deciduous forest from 6000 BP, but bordering with mixed forest (ie coniferous and deciduous) prior to that at 9000 BP[1] (Huntley and Prentice 1993).

Whilst it is now generally accepted that the 'Wildwood' of northern Europe developed as the postglacial climax vegetation, there is on-going debate regarding its spread and character. It is now thought that the postglacial vegetation cover was a much more subtle mosaic; not uniform blankets of woodland, but with varying degrees of vegetation and openness eg Vera (1997; 2000). Whitehouse and Smith (2010) analysed sub-fossil

[1] The only difference between the two categories – deciduous and mixed – is the proportion (as a percentage of total tree pollen) of certain Pinaceae taxa; <10 per cent within the former category, and >10 per cent in the latter (see Huntley and Prentice 1993: table 7.1). This clearly still allows for some coniferous component within a 'deciduous' category. They also include *Taxus* (yew) with the main deciduous taxa. For both, total tree pollen had to be >50 per cent of the total land pollen.

beetle records from the early and mid Holocene, and demonstrated that open indicator species were consistently present throughout (reinforcing their previous work (Whitehouse and Smith 2004) that demonstrated the importance of open and grassland species in the early Holocene), albeit with fluctuating abundances temporally and spatially. Whitehouse and Smith (2004; 2010) also suggested that the role of grazing herbivores was less significant than previously suggested by Vera (2000) in his 'wood-pasture' type landscape, and rather that natural processes, such as fire and storm damage, were important in creating and/or maintaining woodland clearings (also see Brown 1997).

On southern chalklands in particular, evidence to suggest that the postglacial vegetation included both woodland and open areas is hinted at in Dorset from the Dorchester environs investigations (Allen 1994; 1997c; 1997b, 183-4) and more convincingly made from research in Cranborne Chase, in the upper valley of the River Allen (French *et al* 2003; 2007; French 2009), the implications of which are outlined by Allen (Allen and Scaife 2007; Allen and Gardiner 2009). The latter work has suggested that this early Holocene woodland was slow and patchy to develop, perhaps with certain areas never becoming fully wooded (French *et al* 2003; 2005a) In particular, the pollen record (Scaife 2003; 2007) suggested an early Holocene woodland development of birch, then pine, oak, elm and hazel expansion, but with a continuation of herbs, representing a substantially open landscape into the middle part of the early Holocene.

At Mount Caburn[2], East Sussex (Waller and Hamilton 2000) suggest that although woodland perpetuated from the mid Holocene to the Bronze Age, there was also evidence of scrub and grassland communities throughout this phase too, probably as patches but not necessarily permanent features. After *c* 6000 cal BP, clear chalk grassland indicators were present, initially *Sanguisorba minor*, followed by *Plantago media* and *Gentianella campestris* type, possibly on the steeper, more-exposed upper slopes of Mount Caburn (Waller and Hamilton 2000).

Such an open-canopy woodland would have been broken by glades and openings which were maintained both artificially – by animals grazing and browsing – and naturally – by fire and storms – and then exploited by human populations for their activities. It is no longer possible to assume from any individual site or sampling point that a) there was or had been a postglacial woodland cover, and b) the absence of woodland, therefore, indicates clearance to create and establish open conditions. The fact that areas may not have been clothed in woodland in the Mesolithic and Neolithic periods, means that the presence of open downland does not require us to invoke anthropogenic woodland clearance, but it might provide us with reasons for concentrations of human activities, and subsequently centres of monument building (Allen and Gardiner 2002; 2009).

We are turning away from a direct chronological dialogue (eg Table 3.1) and molluscan succession (Kerney 1977), to a three dimensional spatial interpretation of land-use maps (cf Allen *et al* 1990; Allen 1997a). This requires increased chronological and spatial resolution in the data sets used (Allen 2000), and much more detailed sequenced chronological resolution; that is ditch fill sequences are dated throughout infilling and changes in the palaeo-molluscan and land-use history. Many of the existing sequences

[2] This site was less than 4km from those of Thorley's (1981) and the differences highlight the importance of understanding pollen sourcing in the interpretation of pollen records.

from buried soils, colluvium and ditches are only poorly or vaguely dated. In addition to this new fundamental shift in our interpretative assumptions, this review is undertaken prior to the completion of the largest molluscan analysis programme in the World Heritage Site. The molluscan programme associated with the Stonehenge Riverside Project includes some 194 samples from 32 sequences taken from 13 'sites'. Although the programme of analysis is well progressed (Allen 2010), it is not completed. Some results of that work are incorporated with the interpretations in this review, but it is more than likely that interpretations here will be changed, or modified at least on the completion of that work.

There is still a clear dearth of detailed, secure palaeoenvironmental data from Stonehenge itself, yet within the contextual framework outlined above, and from a combination of mollusc and pollen evidence, it is likely that open 'patchy' woodland – a mix of deciduous and coniferous – dominated in the Early Holocene (Boreal Phase). Nearby, the mollusc evidence from the Avon Valley suggests the existence of woodland cover in the earlier Neolithic, possibly on the valley slopes. Sediments from Stonehenge and Durrington both indicate the presence of pine and hazel, with some birch, elm and oak, together with herbaceous components (grasses and Asteraceae (Lactucae)).

Fragments of pine charcoal are increasingly being recorded at sites across the south of England (see Allen and Scaife 2007, table 2), suggesting a more local presence of the trees themselves. Pine is usually associated with the Early Holocene (Boreal Phase), although records of its later mid Holocene presence from chalkland environments are becoming less uncommon eg in the upper valley of the River Allen where it was interpreted as reflecting local stands (Scaife 2007). Thus, it appears that pine was a real component of early chalkland woodland, although it is not clear how long it persisted in the region.

Within the regional context of such an open woodland, a more open habitat is likely to have existed around some of the monuments themselves, as, for example, the pollen evidence suggests from Beckhampton Road and South Street long barrows.

2. How might the natural trees and plants have appeared over the three phases, particularly in Early Neolithic?

The palaeoenvironmental records have been summarised in detail throughout this chapter, by phase.

The records relating to the nature of the landscape throughout the early phases (Late Mesolithic–Early/Middle Neolithic) of Stonehenge's existence are complex and, at times, conflicting. This is not helped by a scarcity of reliable deposits and well-secured chronologies.

Nevertheless, there generally appears to be evidence of an opening up of the landscape across this timeframe, to open downland conditions. The best molluscan evidence of open grassland comes from Stonehenge's Greater and Lesser Cursus ditches and Amesbury 42, and equivalent pollen evidence comes from Whitesheet Down and Windmill Hill, as well as multiple sub-barrow buried soils.

Grassland is thought to have been well established by the Late Neolithic, as indicated, for example, from North Kite, the molluscs and pollen at Durrington Walls, and the turves – and their associated palaeoenvironmental remains (grassland beetles, pollen of grass and hazel, moss macrofossil taxa) – at Silbury Hill. Evidence of woodland in the region also exists, although detailed woodland to grassland ratios are unknown. Scant pollen evidence from the buried soil below Stonehenge bank tentatively suggests that it was constructed in open grassland (grasses dominant). Further, subsequent evidence of well-established grassland comes from the Early Bronze Age turf-constructed barrows on New King Barrow Ridge.

Pteridium aquilinum (bracken) seems to have been a constituent part of the landscape, since Late Mesolithic–Early Neolithic times (see below), although as this evidence is based principally on the occurrence of its decay–resistant spores, it is possible that it is over-represented within the fossil record.

3. What archaeological evidence do we have for the influence of people on the levels of vegetation and changes to the species present? What can this tell us about different levels of activity and different uses of the land in our various phases?

There is evidence of agricultural activity within the region from the presence of cereal pollen grains and their associated weeds. Abundant cereal pollen was present in the part of the Durrington Walls (floodplain) sequence that was attributed to the Early Neolithic (although radiocarbon dating is required to confirm this). The presence of the mollusc *Pomatias elegans* (a burrowing mollusc indicative of disaggregated soils, possibly associated with clearance events (Davies 2008, 173)) could be indicating disturbance – possibly cultivation activity – at Stonehenge's Greater and Lesser Cursus sites during the Middle Neolithic.

There appears to be a preference for the use of oak wood in funerary practices, seen here from the Late Neolithic and Early Bronze Age funerary contexts from which charcoal was recovered, and Gale (1990) observed that the EBA charcoal diversity was less than the preceding phases; this could be reflecting the availability of wood types in what appears to be a more-open landscape.

It has been established that Avebury and its surroundings had Late Neolithic woodland regeneration followed by renewed clearance in the Beaker (LN-EBA) period eg upper ditch fills at South Street long barrow were dominated by woodland molluscan taxa (see Campbell *et al* in press). Davies and Wolski (2001) show the potential for calculating the maximum distance of Late Neolithic woodland from a monument (pollen analysis is unlikely to be able to do this due to the lack of sufficiently-resolved data for reconstructing clearing sizes (Brown 1997)) but state that it is not possible to determine the structure of the woodland itself (ie the number and density of trees). There are slight indications for Late Neolithic vegetation regeneration in the Stonehenge region; the molluscan evidence hints at the presence of scrubby vegetation (from Coneybury) and longer mesic grassland (from Stonehenge); however, given the uncertain nature of ditch deposits, this is not irrefutable. Interestingly, pollen evidence from the buried soils below some sites within the Avebury region (Avebury Henge, Horslip long barrow and Knap Hill) implied a regeneration phase earlier – in the Early Neolithic – following agricultural and pastoral phases of land-use; although the (un)reliability of pollen assemblages from buried soils should not be forgotten.

The high abundance of bracken spores – and in places, its charred tracheids – is typical of Neolithic soil pollen diagrams from the region (eg at South Street long barrow (Dimbleby and Evans 1974)). This was considered problematical given its modern rarity on chalkland soils and more common association with woodland and heathland habitats. Possible reasons for the anomalous abundance of bracken were suggested by Dimbleby and Evans (1974): i) that bracken *was* growing in the area ("there is no ecological objection to the growth of bracken on calcareous soils" (Dimbleby and Evans 1974, 129)) and supported by Dimbleby (1979b) from his observed stratification of *Pteridium* spores in the soil suggesting their deposition immediately prior to the soil's burial, ii) spores blew in and were concentrated through differential preservation, and/or iii) bracken was deliberately brought to the site eg as old animal bedding used as fertiliser. Bracken is known to have been used for multiple applications, especially as animal bedding but also as a fertiliser (either from its incorporation as animal bedding with animal dung, or burnt first to make potash) (Rymer 1976), and as a mulch to damp down weeds. It could also be derived from the animal dung of wild animals, such as deer, for example. More recently Scaife (1990), from work at Hazleton North long barrow, suggested that it colonised after burning events. This has also been proposed for Whitesheet Down (Scaife in Rawlings *et al* 2004) – or, after woodland clearance at Stonehenge (Scaife 1995a). Bracken can establish on neutral-acidic conditions, such as on Clay-with-Flints. Bracken colonies tend to be strongly calcifuge, though as young sporelings plants are calicicolus, an adaptation that allows the plant to invade fire-burn habitats (Page 1988, 284).

4. How did the landscape appear in different areas of the Stonehenge landscape – eg river valley, dry valleys and upland areas?

The most relevant pollen record from Stonehenge is that from Durrington Walls on the River Avon floodplain (Scaife in Cleal *et al* 2004; see also **Chapter 2 – Geology, Landscape and Soils**); although even this sequence lacks a detailed age-depth model, and has hiatuses. It does provide some information on the vegetation of a wet valley environment, although whether it was initially a true river valley or low marshy area with seasonal in-wash is not clear (Scaife in Cleal *et al* 2004, 231); it showed a late glacial vegetation dominated by open grass and sedges, replaced over time by birch and pine. Oak, elm and hazel then increased as the climate improved in the Early Holocene. Following a hiatus, the record here became dominated by herbs, with much reduced tree and shrub taxa (although lime was present). The taxa indicated a floodplain (fen peat) environment (notably grasses, sedges, with marsh-marigold reedmace/bur-reed) but with some evidence of arable activity (cereal pollen and the arable-associated weeds (segetals)) and cleared/waste ground and pastoral habitats (goosefoots and oraches, clovers, docks and plantains). Overall, this was taken to infer a period of intensified land clearance, although the timing of this is unclear given the lack of dating within the profile.

Chapter 4. Plant Resources

Ruth Pelling and Gill Campbell

Introduction

This review of the archaeobotanical evidence from Stonehenge and the surrounding area represents a critical reappraisal of the evidence, focussing on the primary data. As its starting point the geographical focus encompasses the WHS and the surrounding 'Stonehenge Landscape' as defined by Darvill (2005, 6). Evidence for the broader 'Stonehenge Region' and 'World', also defined by Darvill (2005, 7) is taken from the data gathered as part of a review of plant remains for English Heritage for southern England (Campbell *et al* in press), as well as published data elsewhere in the country. Sites in Northern England and Scotland are not included given the potential for different cultural traditions and chronological trends. A recent publication by Bishop *et al* (2010) summarizes the available data from Scotland, while Hall and Huntley (2007) discuss Northern England.

Despite the significance of the Stonehenge landscape and the vast weight of published literature, very few archaeobotanical remains have been recovered from the immediate area. In large part, this is likely to be due to the absence of substantial research excavation employing modern sampling techniques and large sample sizes (see Campbell *et al* 2011; Jones and Rowley-Conwy 2007), as well as the ceremonial nature of the landscape. Excavation employing bulk sampling and flotation recovery techniques sufficient to generate potentially useful quantities of charred plant remains, has been limited in the WHS and surrounding area, with none prior to the work published in Richards 1990. While plant impressions in pottery were examined from Windmill Hill in the Avebury WHS and West Kennet by Helbaek (1952), bulk sampling and flotation was not employed until much later (Fairbairn 1993; 1997; 1999; 2000). The recent work at Durrington Walls is contributing substantially to the available data and provides a particularly valuable contribution for the Late Neolithic (Ellen Simmons pers comm), although dates recently obtained on cereals have demonstrated the presence of more recent contamination on the site. Thus, critical examination of the primary data reveals that discussions concerning the nature of the arable economy of the people who built Stonehenge tend to be based on conjecture and only slight evidence from plant remains themselves.

Outside the area, the nature of the Neolithic plant based economy is better understood, although not without controversy. The debates continue as to the relative importance of cereal cultivation and collected wild resources, the scale of cereal cultivation and related to this, the degree of sedentism or mobility. Those who argue for a more cereal-based economy stress that often the low amounts of charred grain recovered can be related to insufficient sample sizes and under-sampling (Jones and Rowley-Conwy 2007; Jones and Legge 2008) and that the evidence for cereals is much more comparable to mainland Europe than often credited (Bogaard and Jones 2007). They also attribute the apparent over-representation of charred hazelnut shells to taphonomic processes and the differential treatment of product (cereal grain charred only accidentally or as a burnt offering) versus waste (hazelnut shell disposed of in the fire). Opposing this view are those who argue that, regardless of routine sampling for plant remains, there continues to be an overrepresentation of wild fruits and nuts (particularly hazelnut) compared to cereals, and that this does reflect a diet in which wild foods were of significantly greater importance than in later periods (Robinson 2000; Jones 1980). In addition, Robinson (2000) (see also Moffett *et al* 1989; Stevens and Fuller 2012) raised the fact that Late Neolithic features tend to produce fewer cereal remains than Early/Middle Neolithic. This trend is still apparent in southern Britain suggesting the route from hunter gatherer to fully fledged arable farming may not be straightforward.

The nature of the evidence

Plant remains are preserved archaeologically through charring (resulting in the conversion of the organic content to stable carbon), anaerobic waterlogged conditions (in which bacterial decomposition is prevented by the lack of oxygen), or by calcium phosphate mineralisation (usually associated with middens or cess pits). Waterlogged conditions are particularly rare in the chalk landscape and no waterlogged plant remains have been recovered from Neolithic deposits in the area, although delicate biological remains have been recovered from Late Neolithic (Chalcolithic) contexts within the centre of Silbury Hill (Campbell 2011; Robinson 2011a; Hall 2011).

Nationally, waterlogged plant remains are extremely rare for the early prehistoric period. Where waterlogged plant remains do occur, for example at Etton causewayed enclosure, Cambridgeshire (Nye and Scaife 1998), they are dominated by naturally occurring plant species reflecting the immediate vegetation rather than economic activities. Similarly, no mineralised remains are known prior to the Middle Bronze Age. Charred plant remains therefore form the basis of this discussion on plant use, supplemented by other proxy data for the landscape, woodland clearance and tillage where it is available. Details of the archaeobotanical data from the Stonehenge landscape are given in Table 4.1.

Charring of plant materials, by its very nature, creates a bias towards small, dense material. Cereal grains and weed seeds, the denser chaff parts (glume bases, rachis, culm nodes, rhizomes), fruit seeds and stones, nut shells and some tubers are typical of charred assemblages. While tubers, corms and bulbs are preserved, they are often not diagnostic in form, identification tending to be limited to small distinctive tubers of pignut (*Conopodium majus*), onion couch grass (*Arrhenatherum elatius*) and lesser celandine (*Ranunculus ficaria*).

The characteristic cereals of the Neolithic and Early Bronze Age are emmer wheat (*Triticum dicoccum*) and barley (*Hordeum vulgare*). Occasionally free-threshing bread wheat (*Triticum aestivum*) type grains have also been recorded, although they are rarely directly dated and frequently found to be intrusive. Tentative identifications of einkorn (*Triticum monococcum*) also exist for a few Early Neolithic sites. Spelt wheat (*Triticum spelta*) is not reliably identified until the Middle Bronze Age, when it is likely to have been introduced. Emmer and spelt wheat are hulled or glume wheats (often not distinguishable so recorded as *Triticum dicoccum/spelta* or 'hulled wheat') in which the grain is held in tightly enclosing glumes. Unlike free-threshing grain which is easily released from its chaff, the hulled wheats require additional pounding in order to release the grain. Hulled wheats are thought to have been stored in spikelet form (pairs of grain enclosed in their glumes) which provides additional protection against fungal and insect damage. Processing is likely to have been conducted within the settlement or household on a regular basis, the waste by-product (chaff, rachis and weed seeds) being separated by sieving. This waste may have been thrown or swept into domestic fires on a regular piecemeal basis (though such waste can also be used as fodder). The lower portion of the glumes in hulled wheats is dense and woody and therefore survives charring better the more papery upper parts. Hulled wheat chaff preserved archaeologically therefore tends to consist of 'glume bases' and 'spikelet forks' (pairs of glume bases still attached to each other) with occasional denser rachis internodes (Hillman 1981; 1984).

Table 4.1 Macroscopic plant remains recovered from the Stonehenge World Heritage Site (Neolithic to Middle/Later Bronze Age)

Reference	Site	Volume floated	Grain	Chaff	Weed s	hazel frag	Other wild	Tuber	Notes
Phase 1 - before StonehengeEarly Neolithic (4000-3000 BC)									
Carruthers 1990	Coneybury Anomaly	61 l	emmer/spelt x 10 indet cereals x 40	emmer x1					
Carruthers 1990	Wilsford Down, pit	10 l				2			
Carruthers 1990	Robin Hood's Ball, pits	102 l	Indet x1			26		indet x 2	
Middle Neolithic (3500-3100 BC)									
Allen 1997a; 1995a	Stonehenge Cursus, base of secondary fills	?	emmer grain x ?						Noted in molluscs sample
Carruthers 1990	Lesser Cursus	hand						indet x5	
Carruthers 1990	King Barrow Ridge, pits	125 l	emmer/spelt x1		1	160	sloe stone x1		
Late Neolithic/Chalcolithic: Phase 2 – the time of building Stonehenge (3000 – 2200)									
Simmons pers comm	Durrington Walls	13600 l			?	Many	Apple, sloe, indet fruit	Arrhen, indet	C14 suggests grain is all intrusive (Middle Bronze Age and later)
Clapham 1995a	Aubrey Hole 5, cremation	hand						Arrhen x1	cremated bone 2xburnt skewer pins some Romano-

									British pot
Scaife 1995a	The Avenue (Vatcher excavations)	hand	indet caryopsis x1		11				
Carruthers 1990	Coneybury Anomaly upper fills	25 l			2				
Early Bronze Age: Phase 3 – honouring Stonehenge (2200-1500 BC)									
Carruthers 1990	Coneybury Henge context unclear	26 l	naked barley x 159 hulled barley x 102 barley x 43		5		cf hawthorn stone x 1	Arrhen x1	Confirmed Early Bronze Age by C14 dates
Carruthers 1990	Beaker pit, W2	10 l				1			Late Neol, Beaker & M/L BA pot and MBA copper alloy.
Middle/Later Bronze Age									
Simmons pers comm	Durrington Walls	?	cf emmer x ++ barley x ++						
Stevens 2008a	A303 Area P, WA52246 (MBA), pit	30 l	barley x 4 emmer/spelt x 1 indet x 8		3		?sloe x 1 hawthorn x 1 thorn x 1	Arrhen x1	
Carruthers 1990	Fargo Wood II (LBA) postholes	6 l	emmer/spelt x 1 indet x2			1			

Arrhen = *Arrhenatherum elatius* (onion couch grass) tuber
Hazel – hazelnut shell fragments
Chaff = glume base

Free-threshing cereals are more likely to be threshed and winnowed close to where they are harvested and the grain brought into the settlement for storage. In addition, the glume bases of the free-threshing wheat are less woody than those of hulled wheats and tend not to survive charring. While the more robust rachis may survive charring, it is less likely to enter the settlement unless brought in for use as animal feed/bedding, thatch and so on. Free-threshing chaff therefore enters fires (and consequently the archaeological record) less regularly, through burning of animal dung and bedding, thatching or straw rather than the routine burning of day-to-day cereal processing waste (Hillman 1981; 1984). Free-threshing wheat grains are often difficult to distinguish from hulled grain which has been charred after the removal of its chaff (the grain can puff up significantly). When free-threshing wheat grains are directly dated they have often produced later, medieval or post-medieval dates indicating a substantial problem of contamination. The significance of free-threshing wheat in the Neolithic is therefore difficult to establish although its presence in Early Neolithic Kent has recently been confirmed (Carruthers forthcoming a; b).

Two varieties of barley were grown in Britain following the introduction of agriculture: hulled barley (*Hordeum vulgare* var *vulgare*) and naked barley (*Hordeum vulgare* var *nudum*). Both are free-threshing in the sense that the grain is easily released from the ear. While hulled barley produces grain where the paleas are fused to the grain, in naked barley this characteristic has been lost and the grain falls free from its chaff when mature (Zohary and Hopf 2000, 60). Both forms of barley have been recorded from Neolithic sites in Britain, although there seems to have been a greater focus on naked barley in the south west. Naked barley largely disappears from the record by the end of the Bronze Age being re-introduced in the medieval period. Although it is not strictly necessary, hulled barley grain is often moistened or parched to ease the removal of the adhering chaff prior to grinding into meal or flour. The hulls are removed by rubbing or beating (hummeling, Fenton 1978, 373; Hillman 1981; 1984). If the intention is to malt the grain in order to produce beer dehusking is not necessary (see **Chapter 7 - Diet** for a discussion of brewing).

Contextual and dating issues

In the absence of large scale modern excavation other than at Durrington Walls, there are a number of problems with interpretation and reliability of the archaeobotanical data. The primary issue of concern is the small dataset and the danger of over interpreting very minor assemblages. Isolated finds are of limited interpretative value particularly in the absence of direct dates on the finds themselves. Until recently, none of the Neolithic or Early Bronze Age cereal remains in the published literature from the Stonehenge landscape had been directly dated. This was particularly problematic in the case of secondary fills of features which have produced finds of mixed date (for example Coneybury Henge). Equally, individual finds of isolated grain without a direct date are notoriously unreliable. That two post-Roman dates were obtained from grain recovered from the 2008 excavations at Stonehenge (Darvill and Wainwright 2009, 15) demonstrates the potential for intrusive material to enter apparently secure contexts. This has been confirmed by a recent English Heritage funded dating programme of cereals from Durrington Walls, all of which have been shown to be intrusive including those from contexts apparently sealed beneath the henge bank (Table 4.2). Problems in the use of molluscs, pollen and other indicators of vegetation and landscape patterns in the Stonehenge landscape have been discussed by Allen (1997a; see also **Chapter 3 - Vegetation History** and Davies 2008), particularly on the reliability of using data from monuments to extrapolate to the wider landscape. Problems of individual finds will be discussed later in the text.

The use of pollen as an indicator of cereal cultivation is particularly problematic in the region. Pollen is locally poorly represented, largely due to the absence of suitable deposits (see **Chapter 3 - Vegetation History**). Given the poor dispersal mechanisms of cereal pollen (in addition to inherent difficulties of identification which is only to the level of 'type'), it is likely that where cereal pollen is recorded it implies cereal processing or the deposition of cereals within or very close to that feature. It does not necessarily imply cultivation in surrounding fields or plots. Most significant in the Stonehenge region is the poor dating of pollen profiles in which cereal-type pollen has been recovered. Cereal-type pollen is recorded in the upper profile of the Stonehenge Car Park pits in association with herbs that could indicate arable activities (eg *Sinapis* type, *Chenopodium* type, *Fallopia convolvulus*) (Scaife 1995a, 52). A Mesolithic date was obtained on *Pinus* charcoal from these deposits (8400±100 BP (OxA-4220) 7593-7183 cal BC), showing some residual contamination. The tertiary fill is regarded as representing a Sub-boreal environment (ie Late Neolithic-Bronze Age), suggesting a hiatus (Allen 1995a, 55). Clearly the date of this context is uncertain and interpretation of the cereal-type pollen record is difficult.

Some cereal-type pollen was identified from a sample taken from buried soils as part of the A303 improvement scheme Peglar (2008). The absence of associated dating evidence and bioturbation/sediment mixing again prevents any meaningful interpretation.

A core through peats in the Avon Valley *c* 80m east of Durrington Walls, has also produced cereal-type pollen along with taxa typically associated with arable conditions and clearance (Scaife in Cleal *et al* 2004). Again problems of dating hinder any interpretation; a hiatus occurs between the Late Devensian/Early Holocene vegetation zone durr 1 and durr 2 of unknown length. As discussed in **Chapter 3 -Vegetation History**, such a period of inferred intensification of land clearance (as suggested in durr 2) typically represents the Bronze Age (or later) deforestation. Refined dating of these deposits is needed to clarify pollen zone chronology.

Phase 1 - Before Stonehenge (The Mesolithic and Early Neolithic)

Mesolithic 9500-4000 BC

Locally plant macrofossils for this phase are limited to the pine wood charcoal in the visitors centre car park (Cleal *et al* 1995, 47 (identifications by Gale)). We can assume that food plants were utilized, largely from the woodland margins along river valleys and within localised clearings. Mesolithic finds of hazelnut shell, sometimes in large quantities, have been 'found ubiquitously throughout temperate Europe' (Zvelebil 1994, 41). *Corylus* pollen from the lower zone of the Car Park pits attests to the likely availability of hazelnut locally (Allen 1995a; Scaife 1995a). Small quantities of hazelnut shell occur on most sites of this date in southern England, with larger assemblages recovered from Ascott-under Wychwood, Oxfordshire (Evans 1971c, 39), Oakhanger VII, Hampshire (Jacobi 1978a, Rankine *et al* 1960), and Thatcham, Berkshire (Scaife 1992). Potential food remains from waterlogged deposits at Westward Ho!, North Devon, associated with human activity included dogwood (*Cornus sanguinea*) stones, recovered in large numbers, hazelnut shell, sloe (*Prunus spinosa*) stones, blackberry (*Rubus fruticosus* agg.) and wild strawberry (*Fragaria vesca*) (Vaughan 1987). While it is not possible to positively demonstrate the use of these remains as food, the deposits do at least provide evidence of their availability. Charred plant remains recovered were fragments of hazelnut shell, a hawthorn (*Crataegus* cf. *monogyna*) stone and a few buds. In addition to fruit and berries it is likely that a range of above and below ground food resources were consumed such as tubers and fungi, not visible or recognisable in the archaeological record. Lesser celandine (*Ranunculus ficaria*) tubers, for example, have been identified in large quantities from Mesolithic midden deposits at Staosnaig on Colonsay in western Scotland (Mason and Hather 2000) where they may represent food remains (see discussion below).

Early Neolithic (4000-3500 BC)

Cereals appear in the Stonehenge landscape, as they do elsewhere in Britain, in the beginning of the 4th millennium cal BC. An assemblage of poorly preserved cereals, including an emmer wheat glume base and indeterminate hulled wheat grains, was recovered from primary fills within the Coneybury Anomaly (50 grains and 1 glume base from 61 litres of deposit (Carruthers 1990, 250-2)). The cereals form part of a substantial deposit of animal bone, charcoal, flint and ceramic remains which is interpreted as containing at least some deliberately placed material. The cereals themselves were not dated, although a radiocarbon date was obtained on bone of 3980-3708 BC (OxA-1402; 5050±100BP). There is evidence that the pit fills are significantly compressed in this feature and Later Neolithic finds were recovered from the upper fills (Richards 1990). However, the primary fills do seem to be well sealed and the cereal assemblage is of a good size, so we must assume the charred plant remains are contemporary. A less reliable single indeterminate grain was recovered from Robin Hood's Ball W31 (Carruthers 1990). In the broader Stonehenge region the causewayed enclosure of Windmill Hill, in the Avebury World Heritage Area produced a modest quantity of cereals from inside the enclosure (167 cereal grains from 1000 litres of deposit) associated with weed seeds (*Galium aparine*, *Plantago lanceolata*, *Chenopodium* sp, various small seeded grasses), and rare chaff remains and tubers. Outside the enclosure, cereals were recovered in greater density (129 grains plus numerous fragments from 22.5 litres) (Fairbairn 2000).

Alongside the cultivated cereals, Early Neolithic populations in the Stonehenge area were also collecting wild food resources. Occasional hazelnut shell fragments and indeterminate tubers were recovered from Early Neolithic Robin Hood's Ball and Wilsford Down (Carruthers 1990, 250-2). In neither case were the quantities of nut shell anything more than would be expected for occasional casually discarded burnt food waste. It is not possible to establish if the tuber fragments represent food debris or simply derive from the burning of turf or handfuls of pulled grasses.

The date on bone from the Coneybury Anomaly is consistent with early cereal dates across southern Britain which suggests that cereal cultivation spread fairly rapidly in the first quarter of the fourth millennium. Cereals have been routinely recovered from sites of this phase, although usually in low densities and associated with finds of hazelnut shell and occasionally other wild plant foods, notably sloe (*Prunus spinosa*) and crab apple (*Malus sylvestris*). Remarkable deposits of cereals grains have occasionally been recovered from sites of this period, notably from long houses at Lismore Fields in Derbyshire (Jones and Rowley-Conwy 2007) and Balbridie, Grampian Region (Fairweather and Ralston 1993), both outside the region. In both instances the longhouses were destroyed by fire, resulting in the charring of many thousands of stored grains. Such destruction deposits associated with long houses are rare events and the examination of a number of long houses elsewhere such as Yarnton in Oxfordshire (Robinson 2000), Horton in Berkshire (Pelling forthcoming a) and White Horse Stone in Kent (Giorgi 2006) have resulted in no or only occasional grains from badly truncated deposits.

A number of pit deposits have also produced exceptional assemblages, often with many thousands of grains or spikelets. Such finds include the several thousand emmer wheat spikelets from Hambledon Hill, Stepleton Enclosure, dated to 3650-3500 (75%) or 3440-3370 (20%) cal BC (4750±40; OxA-7839) and 3640-3490 (61%) or 3470-3370 (34%) cal BC (4730±45: OxA-7840) (Jones and Legge 2008). A deposit of emmer wheat spikelets, naked and hulled barley grain (396 grains, 176 chaff items 21 weeds) from a pit at Poundbury Farm, Dorset (Pelling 2011a) produced a series of dates (NZA-31070 and UBA-16020, 16021) which when modelled (Barclay 2011a, 8) fall between 3770-3640 (95.4%) cal BC and 3680-3630 cal BC (86.9%), or less likely an end date of 3550-3540 cal BC (8.5%). A large deposit of spikelets from Westwood Cross, Thanet, Kent (Stevens 2011) produced a potentially slightly earlier, but similar range of dates (3800-3650 cal BC, NZA-2654; 4951±35 uncal bc; 3790-3650 cal BC, UBA-13386, 4958 ±30 uncal bc and 3940-3670 cal BC, UBA-13385, 4986±30uncal bc) all on emmer grain. Such pit deposits could represent spikelets burnt in storage (although the Poundbury pit for example is not likely to have been suitable this purpose), or simply discarded dumps of spoiled or accidentally burnt crops. Alternatively these assemblages may represent something out of the ordinary; potentially deliberately burnt and deposited 'offerings'. While intensive sampling will increase the opportunity of recovering such deposits, there remains an element of chance in their discovery.

A number of sites have produced cereal assemblages from sealed midden or occupation deposits which (as suggested by Robinson 2000, 87) may be less likely to have any ritual implication. At Hazleton, Gloucestershire (Moffett *et al* 1989; Straker 1990), Early Neolithic midden material was sealed beneath a long barrow. In excess of 1000 fragments of hazelnut were recovered with 283 cereal grains. At The Stumble, Blackwater Estuary, Essex (Murphy 1989; Wilkinson and Murphy 1995) a mixture of grain, chaff, weed seeds and fruits and nuts were recovered from cut features sealed beneath estuarine deposits. A date of 4675±70 BP (OxA 2299), 3640-3340 cal BC (95% confidence) on emmer grain (Wilkinson and Murphy 1995, 58) falls in the Early Neolithic, while later Neolithic dates were also obtained. Midden deposits sealed in the top of a palaeochannel at Dorney on the Middle Thames Valley (Robinson 2000; Robinson 2011b, 188-9), produced 99 grains to 53 hazelnut shell fragments, 3 sloe stones, a hawthorn stone and a weed seed from 967 litres. A deposit of emmer wheat spikelets (470 grains - including emmer, hulled wheat and indeterminate wheat grain - to 213 glume bases) sealed beneath peat in Newham, East London (Pelling forthcoming b), was dated to 3770-3630 cal BC (4890±35BP; GU-18956). While this last assemblage may represent a placed deposit, the rest of the plant remains are from more mixed deposits containing contemporary cultural material as well as vertebrate remains and may therefore be regarded as more typically representative of routine waste (see **Chapter 9 - Depositional Practice**).

A number of other sites, such as Maiden Castle (Palmer and Jones 1991) and Flagstones, Dorset (Straker 1997) have produced smaller assemblages of mixed cereals and wild food plants from a range of features. However, they are often in very low densities, and it is not possible to speculate on the relatively importance of either cereals or wild foods. A much publicised and unusual fragment of charred barley 'bread' from Yarnton on the Thames Valley in Oxfordshire provides some clues as the use of the cereals. The fragments consist of a number of coarsely ground grains including grain identified as barley (see also **Chapter 7 – Diet**). A combined date of 3620-3350 cal BC (OxA-6475±70BP; NZA-8679: 4672±57BP, Robinson 2011b, 189) is comparable to some of the early dates on cereals.

The most common cereals cultivated by Early Neolithic farmers appear to be barley and hulled wheat, although free-threshing wheat (ie naked wheat) has now be securely dated to this period. Naked forms of barley have been identified (including directly dated examples) from grain deposits at Poundbury Farm, Dorchester, Dorset (Pelling 2011a) and Westwood Cross, Thanet, Kent (Stevens 2011), and from samples at Hambledon Hill and Stepleton Spur (Jones and Legge 2008), and East Porth Samson, Isles of Scilly (Ratcliffe and Straker 1996). Naked barley is also recorded in pottery impressions at Whitehawk, Brighton, Maiden Castle, Dorset, West Kennet and Windmill Hill in Wiltshire (Helbaek 1952). Hulled barley is positively identified from a number of sites in low numbers including Windmill Hill (Fairbairn 1999) and Dorney in the Middle Thames Valley (Robinson 2011b, 189).

The hulled wheat most associated with the Early Neolithic is emmer (*Triticum dicoccum*) which has been identified from a number of sites in southern England including Poundbury Farm, Westwood Cross, Hambledon Hill (Pelling 2011a; Stevens 2011; Jones and Legge 2008) as well as Lismore Fields in Derbyshire (Jones and Rowley-Conwy 2007) and Balbridie, Grampian Region (Fairweather and Ralston 1993). Possible einkorn wheat (*Triticum monococcum*) has been identified from Hazleton, Gloucestershire (Straker 1990), Windmill Hill causewayed enclosure on both charred chaff and pottery impressions (Fairbairn 1999; Helbaek 1952) and The Stumble, Essex (Murphy 1989; Wilkinson and Murphy 1995). The status of free-threshing wheat in the Neolithic has been harder to verify until recently. A number of grains of possible free-threshing wheat were recovered from Hazleton North, sealed beneath the long barrow, although given the notorious problems of identifying wheat grain in the absence of chaff (Hillman *et al* 1996) and the presence of a (directly dated) post-medieval grape seed (Saville *et al* 1987, 110) this identification is tentative. Two examples of short, compact forms of free-threshing grain recovered from basal fills of Neolithic pits at a site in Ramsgate, Thanet, Kent have been radiocarbon dated producing dates of 3765-3722 cal BC (UBA-13517, 4948±30) and 3695-3651 cal BC (UBA-13518 4896±29), while a further two grains have produced similar dates from a site at Thanet Earth (Carruthers forthcoming a & b). Of interest here is the presence of a rachis node from Thanet Earth recently identified as the tetraploid variety, *Triticum durum* or *turgidum* (durum or rivet wheat; Stefani Jacomet pers comm). This is the first identification of tetraploid wheat from prehistoric Britain. Conversely at Horton, Berkshire, dating of free-threshing type wheat grain from an Early Neolithic house and

Fig 4.1 Modern barley ear and charred hulled barley grain from a prehistoric deposit at Stanwick. Photographs by Gill Campbell and Ruth Pelling

associated pits consistently produced medieval or post-medieval dates, despite barley producing Early Neolithic dates from the same contexts (Pelling forthcoming a; Chaffey *et al* forthcoming). Free-threshing forms do appear to be present in the Early Neolithic, at least on the Isle of Thanet, but at many sites contamination of shallow Neolithic deposits by later free-threshing wheat is likely to be a common occurrence.

Evidence for other cultivated, non-cereal, crops from this period is slight and likely to significantly under-represent the importance of these foods and fibre plants as their processing does not usually involve exposure to fire. Two flax (*Linum usitatissimum*) seed impressions were recorded in Early Neolithic pottery from Windmill Hill (Helbaek 1952, 197), whilst charred seeds and capsule fragments were recovered from Ellington School, Ramsgate, in association with the dated free-threshing wheat (Carruthers forthcoming a). Flax is recorded in much greater numbers (124 seeds) from Lismore Fields, Derbyshire (Jones and Rowley-Conwy 2007) as well as Balbridie, Grampian (Fairweather and Ralston 1993). As well as being a food source, flax could also have been used as a fibre for textile production (see **Chapter 10 - Design, Clothing and Personal Adornment**).

A possible broad/Celtic bean (cf *Vicia faba*) was identified from a Neolithic house at White Horse Stone (Giorgi 2006, 8-9) although the possibility that this represents intrusive material (an iron nail was found in the sample posthole) has been raised by the author. Eight seeds of opium poppy (*Papaver somniferum*) were recovered from the waterlogged fill of a long barrow ditch at Raunds, Northamptonshire dated by association to the first half of the 4th millennium BC (Campbell and Robinson 2007), and

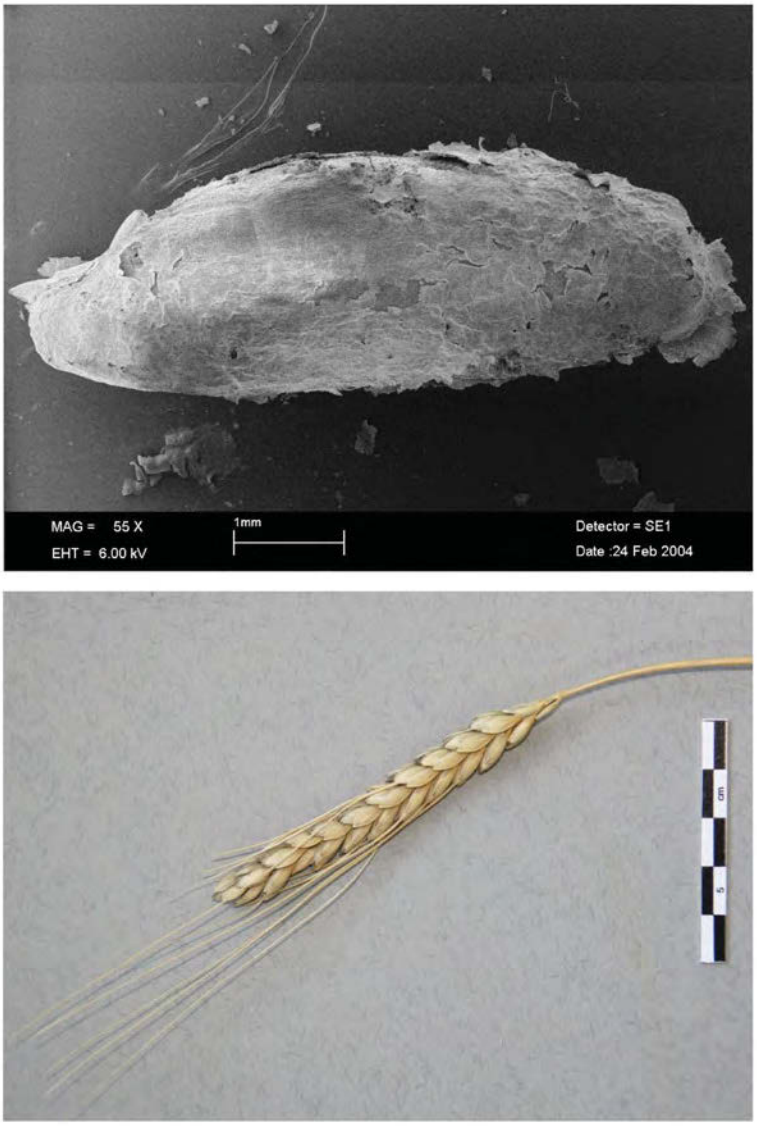

Fig 4.2 Emmer wheat (*Triticum dicoccum*), modern ear and charred grain from prehistoric deposits at Stanwick. Photographs by Gill Campbell and Ruth Pelling

single seeds of indeterminate poppy were recovered from both White Horse Stone (Giorgi 2006, 8-9) and Windmill Hill (Fairbairn 1999). This plant may have been used as a drug, or it could have been grown for flavouring or as an oil crop. The pressed seeds make an excellent cattle cake while the leaves can be fed to pigs (Crawford 1973, 230; Campbell and Robinson 2007, 33). It seems likely that opium poppy was first cultivated in the western Mediterranean from where it spread around the world. There are numerous records dating to the Early and Middle Neolithic from northern Europe (Zohary and Hopf 2000, 135-8).

Most surprising was the find of an apparently domestic-type grape (*Vitis vinifera*) seed and piece of *Vitis* charcoal from Hambledon Hill, Dorset (Jones and Legge 2008; Austin *et al* 2008), the seed producing a radiocarbon date of 3640-3340 cal BC (OxA-931; 4660 ± 80). While the date on the grape is slightly later than the earliest cereal dates, it is a remarkably early for a find of grape in Britain, which thereafter does not re-occur in southern England until the beginning of the Roman period (van der Veen *et al* 2008). The status of grape as an Early Neolithic cultivar or import from this single find unfortunately remains unclear. Martin Jones (2007, 171-2) has postulated long distance transport of either dried or fresh fruit to the site as an exotic addition to a feast.

Weed assemblages associated with cereals in this phase are limited and at several sites (eg The Stumble, Hazleton, Poundbury, Westwood Cross, Hambledon and Stepleton Enclosure) consistently include some or all of the same few taxa: black bindweed (*Fallopia convolvulus*), docks (*Rumex* spp.), cleavers/goosegrass (*Galium aparine*), lesser stitchwort (*Stellaria graminea*), fat hen as well as other goosefoots (*Chenopodium album*, Chenopodiaceae indet), vetches/tares (*Vicia/Lathyrus*), knotgrass (*Polygonum aviculare*) and grasses (Poaceae). These taxa are capable of exploiting a range of habitats and it is likely that a flora more specifically associated with cereal crops took time to develop.

Hazelnut shell and other wild resources are often present in large quantities such as at Hazleton North, Gloucestershire (Straker 1990), Whitesheet Hill causewayed enclosure (Hinton 2004) and Ellington School, Ramsgate (Carruthers forthcoming a). In numbers of fragments or weight, hazelnut shell outnumbers cereal grains at these sites. Conversely the grain rich deposits at Poundbury Farm (Pelling 2011a), Hambledon Hill Stepleton Spur (Jones and Legge 2008), and Westwood Cross (Stevens 2011) produced only few or no hazelnut shells, although at Poundbury Farm and Hambledon Hill hazelnut was present in other deposits.

That hazelnut shell is rare in grain-rich assemblages is unsurprising if it is considered these deposits may represent accidentally burnt, or possibly sacrificed, stored/discarded grain supplies and are therefore unlikely to include hazelnut debris. The bulk of low density scatters of grain and hazelnut shell or other material on sites is likely to represent mixed waste, often re-worked and moved across a site. Storage of grain and hazelnut shell is likely to be separate. Where hazelnut shell is found in large numbers it is possible that it too represents a stored product, the oily kernels rarely surviving burning and the shell potentially fragmenting if burnt whole. At Ellington School, Ramsgate, 500 fragments of hazelnut shell were found in the bases of two pits in association with cereal grain (including a compact form of free-threshing wheat) and in one pit a flax seed (Carruthers forthcoming a). The consistency of the composition of the fills of these two pits and concentration of charred remains suggests deliberately-placed burnt offerings which would imply some level of significance applied to both the hazelnuts and the grain.

In addition other wild plants exploited include crab apple (*Malus sylvestris*) recorded, for example at Early Neolithic Yarnton (Hey and Robinson 2011a), Windmill Hill (Fairbairn 1999) and Penhale Round in Cornwall (Carruthers forthcoming c). Sloe (*Prunus spinosa*) is also commonly encountered, for example at Yarnton and Dorney in the Thames Valley (Hey and Robinson 2011a; Robinson 2000) and the causewayed enclosures of Whitesheet Hill (Hinton 2004) and Windmill Hill (Fairbairn 1999). Tubers are encountered at a number of sites, of which three species are typically identified: onion couch grass (*Arrhenatherum elatius*), pignut (*Conopodium majus*) and lesser celandine (*Ranunculus ficaria*). Onion couch grass or false oat grass is routinely recovered archaeologically in small numbers and is likely to reflect the burning of handfuls of grasses as tinder, or as a method of clearing grasses to form a wind break, then throwing the resulting handfuls onto a fire. They are particularly associated with Bronze Age cremations. Stevens (2008b) suggests this may be related to the need to

create a fire break around the pyre site, the tubers pulled up with handfuls of grasses incorporating other weeds and being thrown onto the pyre, whereas Campbell (2007, 30) suggests that their presence may reflect the use of turves as fuel, or the digging of shallow pits or scoops under pyres resulting in the vegetation exposed in the sides of the pit becoming burnt. Robinson (1988) suggests that the dried stems of *A. elatius* would have been useful tinder for lighting fires and that the swollen internodes could easily have been uprooted with the plant and burnt. It is unlikely that they were used as a food source as there is no evidence for this in historical or ethnobotanical literature. They are also deemed to be quite inedible (Mears and Hillman 2007, 331).
In terms of local environment, the presence of onion couch grass tubers suggests that there were cleared areas near to the site that were not being agriculturally utilised, abandoned arable fields or grassland not being grazed by animals (Robinson 1988). Although remains could also derive from intensive weeding of arable plots where onion couch has invaded from the margins. A number of tubers were recovered from beneath the long barrow at Hazleton North (Straker 1990) may be the result of such activities.

Pignut (*Conopodium majus*) has been identified in low numbers at several sites including two in Wiltshire: Windmill Hill (Fairbairn 1999) and Whitesheet Hill (Hinton 2004), where they could represent food remains. The nutty tubers are edible either raw or cooked and is it probably this nut to which the song 'Here we go gathering nuts in May' refers. Pignut tubers will not pull out from the ground easily and need to be dug out from the soil, suggesting deliberate effort was involved in their collection. Underground, the stem forms a right angle to the tuber and so detaches easily, which makes careful digging necessary (Mears and Hillman 2007, 251).

A lesser celandine tuber was recorded at Windmill Hill, where a medicinal use was postulated (Fairbairn 1999). A particularly substantial deposit of 259 lesser celandine tubers was recovered from a pit broadly dated as 'Neolithic' at Long Range, off the A30 near Honiton (Clapham 1999). A single barley grain, a pignut tuber and fragments of hazelnut shell were also found in the sample.

Lesser celandine is characteristic of damp, open grassland, although also common in shady conditions and as a woodland edge species, producing numerous tubers at or just below the surface of the soil that are easily pulled. Such a large number of tubers may be the result of burning of turfs or deliberate collection and burning of this resource, or accidental charring during roasting for food preparation. *Ranunculus* species contain a toxin, protoanemonin, that tastes acrid and burns the throat, which means tubers need to be processed either by boiling, roasting or drying before eating (Kuhnlein and Turner 1991). Mesolithic examples have been recovered from the Hebrides (see above). Mesolithic and Neolithic examples from Europe have tended to be interpreted as food debris. Bronze Age tubers were recovered from hearths, cooking pits and cultural layers at Ajvide, Denmark (Engelmark and Viklund 1988). Lesser celandine tubers are known to have been cooked and included in salads, the tubers boiled, dried and then ground into a flour in Sweden and in eastern Netherlands cooked or baked and served like potatoes with meat (Mason and Hather 2000). Lesser celandine can also be used to purge the body (Fairbairn 1999), and was used as a cure for piles and scrofula - the King's Evil (Grigson 1987, 142).

Middle Neolithic (3500-3000 BC)

For the Middle Neolithic, evidence is particularly sparse from the Stonehenge area, as it is across southern Britain as a whole. In large part this is due to the paucity of settlement sites and the difficulties in recognising Middle Neolithic archaeology. The dates on grain from Hambledon Hill and Stepleton Enclosure (Jones and Legg 2008) and from The Stumble in Essex (Wilkinson and Murphy 1995, 58) suggest the cereal assemblages at these sites may span the Early to Middle Neolithic period. Indeed cereal grains appear to have been deposited throughout the Neolithic at The Stumble. A single grain of hulled wheat was recovered from 125 litres of soil processed at Middle Neolithic King Barrow Ridge W59, in association with hazelnut shell, a sloe stone and a weed of black bindweed (*Fallopia convolvulus*) (Carruthers 1990). From the Lesser Cursus five unidentified tubers were recovered by hand (Carruthers 1990). Allen (1997a, 129) makes reference to charred caryopses of *Triticum dicoccum* (emmer) from the base of the secondary fills of the Cursus, in a mollusc sample. In the absence of any direct date, the reliability of this find must be questioned particularly given the deposits examined were exposed following a tree fall as a result of a storm.

Within the Avebury World Heritage site a 50 litre sample from a pit outside the West Kennet Avenue produced a deposit of charred hazelnut shell (309 fragments) and a single seed of goosegrass (*Galium aparine*) (Stevens 2009). Generally most records for the Middle Neolithic consist of low level scatters of grain and hazelnut shells. Elsewhere there is often a problem of residuality, with plant remains from Middle Neolithic contexts producing Early Neolithic radiocarbon dates, eg Easton Down, Wiltshire (Fairbairn 1993). Castle Hill, Honiton produced a number of cereal fragments, in association with fragments of onion couch tuber, pignut tuber, hazelnut shell fragments, sloe stones and a few weed seeds (including goosegrass, fat hen/orache, elder and sheep's sorrel grasses) (Clapham 1999).

Late Neolithic/Chalcolithic: Phase 2 – the time of building Stonehenge (3000 – 2200 BC)

Evidence for plant remains in the Stonehenge region for this phase is derived from hand collected seeds from the Vatcher excavations of The Avenue (Scaife 1995a) and a single *Arrhenatherum elatius* tuber from Aubrey Hole 5 (Clapham 1995a), presumably associated with cremation deposits. This dataset has recently been significantly augmented by the ongoing post-excavation work at Durrington Walls.

Samples were taken during the recent excavations at Durrington Walls, as part of the Stonehenge Riverside Project, from all undisturbed contexts where possible, including the sampling of midden spreads and house floors using a grid system. In total over 1000 samples have been collected and 13600 litres of soil processed. While analysis is still ongoing, the detailed large scale excavation and sampling programme has produced the most comprehensive set of archaeobotanical data from the Stonehenge area to date. Provisional results have kindly been provided by Ellen Simmons (pers comm). In common with other Late Neolithic sites, hazelnuts form the most abundant and widespread class of charred plant material. Generally the density of hazelnut shell was modest from occupation debris overlying houses and middens. A much greater density of remains was present in two house floor deposits, apparently with an increase in density in the region of the hearth and in slots to the north and east sides of one of the houses. Presumably the increased density of hazelnut shell in the hearth area represents food waste being thrown onto fires or used as fuel. Basal culm internodes of onion couch grass were present in low densities including 5 to 10 corms in one house floor deposit and occupation debris. Other wild plants represented were the occasional seeds of crab apple and sloe as well as indeterminate Rosaceae fruit flesh, tuber fragments and large culm nodes.

The Durrington Walls excavations also produced cereal remains, albeit in low densities. Grains of emmer wheat, barley and free-threshing wheat were identified from midden spreads including an occupation debris deposit (1394) overlying house 902, which was sealed by the chalk of the Durrington Walls henge bank. Articulated pig bones from the same context produced a good Late Neolithic date of 2490-2340 cal BC (95% confidence level, OxA-18934, 3930±27 BP, Marshall pers comm). Single grains were recovered from the hearth deposit in house floor 902, the fill of a possible abandonment pit adjacent to house 772 and the southern midden spread. Grains recovered from slightly later (Early Bronze Age) buried soil layer 585 include possible emmer and barley. Given the low density of cereal remains and the presence of free-threshing wheat, frequently an indicator of contamination, nine grains were submitted by English Heritage for AMS dating. In contrast to the animal bone which consistently produced Late Neolithic dates, none of the nine grains submitted for dating proved to be contemporary with the main phase of Late Neolithic activity at Durrington Walls. A range of dates was obtained from the Middle Bronze Age to the post-medieval/modern period with the grain from context 1394 producing Middle Bronze Age, Early Saxon and most-medieval/modern dates (Table 4.2). It is likely that most or all of the cereals from the site are intrusive.

Table 4.2 Durrington Walls radiocarbon dates on cereal grains (prepared by Peter Marshall)

Laboratory number	Sample	Material and context	$\delta^{13}C$ (‰)	$\delta^{13}C$ (‰) AMS	Radiocarbon Age (BP)	Calibrated Date (95% confidence)
OxA-27940	[549] <10079> sample A	Charred grain. *Triticum* sp (free-threshing) from [459] the fill of a very shallow pit [538] part of the eastern pit complex	-21.7		466±23	cal AD 1415-1450
SUERC-45872	[549] <10079> sample B	Charred grain. *Triticum* sp (free-threshing) from [549] the fill of a very shallow pit [538] part of eastern pit complex	-22.1		169±34	cal AD 1650-1955
OxA-27941	[585] <10731> sample A	Charred grain. *Hordeum vulgare* (hulled) from [585] a buried soil that formed over the Avenue.	-23.9		1558±24	cal AD 425-570
SUERC-45873	[585] <10731> sample B	Charred grain. *Hordeum vulgare* (hulled) from [585] a buried soil that formed over the Avenue	-26.1		1045±34	cal AD 890-1030
UBA-22719	[585] <10730> Sample D	Charred grain. *Hordeum vulgare* (hulled) from [585] a buried soil that formed over the Avenue.		-24.9	3197±36	1530-1410 cal BC
UBA-22720	[585] <10730> sample D	Charred grain. *Triticum dicoccum* from [585] a buried soil that formed over the Avenue.		-23.1	3126±33	1490-1310 cal BC
OxA-27942	[1394] <12067> Sample A	Charred grain. *Hordeum vulgare* (hulled) from midden deposit [1394] which accumulated over the abandoned House 902 and was sealed beneath the henge bank.	-22.6		1560±24	cal AD 425-565
SUERC-45874	[1394] <12067> sample B	Charred grain. *Hordeum vulgare* (hulled) from midden deposit [1394] which accumulated over the abandoned House 902 and was sealed beneath the henge bank.	-23.4		2949±34	1300-1040 cal BC
UBA-22721	[1394] <12073> sample C	Charred grain. *Triticum* sp (free-threshing) from midden deposit [1394] which accumulated over the abandoned House 902 and was sealed beneath the henge bank.		-21	78±33	cal AD 1680-1930

Given the widespread evidence for feasting and the volume of soil processed at the site, the absence of Late Neolithic cereal remains is striking and would suggest that either cereals were not being utilized or that only ground flour was brought into the site.

At West Kennet, sampling of material from the Late Neolithic palisade enclosures produced a seemingly reasonable assemblage of charred plant remains, comprising over 220 items (Fairbairn 1997). As the author himself discusses, the concentration of the material was very low (151 samples each of 10 to 15 litres, ie >1510 litres) and is regarded as derived from sporadic inputs of plant material during construction and later abandonment and burning of the palisade as well as contamination from later activity. Probable emmer wheat and hulled six-row barley were recovered from the ditches of enclosure 1, while enclosure 2 included some wheat chaff, possible bread wheat grain, two oat grains, a large legume and possibly a pea. However, given that large Saxon assemblages were recovered from the vicinity of enclosure 2, this material could all be Saxon in date and intrusive in the prehistoric contexts, particularly as pulses and free-threshing bread type wheat tend to be more reliably dated to later periods.

At Marden Henge in the Vale of Pewsey to the north of the Stonehenge region, recent excavation and sampling by English Heritage produced only slight evidence for hazelnut shell and a complete absence of Neolithic cereals from 686 litres of sediment processed (Pelling 2011b; a single spelt wheat glume base recovered is considered intrusive). This contrasts with the charcoal which was present in substantial quantities in the midden deposits (Hazell 2011) and bones which provided evidence for feasting activities (Worley 2011).

Elsewhere in southern Britain, cereals appear to be under-represented compared to the Early Neolithic period and in relation to collected wild plants. It is noticeable that the dense cereal deposits seen in Early Neolithic pits are extremely rare in the Late Neolithic with none present in the southern counties (unlike parts of northern England and Scotland where large cereal assemblages are found in this period). In contrast, a number of sites have produced substantial deposits of wild fruits and nuts, with no or only few cereal grains, particularly from 'Grooved Ware pits'. Where cereals have been dated from Grooved Ware pits they tend to produce much later dates (Stevens and Fuller 2012). An exception to this is a Grooved Ware pit from Clifton, Worcesterhire (Jackson and Ray 2012, 155-6; Clapham 2009). A substantial deposit of more than 8000 barley grains (hulled and naked) was recovered and a small number of wheat and other grains, as well as a large deposit of *Malus* pips and fruit fragments and few hazelnut shell fragments. Dates on grain and *Malus* seeds fall in the range of 2900 -2600 cal BC (Jackson and Ray 2012). At The Stumble (site 28A) in the Blackwater Estuary in Essex, emmer wheat has been dated to 2855-2465 cal BC (95% confidence, OxA-1914, 4020 ± 70 BP (Wilkinson *et al* 2012, 85)). The Early Neolithic dates discussed above and the artefacts associated with grain deposits at the site suggest this is one of the few sites where good cereal remains are recovered throughout the Neolithic.

On current evidence it would appear that over much of southern and midland Britain in the Late Neolithic cereal remains were less frequently burnt and deposited in pits than wild food plants. Where cereals are recorded they tend to be of emmer wheat, and barley. Einkorn has not been identified from the Late Neolithic and may only ever have been present as a weed/volunteer within the Early Neolithic emmer crops. The presence of free-threshing wheat appears doubtful given the consistent later intrusive dates on grain when ever it is directly dated (Stevens and Fuller 2012).There may be some evidence for the presence of pea (*Pisum sativum)* from the Late Neolithic onwards, although again none have been directly dated. One large legume identified as vetch, tare or pea was found at Flagstones (Straker 1997; intrusive dates were obtained from grape seeds at the site); a possible pea was identified in a Late Neolithic channel deposit at Runnymede, Berkshire (Greig 1991).

The possibility that a different pattern was emerging in the Late Neolithic archaeobotanical record, particularly in relation to Grooved Ware pits, was initially highlighted by Moffett *et al* (1989) and Robinson (2000). At Barrow Hills, Radley, Oxfordshire (Moffett 1999) 9 cereal grains were recovered compared to 340 fragments of hazelnut shell (probably about 11 hazelnuts) and over 300 fragments of crab apple seed, endocarp, calyx and epidermis fragments (probably about five whole apples). While the number of hazelnuts and apples is not great compared to the grain, the remains do represent food of significantly greater size and weight than the grain. While hazelnut might have a greater chance of being burnt than cereal grain, the same cannot be argued for apple. Similar dominance of hazelnut shells with very few grains is recorded at White Horse Stone (Grooved Ware pits over the Early Neolithic house; Giorgi 2006), Windmill Hill Area M pits (Fairbairn 2000), and Mount Farm, Dorchester-on-Thames (Jones 1980). Similar patterns are presented in the slightly earlier Peterborough Ware Pits at Green Park, Reading (Campbell 2004), The Beehive, Wiltshire (Higgins 2003), and Late Neolithic/Early Bronze Age Gravelly Guy (Moffett 1989). A Grooved Ware pit at Horton Quarry, Berkshire produced a substantial deposit of >1000 whole sloes, a number of complete or nearly complete crab apples, seeds of common and midland hawthorn (*Crataegus monogyna* and *C. laevigata*) and alder buckthorn (*Frangula alnus*), as well as hazelnut shell fragments. It is possible that the hazelnut shell derives from whole nuts that fragmented on burning. This deposit was interpreted as a deliberately placed burnt assemblage of fruits and nuts, accompanied by broken domestic artefacts including flint scrapers and pottery (Pelling forthcoming a; Chaffey *et al* forthcoming; Chaffey and Brook 2012). Of the four grains also identified the only dated example produced a medieval date. Other contemporary pits at the site produced smaller scatters of hazelnut shell with occasional grains suggesting more generic refuse scatters.

A Beaker pit at Bestwall Quarry, Dorset contained a number of acorn cotyledons and several flax seeds. Two of the acorn cotyledons were dated (GrN 28062, 28063) to produce a weighted mean date of 2340-2200 cal BC (95% confidence) (Carruthers 2009, 342). A slightly later Beaker/Early Bronze age context at the Abingdon Multiplex site, Oxfordshire, also produced a pit deposit of charred acorn cotyledons (Pelling in OAU 1997). There are a number of Continental records of charred acorns (eg Karg and Märkle 2002). It is possible that these acorns were accidently burnt during roasting, a method by which they can be made palatable to humans (Mosley 1910; Barlow and Heck 2002, 135). Acorns may also have been collected, dried and/or shelled to separate the kernels from the shells then pounded to produce a meal which was then leached in water to remove the bitter tannins. This sequence of processing would, however, be less likely to leave an archaeological trace and, as such, the importance of acorns as part of human diet in prehistoric Britain may be underestimated. Work by Barlow and Heck (2002) would suggest that remains of acorn are generally under-represented in the archaeological record even in areas where they are known to have been used from ethnographic evidence. Alternatively these acorn deposits may represent some sort of deliberate burning and deposition akin to that suggested for the Grooved Ware pit at Horton.

An intriguing hypothesis recently put forward by Stevens and Fuller is that the monuments of the Late Neolithic and Early Bronze Age were built, not in a period of surplus arable production, but potentially in a period of climatic crisis and arable failure (Stevens and Fuller 2012). As supporting evidence for this hypothesis they cite the absence of quern stones in the Late Neolithic and evidence in the isotope signature from some sites, including Hambledon, for an increase in protein

Fig 4.3 Charred autumnal fruits from a Grooved Ware pit at Horton, Berkshire including (left) crab apples (*Malus sylvestris*) and (right) sloes (*Prunus spinosa*). Photograph by Karen Nicholls. © Wessex Archaeology

consumption in the Late Neolithic. A similar scenario has been postulated for an associated deteriorating climate and shift from cultivated and domestic to wild resources in the Late Neolithic of Switzerland (Schibler and Jacomet 2010). Stevens and Fuller (2012) do not propose a total absence of cereal cultivation, merely a dramatic decline. Dark and Gent (2001) discuss the possibility of a honeymoon period of early cereal cultivation followed by a period of increased weeds, pests and diseases as cultivation became more established. The use of acorns in particular as a food source, or potentially a ritual deposit may result from a crisis in food production and procurement.

The major difficulty in this argument is the problem of negative evidence. The fact that the research focus for the Late Neolithic has tended to be on ceremonial rather than settlement sites is such that it might be expected that domestic type charred remains will be few. However, sampling of developer funded sites would presumably result in chance finds of grain deposits as it has for the Early Neolithic and for later periods, and these sites have only produced chance finds of apparently deliberately placed wild foods (and intrusive cereals). A major concern here is the tendency to only sample or analyse plant remains from features which produce ceramics, meaning that there may be a bias against understanding the nature of activities involving plants where deposition does not take place in pits or other features with readily datable finds.

Early Bronze Age: Phase 3 – honouring Stonehenge (2200-1500 BC)

The most substantial published deposit of cereal grain from the Stonehenge area, was recovered from the ditch of Coneybury Henge, consisting of just over 300 grains of hulled and naked barley with a small number of weeds, an onion couch tuber and a possible hawthorn stone (Carruthers 1990). At the time of publication, no date had been obtained on this grain and while the author discusses the assemblage as Early Bronze Age in the text (page 250), it is given as Late Neolithic in the table (page 251). English Heritage have recently commissioned dates on the grain (six dates, three on hulled barley and three on naked barley) which confirm an Early Bronze Age date for this deposit, all dates falling within the centuries either side of 2000 cal BC (Table 4.3). The grain has clearly derived from a secondary deposit and is not related to the Late Neolithic activity at the Coneybury Henge.

Table 4.3 Radiocarbon results on charred grain from sample <1444>, secondary fill of the henge ditch, Coneybury Henge (W2) (prepared by Peter Marshall)

Laboratory number	Sample	Material and context	$\delta^{13}C$ (‰)	Radiocarbon Age (BP)	Calibrated Date (95% confidence)
UBA-22184	A	*Hordeum vulgare* var *nudum* (naked barley)	-24.4	3594+-37	2040-1880 cal BC
SUERC-44490	B	*Hordeum vulgare* var *nudum* (naked barley)	-24.7	3611+-27	2040-1890 cal BC
OxA-27614	C	*Hordeum vulgare* var *nudum* (naked barley)	-24.4	3695+-30	2200-1970 cal BC
UBA-22184	A	*Hordeum vulgare* L emend (hulled barley)	-26.3	3640+-33	2140-1910 cal BC
SUERC-44489	B	*Hordeum vulgare* L emend (hulled barley)	-24.3	3620+-27	2120-1890 cal BC
OxA-27707	C	*Hordeum vulgare* L emend (hulled barley)	-24.5	3639+-29	2140-1920 cal BC

Elsewhere within the Stonehenge area the plant remains follow the same pattern as the Late Neolithic. One fragment of hazelnut shell was recovered from a Beaker pit (W2), while three cereal grains, including emmer/spelt, and a hazelnut shell fragment were recovered from a Later Bronze Age post-hole at Fargo Wood II (W34) (Carruthers 1990). Cereals from the recent Durrington Walls excavation from possible Early Bronze Age contexts have produced later dates and can therefore be discounted for this period. Slightly further away, at Willis's Field Barn, on the Southern Range Road on

Salisbury Plain to the north of the Stonehenge area, a Beaker/Early Bronze Age pit produced 427 fragments of hazelnut shell, four grains of barley, a cereal sized culm node and a weed seed (Clapham 2008). Elsewhere the same pattern of low concentrations of cereal grains and higher proportions of hazelnut shell and other wild plants continues (Robinson 2000; Moffett *et al* 1989).

The earliest dated example of spelt wheat so far occurs at the end of the Early Bronze Age from Monkton Road, Minster, Isle of Thanet. Spelt wheat glume bases produced a date of 1896-1690 cal BC (3470±30BP, SUERC-32886; Barclay *et al* 2011a). This marks the beginning of a period of increased occurrences and densities of cereals and other cultivated plants, as well as the appearance in the archaeological record of a greater variety of taxa, which becomes particularly visible from the Middle Bronze Age onwards, contemporaneous with the development of a more formalised agricultural landscape. Locally the Middle Bronze Age plant evidence remains sparse, likely due to the lack of domestic activity in the area and the continued ceremonial aspect of the landscape as well as lack of large scale excavation. Surprisingly, some of the cereal grain from Durrington Walls excavation has produced Middle Bronze Age dates (Table 4.2). Activity involving cereals was evidently taking place in the landscape despite leaving no other archaeological trace at the site (Parker Pearson pers comm). Outside the immediate WHS area small assemblages of cereals were recovered from Middle Bronze Age features on the A303 improvement route (Stevens 2008a). At Willis's Field Barn, cereal grain and chaff were more numerous in the Middle Bronze Age than previously, although still limited, while wild food plants were not recovered (Clapham 2008).

Spelt wheat is recorded at a number of Middle Bronze Age sites in southern Britain (Pelling 2003; Clapham 1999; Robinson cited in Campbell and Straker 2003 and Pelling 2003; Martin and Murphy 1988; Monckton 2000; Hinton 1982; Smith 2001), However, occurrences remain sporadic at many sites, while in some areas it does not appear until the Iron Age. Flax is more routinely found, for example at Weir Bank Stud Farm, Berkshire (Clapham 1995b, 43), Perry Oaks (Carruthers 2006; also from pollen, Wiltshire 2006), Horton, Berkshire (Pelling forthcoming a), and from Runnymede by the Late Bronze Age (Greig 1991). The evidence for pulses is more convincing from the Middle to Late Bronze Age, particularly Celtic bean (*Vicia faba*), high numbers of which were found at Bronze Age sites on the Isles of Scilly (Ratcliffe and Straker 1996) and at Rowden in Dorset (Carruthers 1991). Oil crops also become more prevalent; opium poppy is recorded from the Wilsford Shaft (Robinson 1989, 83) while there is also some evidence for the use of *Brassica* sp or *Brassica/Sinapis* sp, seeds of which have been found at many Bronze Age sites and large assemblages recovered from some Iron Age sites. There is limited evidence for the use of brassicas in Europe from the Late Neolithic, but they were well-established oil crops by the Roman period (Zohary and Hopf 2000, 139).

Sisymbrium officinale (hedge mustard) may also have been used as a source of oil. Over 100 *Sisymbrium officinale* seeds were found at Trethellan Farm, Cornwall, in a single pit fill associated with a Middle Bronze Age house but only a single seed was found in the other 138 contexts sampled. This led the author to suggest that this species was being deliberately collected or cultivated since a more even distribution would be expected if it was acting as an arable weed (Straker 1991, 169). A similar interpretation has been made for large numbers of seeds of *Sisymbrium officinale* found at a Bronze Age settlement site in Yugoslavia (Kroll 1991, 167) and it is worth noting that Pat Hinton identified possible *Sisymbrium officinale* at Black Patch in East Sussex (Hinton 1982, 383).

Conclusions

The review of the plant remains from the Stonehenge landscape and surrounding region demonstrates the paucity of plant remains associated with the ceremonial landscape. In large part this must be a reflection of the nature of the area and the absence of settlement activity. It is not possible to establish if cereal cultivation occurred locally or if people brought cereals with them from elsewhere. In contrast to the local evidence, archaeobotanical data from the wider Stonehenge 'World' is increasingly detailed with a number of quite significant assemblages. There appears to be a pattern of Early Neolithic cereal assemblages, possibly reflecting the early success of agriculture in an environment where cereal crops had little competition from weeds, insect or fungal attack and the novelty and nutritional value of the crops was attractive. The large cereal rich assemblages are still few and far between and it is difficult to extrapolate from them to make generalised statements, but it would appear that farming was successful in some parts of the country from the early 4th millennium BC. Emmer wheat, naked and hulled barley, some free-threshing wheat including tetraploid types, at least in the far south east of the country, and possible einkorn, were cultivated, presumably in small plots and initially with only limited competition from a few weed taxa including twining species such as black bindweed, vetches and goosegrass. Cultivated wheat and barley are derived from wild desert-edge grasses of the Near East and as such require as all the available daylight to produce mature grain under British conditions. They would therefore require a relatively sizable clearing to prevent shading from trees, while the soil would need to be broken up by hoe or spade and cleared of potentially competing weeds. The climate, with moist soils, mild winters enabling autumn or early summer sowing, and long summer daylight hours to maximise ripening are such that exceptionally high yields are likely to have been possible.

In addition to the cereals, flax and opium poppy may also have been cultivated, possibly with some pulses (although this remains to be demonstrated by direct dating). The diet continued to be supplemented with collected hazelnuts, hawthorns, sloes, possibly tubers, crab apple and presumably blackberry, raspberry and other fruit species of the woodland edge and scrubby environments and less visible vegetative parts of plants including tubers and leaves (see also **Chapter 7 - Diet**). The presence of large quantities of cereal grains or spikelets in pits may point to some sort of burnt offering, or may simply derive from occasional burning accidents of stored crops. Grapes seem to have been imported or even grown at least at Hambledon Hill, Dorset.

It has become clear that plant use and cultivation cannot be regarded as a consistent phenomenon throughout the period any more than other cultural artefacts or monuments. With rare exceptions, available data indicates that in southern Britain at least, cereals form a much less significant component of the assemblages in proportion to wild food plants in the Late Neolithic. This is similarly reflected in the absence of cereal impressions and chaff tempering in Late Neolithic pottery (Jessen and Helbaek 1944) and a paucity of quern stones despite their presence in Early Neolithic contexts (Curwen 1937; Stevens 2007). It is difficult to establish if this represents a change in behaviour and treatment of the plants resulting in depositional or taphonomic change, or if this represents a decline in cereal cultivation. The idea of an early honeymoon period for cereal cultivation followed by a period of tougher conditions as weed floras developed, insect and fungal pathogens increased (Dark and Gent 2001) is of interest here. Cereal cultivation may then have continued on a much less significant scale until the Middle Bronze Age and the beginning of much more organised agricultural landscapes, greater population and introductions of new species.

Chapter 5. Animal Resources

Fay Worley

1. Introduction

Relatively few Neolithic and Early Bronze Age animal bone assemblages have been recovered from sites in England compared to the number from later prehistoric and historic sites, and those that we have are generally small. The designated WHS area surrounding Stonehenge includes 14 assemblages (Table 5.1); two from Phase 1, seven from Phase 2 and four from Phase 3, with a further assemblage dated to Phases 2 or 3. This rather limited dataset is insufficient to discuss the broader questions of Neolithic animal utilisation asked of this project. In order to provide a large enough sample to discuss animal utilisation, the focus of this study is expanded from the designated area to include all Neolithic and Early Bronze Age animal bone assemblages from the county of Wiltshire. A recent review of Neolithic and Early Bronze Age animal bone assemblages in southern England cites Wiltshire as the most densely represented county in southern England with 78 assemblages from 47 sites (Serjeantson 2011a, 4). Serjeantson's 2011 review, and associated data tables (Serjeantson 2011b) are the basis for this report, with additional unpublished data from Boscombe Down (Higbee pers comm) and Marden (Worley 2011), and published data from Durrington Walls Environs (Hamilton-Dyer 2004) and the Amesbury Archer and Companion graves (Fitzpatrick 2011) also included. Previous reviews of animal remains from the Stonehenge region include Coy and Maltby's (1987) discussion of zooarchaeology (archaeozoology) in Wessex and Maltby's (1990a) overview of animal bones recovered from the Stonehenge environs excavations. These studies are not referred to here, as both now predate zooarchaeological research on nearly a third of Wiltshire sites in the dataset, including significant new research on assemblages from Durrington Walls (Albarella and Payne 2005 and Albarella and Serjeantson 2002), Stonehenge (Serjeantson 1995, Serjeantson and Gardiner 1995) and Windmill Hill (Grigson 1999).

The Wiltshire sites are located in two clusters situated on the north and south sides of the Vale of Pewsey, with the exception of the site at Marden, which sits within the valley. Stonehenge sits within the southern cluster. The paucity of sites with surviving animal bone in the valley may be related to its acidic greensand geology, in addition to the distribution of archaeological excavation. The sites to the north and south sit on chalk, a favourable geology for the preservation of animal bone.

Wiltshire assemblages include two (Durrington Walls and Windmill Hill) highlighted by Serjeantson (2011a, 7-8) as of particular significance to our understanding of Neolithic and Early Bronze Age animal utilisation throughout the south of England, due to their size and complexity. Three more (West Kennet palisade enclosures, Coneybury Anomaly and Boscombe Down) also produced relatively large identified assemblages (see Table 5.2).

2. Time frame and site types

A review of animal remains from Mesolithic southern England is currently underway. Animal bone has been reported from three sites: Cherhill, Vespasian's Camp and

Allington, although it is not clear whether the bone from the latter is securely Mesolithic from the sites unpublished report (Bateman 1998). The Mesolithic settlement at Castle Meadow, Downton (Higgs 1959) and the Mesolithic postholes

Table 5.1 Animal bone assemblages from within the Stonehenge WHS

Phase*	Number	Sites
Phase 1	2	Coneybury Anomaly, Stonehenge lesser cursus
Phase 2	7	Coneybury Henge, Amesbury barrow 39, Amesbury Chalk Plaque Pit, Stonehenge, Stonehenge Avenue, Durrington Walls, Woodhenge
Phase 2 or 3	1	Amesbury barrow 42
Phase 3	4	Amesbury barrow 39, Amesbury barrow 51, Amesbury grave 1502, Durrington Down barrow,

*Note phases from Serjeantson (2011a) amended to date ranges used in this project

Table 5.2 Sites from southern England with over 500 identified mammal bones (NISP – Number of Identified Specimens) in a single phase*

Site	County	NISP	Phase
Runnymede Bridge	Surrey	10483	1
Durrington Walls	Wilts	8500	2
Hambledon Hill	Dorset	7246	1
Windmill Hill	Wilts	2045	1
Mount Pleasant (Beaker assemblage)	Dorset	1946	2-3
West Kennet Palisade enclosures	Wilts	1923	2
Maiden Castle	Dorset	967	1
Coneybury Anomaly	Wilts	927	1
Boscombe Down (Higbee pers comm)	Wilts	906	2
Mount Pleasant	Dorset	630	2
Twford Down	Hants	615	3
Abingdon causewayed enclosure	Oxon	614	1
Staines causewayed enclosure	Surrey	614	1
Barrow Hills Radley	Oxon	554	2
Ascott-u-Wychwood	Oxon	507	1

*Following Serjeantson's (2011a) NISP calculation, amended for this project's phasing. Note that Boscombe Down was not included in Serjeantson's (2011a) study and therefore the NISP calculation may be more inclusive than that presented for other sites.

excavated in Stonehenge car park did not recover animal bone assemblages (Vatcher and Vatcher 1973, Allen 1995a). Little information is published on the Mesolithic bones, with the exception of those from Cherhill, where there was some mixing of the Mesolithic and Neolithic animal bones, with wild mammal bones being attributed to the Mesolithic and considered residual when found with Neolithic artefacts (Grigson 1983, 64). The assemblage from Vespasian's camp is yet to be fully reported, but was known to be dominated by aurochs (Jacques *et al* 2012).

Phase 1 (4000-3000BC; before Stonehenge) as defined for this project, roughly equates to the Early and Mid Neolithic phases cited in Serjeantson (2011a) (4000-3700 and 3300-2900 BC) and is represented by 24% of the countable mammal NISP (Table 5.6). The earliest Neolithic assemblages from Wiltshire are those from Cherhill (NISP 38), Coneybury Anomaly (NISP 927), Windmill Hill pre-enclosure (NISP 175) and Windmill Hill outer pits (NISP 18). Animal bone from Coneybury Anomaly was radiocarbon dated to 3980-3708BC (OxA-1402; Richards 1990, 42) and from the earliest deposits at Windmill Hill to 3900-3350 (OxA-2406; Ambers and Housley 1999, 119). No radiocarbon dates were recovered from the Windmill Hill outer pits or Cherhill assemblages. A further 32 assemblages date to the Early/Mid Neolithic. These assemblages comprise causewayed enclosures, pits or pit clusters and long barrows (Tables 5.3 and 5.5). Assemblages from Stonehenge, the Stonehenge lesser cursus, Easton Down and South Street long barrows are recorded as 3300-2900BC or Middle Neolithic in Serjeantson (2011a).

The majority of Phase 1 animal bones considered countable by Serjeantson (2011a) have been recovered from causewayed enclosure occupation layers, ditch or pit fills, although these sites do not necessarily represent the contemporary everyday diet. Indeed slightly under a quarter of bones are from the Coneybury Anomaly, a pit fill thought to represent a feasting event and unparalleled elsewhere, and 458 (12%) are from long barrows. The Phase is dominated by animal bones from Windmill Hill (52% NISP).

Phase 2 (3000-2200BC; the time of Stonehenge) equates to the Late Neolithic phase in Serjeantson (2011a) (3000-2200BC). This is the best represented phase in the dataset with over twelve thousand animal bones recovered from enclosures, occupation layers, henges, an avenue, pits or pit clusters, a monumental mound and a long barrow (Tables 5.3-5.5), and comprising 73% of the total mammal NISP (Table 5.6). In addition to the sites presented in Tables 5.3-5.5 and Serjeantson (2011a), an assemblage of approximately 900 bones from pits at Boscombe Down is currently under analysis (Higbee 2011 pers comm), an additional assemblage of approximately nearly 100 bones has been recovered from Marden henge (Worley 2011), and three teeth were recovered from the Phase 2 graves of the Amesbury Archer and Companion (Fitzpatrick 2011). The phase is dominated by the large assemblages from Durrington Walls and West Kennet. Animal bones from Durrington Walls are thought to predominantly represent periodic feasting events rather than everyday consumption (Albarella and Serjeantson 2002) and recent analyses has suggested that they do not only represent animals raised locally (see this chapter, section 4.2). Radiocarbon dating has recently shown that activity at Durrington Walls was restricted to the period 2515-2460BC (Viner *et al* 2010).

Assemblages from the causewayed enclosure at Windmill Hill, pit or pit cluster at Crescent Copse, Amesbury 42 and secondary ditch fills South Street long barrows, Hemp Knoll round barrow and the flat grave at the Sanctuary are all of Late Neolithic or Early Bronze Age date (2400-1800BC), and therefore considered to be Phase 2-3 here (Tables 5.3 and 5.5).

Phase 3 (2200-1500BC; Honouring Stonehenge) equates to the Early Bronze Age (2000-1500BC) in Serjeantson (2011a). Phase 3 assemblages have only been recovered from funerary monuments; round barrows and flat graves (Table 5.5) and comprise only 288 countable mammal bones, of 2% of the total (Table 5.6).

From this short overview, it is apparent that even by expanding the dataset to include all sites in Wiltshire, we have very few sites which represent an 'everyday diet' or production sites which we might expect to tell us about herding strategy. Rather, the sites represent consumption sites and sites with a specialised function (ceremonial, feasting, funerary).

Table 5.3 Animal bone assemblages from enclosures, occupation layers and pit/pit cluster sites

Site type	Enclosure	Causewayed enclosure	Occupation layer	Pit /pit cluster
Phase 1	-	Robin Hoods Ball (30) Whitesheet Hill (1) Whitesheet Hill environs (101) *Windmill Hill (earliest) (175)* 15 x Windmill Hill (1775)	*Cherhill (38)* Windmill Hill (95)	Hemp Knoll (67) *Windmill Hill outer pits (18)* *Coneybury Anomaly (927)*
Phase 2	Longstones enclosure (46) 2x West Kennet palisades (1923)	-	King Barrow Ridge (137)	Amesbury chalk plaque pit (6) Boscombe Down (240) Ratfyn (1) Salisbury Beehive (3) Windmill Hill outer pits (200) Durrington Walls Environs* Boscombe Down*
Phase 2-3	-	Windmill Hill outer ditch (87)	-	Crescent Copse (20)
Total NISP	1969	2169	270	1482

Note - NISP (as calculated by Serjeantson 2011a, Appendix 3) in brackets after each site and the earliest sites are presented italic font.
* Not in Serjeantson 2011a.

Table 5.4 Animal bone from monumental sites. NISP (as calculated by Serjeantson 2011a, Appendix 3) in brackets after each site

Site type	Henge	Avenue	Cursus	Monumental Mound
Phase 1	Stonehenge Phase 1-2 (103) Stonehenge Phase 2 (117)	-	Stonehenge lesser cursus (26)	-
Phase 2	Avebury (1) Coneybury Henge (395) Durrington Walls (8500) Marden (320)* Stonehenge palisade ditch (1) Woodhenge (1)	Stonehenge Avenue (6)	-	Silbury Hill (125)
Total NISP	9438	6	26	125

* Further animal bones have since been excavated (see Worley 2011).

Table 5.5 Animal bone from funerary sites NISP (as calculated by Serjeantson 2011a, Appendix 3) in brackets after each site

Site type	Long barrows	Round barrows	Grave (flat)
Phase 1	Beckhampton Road (41) Boles barrow (1) Easton Down (20) Fussell's Lodge (43) 2 x Horslip (248) King barrow (1) Knook barrow (1) Lanhill (1) Millbarrow (37) Old Ditch longbarrow, (1) Sherrington barrow (1) 2 x South Street (62) White barrow (1)	-	- Amesbury Archer
Phase 2	Easton Down secondary fill (191)	-	* Companion *
Phase 2-3	Amesbury barrow 42 (89) South Street (89)	2 x Hemp Knoll (73)	The Sanctuary (1)
Phase 3		Amesbury barrow 39 (24) Amesbury barrow G 51 (8) Durrington Down barrow (14) Milton Lilbourne 1 (7) Milton Lilbourne 2 (87) Milton Lilbourne 3 (25) Milton Lilbourne 4 (89) Milton Lilbourne 5 (29) Monkton Down G9(1) Ogbourne St. George G1 (1)	Amesbury Grave 1502 (3)
Total NISP	827	358	4

* Not in Serjeantson 2011a.

Table 5.6 Summary of Wiltshire sites listed in Serjeantson (2011a)

	Phase 1	Phase 2	Phase 3	2 or 3	total
No sites	22	17	7	6	47*
No assemblages	42	18	11	7	79
Total NISP	3931	12096**	288	359	16674**

*Six of the 46 sites have assemblages quantified in several different phases. ** Does not include NISP for Durrington Walls environs (Hamilton-Dyer 2004), Amesbury Archer and Companion (Fitzpatrick 2011), or Boscombe Down (Higbee 2011 pers comm), all of which are not in Serjeantson (2011a).

3. Wild species

3.1 Which species were present in the area from the Mesolithic onwards, what evidence do we have for their continued use and in what kinds of contexts are they found in the archaeological record?

The wild species present in any area can be difficult to ascertain from archaeological assemblages as we will only have evidence of those animals used by human societies, a small number of commensal species and those autochthonous species whose remains become incorporated into archaeological deposits by chance. These will not be representative of the entire natural local fauna. The bones of smaller wild animals can provide the most useful information regarding local habitats. However, these bones will usually only be recovered on more recent excavations with a programme of environmental sampling. When bones of small animals are recovered, they can be contextually insecure as they have the potential to have migrated through the burial medium, represent the prey of burrowing animals, or have burrowed themselves. The bones of burrowing, denning or hibernating animals may be assumed to be intrusive in archaeological layers and so not recorded or included in phased assemblages. Serjeantson (2011a) only includes the bones of badgers and foxes (animals which may burrow) when they were not reported as probably intrusive.

In addition, it can be difficult to distinguish between the bones of some wild and domestic species (for example pig and wild pig, dog and wolf or fox and aurochs and domestic cattle). Sheep and goats have no wild relatives in Britain and so are securely domestic when found. There is no evidence for domestic birds in the Neolithic or Early Bronze Age.

Table 5.7 Summary of occurrence of wild mammals in Wiltshire. Note that small mustelids and rodents were not included in Serjeantson (2011a)

	Mesolithic	Phase 1	Phase 2	Phase 3
Roe deer (bones)	?	✓	✓	✓
Red deer (bones)	?	✓	✓	✓
Aurochs	✓	✓	✓	✓
Beaver	?	✓	✓	✓
Wild boar	?	✓	✓	
Wildcat		✓		
Fox	?	✓	?	
Brown bear			✓	
Polecat		✓	✓	
Hare	✓	?		
Wolf		✓		
Badger		?	?	
Pine marten			?	

✓= present, ? = remains recovered, but attribution to phase uncertain

Table 5.8 Presence of wild mammals in Wiltshire bone assemblages (number of assemblages (n) and percentage of assemblages in Phase (%)). Data from Serjeantson (2011b, data tables 1). Does not include finds from Durrington Walls Environs, Woodhenge, Boscombe Down, the Amesbury Archer and Companion graves

	Phase 1 (n=36)		Phase 2 (n=18)		Phase 2 or 3 (n=7)		Phase 3 (n=11)		Grand Total
	n	%	n	%	n	%	N	%	n
Red deer	20	48	7	39	1	14	5	45	33
Roe deer	10	24	5	28	1	14	1	9	17
Aurochs	8	19	6	33	-	-	1	9	15
Fox	6	14	1	6	1	14	-	-	8
Beaver	2	5	3	17	-	-	-	-	5
Badger	2	5	1	6	1	14	-	-	4
Wild boar	1	2	2	11	-	-	-	-	3
Cat	3	7	-	-	-	-	-	-	3
Hare	2	5	-	-	-	-	-	-	2
Brown bear	-	-	1	6	-	-	-	-	1
Pine marten	-	-	1	6	-	-	-	-	1
Wolf	1	2	-	-	-	-	-	-	1

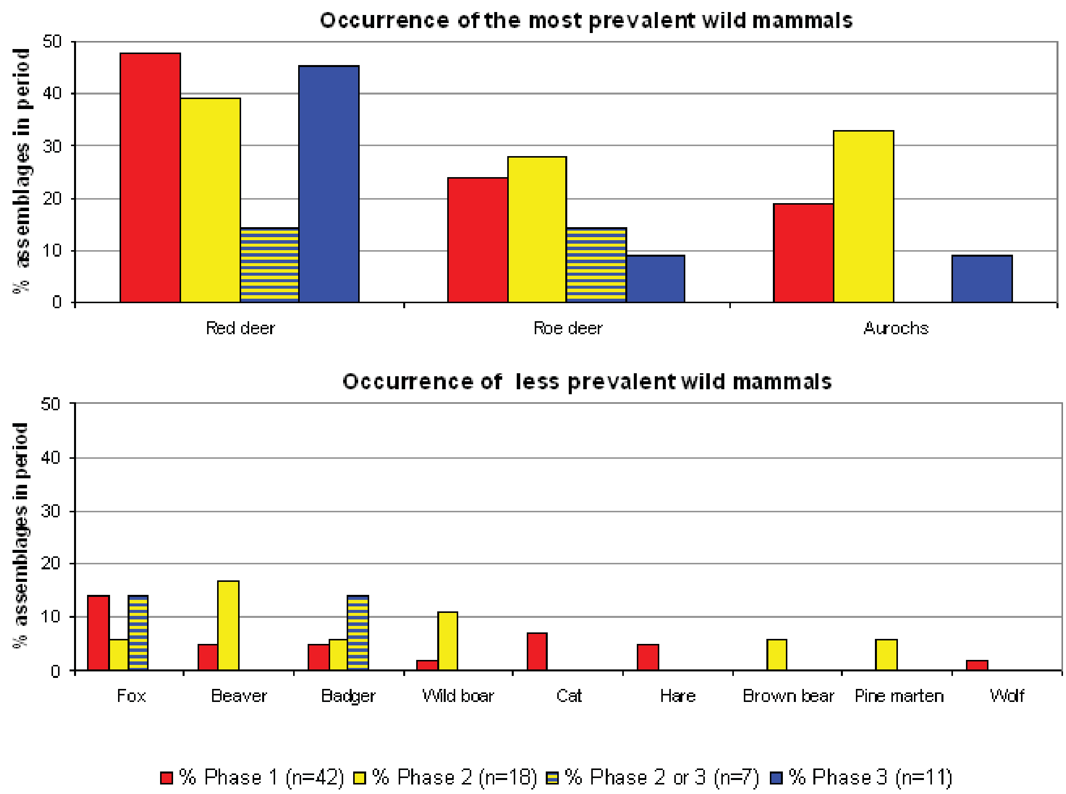

Fig 5.1 Proportions of wild mammal bones across the phases. Data from Serjeantson (2011a; 2011b)

Table 5.9 Wild Mammals from Wiltshire (NISP data from Serjeantson (2011b), supplemented with finds from Hamilton-Dyer (2004). Does not include Woodhenge (Jackson 1929) or Boscombe Down (Higbee 2011 pers comm)

Taxon	Phase 1	Phase 2	Phase 2 or 3	Phase 3	Grand Total
Roe deer	326	27*	1	1	355*
Red deer	101	20*	1	16	138*
Cat	56				56
Fox	22	6	2		30
Beaver	24	4			28
Aurochs	15	7*		1	23*
Badger	10	1	2		13
Hare	13				13
Wild boar	1	5			6
Wolf	1				1
Brown bear		1			1
Pine marten		1			1
Total	269	72	6	18	665

*does not include Marden and Durrington Walls

Serjeantson has shown that wild mammals occurred in the majority of assemblages in each phase in southern England, but always comprised a small minority of the identifiable bones (2011a, 46). She also showed that across the whole of southern England, while the relative frequency of the most commonly identified wild mammals (red deer, roe deer, aurochs and wild boar) stayed generally constant, the relative proportion of red and roe deer switched during Phase 1 from more frequent roe deer at the start of the Neolithic, to more frequent red deer in the Early-Middle Neolithic (2011a, 46-7). This change is due to the large number of roe deer in the Coneybury Anomaly pit. Looking at Wiltshire sites only (Fig 5.1), demonstrates that just under half the assemblages in Phase 1, 2 and 3 contained red deer at a relatively constant proportion. Roe deer maintain their proportion of occurrence in approximately ¼ of sites and aurochs increase from 1/5 to 1/3 of sites from Phases 1 to 2. Neither species is often present in Phase 3's funerary assemblages. Wild boar is sometimes found in Phase 1 and 2 sites. No wild boar have been identified in Phase 3 deposits from Wiltshire, although this probably relates to site type rather than lack of utilisation, as boar continued to be a hunted resource for over a millennium. Perhaps they were simply not considered a suitable animal grave good. The latest evidence for wild boar from Wiltshire comes from King Barrow Ridge (Maltby 1990b, 121) and Windmill Hill in deposits from Phase 2. Aurochs are thought to have become extinct during the Bronze Age in Britain, there is evidence for their utilisation in Wiltshire into the Early Bronze Age at Durrington Down barrow (Maltby and Richards 1990).

3.1.1 Deer: red and roe

The wild mammals most frequently encountered are deer, including both red deer and roe deer found in assemblages from all phases. Fallow deer were not introduced into Britain until many hundreds of years later. European elk (also know as Eurasian moose) is known from Mesolithic sites including Thatcham and Wawcott in Berkshire, and Bronze Age sites in Scotland (Kitchener 2010), but there are no records of the species in Neolithic or Early Bronze Age Wiltshire.

Serjeantson's NISP counts shown in Table 5.10 exclude antlers, which were commonly used as a raw material and tool (see this chapter, section 5.1). Inclusion of antlers would have significantly inflated the NISP of red deer.

Roe deer bones significantly outnumber red deer bones in Phase 1; however, this is largely due to the inclusion of 304 bones as the butchered skeletons of at least seven roe deer in the Coneybury Anomaly (Maltby 1990c, 59-60). Excluding this unique site, the bones of red deer are more common. The frequency of red and roe deer bones relative to all identified bones (Table 5.10) indicates that whilst roe were an important constituent of Phase 1 assemblages (due to their inclusion at Coneybury Anomaly), they represent less than 1% of NISP for the other phases. Red deer were infrequently found in the Phase 2 assemblages but regained importance in Phase 3. The reduction in representation of red deer bones in the Late Neolithic is also noted as a southern England wide phenomenon by Serjeantson (2011a, 47-8).

Table 5.10 Frequency of red and roe deer bones (NISP) and as a proportion of total assemblage NISP (%). Data from Serjeantson (2011a; 2011b), does not include Durrington Walls data

Species		Phase 1	Phase 2	Phase 2 or 3	Phase 3	Grand Total
Roe deer	NISP	326	27	1	1	355
	%	8%	<1%	<1%	<1%	2
Red deer	NISP	101	20	1	16	138
	%	3%	<1%	<1%	6%	1%
Total Assemblage	NISP	3931	12096	359	288	16674

The majority of deer bones have been recovered from Phase 1 assemblages. For this phase red deer remains have been found in the causewayed enclosure at Windmill Hill (NISP 23, primarily from ditch deposits), the Coneybury Anomaly pit (NISP 21), long barrow ditches and mound deposits from six long barrows (Total NISP 26), the occupation at Cherhill (NISP 17), two bones from Hemp Knoll pits and the ditches at Stonehenge (NISP 11), and Stonehenge lesser cursus (one bone). As stated above the majority of roe deer bones from this phase were recovered from the Coneybury Anomaly pit (NISP 304), but roe deer bones have also be found at Windmill Hill causewayed enclosure (NISP 8, primarily from ditches), occupation deposits at Cherhill (NISP 4), Stonehenge (NISP 1) and from two long barrows (NISP 9).

Phase 2 red and roe deer bones have been recovered from the henges at Durrington Walls (MNI 5 red and 2 roe) and Coneybury (NISP 1 red and 5 roe), and secondary ditch fills at Easton Down long barrow (NISP 11 red and 17 roe). In addition, roe deer bones were recovered from pits at Boscombe Down (NISP 4) and West Kennet palisade enclosures (NISP 1). Additional red deer bones were also recovered from pits at King Barrow Ridge (NISP 5) and Durrington Walls environs (NISP 2), and from Longstones enclosure (NISP 1). The Phase 2-3 deer bones were both recovered from later ditch fills at Amesbury barrow 42.

Phase 3 red deer bones were recovered from five round barrows, with the roe deer bone recovered from a sixth.

3.1.2 Aurochs

Aurochs, a species of wild cattle, are distinguished from domestic cattle by their size, although there is some overlap between the smallest Aurochs cows and the largest domestic bulls. Although aurochs survived in Eastern Europe until the 17th century AD, they are believed to have become extinct in Britain during the Bronze Age, sometime after the last radiocarbon dated example (BM-731; c 1300 BC), which was from Somerset (Legge 2010). The remains of aurochs have been reported from eight Phase 1 sites, six Phase 2 sites and 1 Phase 3 site. In addition, Higbee (pers comm) reports a further Phase 2 aurochs bone, and four Phase 2-3 bones from Boscombe Down, which are not in Serjeantson's (2011a) study. The Phase 1 sites represent two of the eighteen long barrow assemblages in this study and are discussed further in part 4.8.2. Both examples are aurochs skulls (found in Knook mound and Horslip barrow primary ditch fill). Two additional aurochs bones were recorded from later ditch fill at Horslip and a bone from Millbarrow could have been wild or domestic cattle. The remaining twelve Phase 1 aurochs specimens are all from ditch fills at Windmill Hill and comprise elements from the head and limbs (Grigson 1999, 231-2). However, a recent genetic study looked at two bones originally identified as aurochs and found that both may be large male domestic cattle (Edwards et al 2007). The Phase 2 specimens are from Windmill Hill outer pits, West Kennet palisade enclosure ditches, occupation on King Barrow Ridge and the henges at Marden, Coneybury and Durrington Walls. Woodhenge also contained aurochs post-cranial bones (Jackson 1929), not included in Serjeantson (2011a). The only Phase 3 evidence for aurochs is an aurochs-sized vertebra from the primary deposits at Durrington Down round barrow.

3.1.3 Wild Boar

Very few wild boar have been identified in the assemblages, the only positive identifications coming from one Phase 1 bone from ditch fills at Windmill Hill, and six Phase 2 bones from Windmill Hill pits (Davis 2000) and ditch fills at Durrington Walls (Richards and Thomas 1984a, 214), and post-dating Serjeantson's (2011a) study, two bones from Phase 2 deposits at Boscombe Down. In addition, some of the pig bones from 2010 excavations at Marden may be wild boar based on size (Worley 2012)The tusks the in Phase 2 graves of Amesbury Archer and Companion are reported simply as boar (Fitzpatrick 2011), so may be male domestic or wild pigs. Wild boar was identified at Cherhill, but attributed to the Mesolithic (Grigson 1983). As stated above, domestic pigs and wild boar can be difficult to distinguish, a problem compounded by the fact that Mesolithic British wild boar were relatively small, but Neolithic animals larger (Albarella 2010, Albarella et al 2009). At some sites the lack of wild boar may be due to an assumption that the pigs were domestic. However at Windmill Hill (Grigson 1999) and Durrington Walls (Harcourt 1971a, Albarella and Payne 2005), two of the largest contributors of pigs to the dataset as a whole, the pigs have been positively identified as predominantly domestic. So in the Neolithic at least there seems to be a genuine paucity of wild boar bones.

3.1.4 Wild horse

Whilst wild horses were present in Early Mesolithic Britain, no directly dated horse remains are known from the 7th millennium BC until Middle Bronze Age (Bendrey et al 2013, Bendrey 2010, 10, Sommer et al 2011), and these are assumed to be domestic.

Horse bones from Durrington Walls were originally thought to have been from wild horses (Harcourt 1971a), but direct radiocarbon dating has since proved them to be intrusive from the Middle Bronze and Iron Ages (Kaagan 2000, Bendrey 2010). We can conclude that there were no wild horses in Wiltshire in the Late Mesolithic or Phases 1 to 3.

3.1.5 Wild canids: wolf and fox
As stated above, foxes and wolves can be difficult to distinguish from domestic dogs. Nevertheless, both species have been identified in Neolithic assemblages in Wiltshire (Serjeantson 2011a).

The only wolf is an atlas vertebra from Phase 1 deposits in the ditch at Stonehenge (Serjeantson 1995, 445). Foxes have been identified in nine assemblages. The earliest is a fox from the buried soil at Cherhill. However, this context contained a mixture of Neolithic and Mesolithic flints and the analyst suggests that the wild fauna are Mesolithic (Grigson 1983). Phase 1 deposits at Millbarrow contained four fox bones, but again the context was insecure (Noddle 1994). A number of fox bones have been recovered from Phase 1 ditches at Windmill Hill (Grigson 1999). Six fox bones from a partial skeleton and a further two leg bones, one of them butchered, were recovered from Phase 1 ditch fills at Stonehenge (Serjeantson 1995, 445-8). At Amesbury barrow 42, two fox humeri were recovered from Phase 2-3 ditch fills. Six fox bones from two individuals were recovered from Phase 2 deposits at Durrington Walls (Harcourt 1971a, 345) with no further information reported. Jackson (1929, 63) records recovering the remains of fox cubs' mandibles and maxillae from the bottom of the Woodhenge ditch at the east entrance, therefore presumably Phase 2. Higbee (pers comm) has recently recorded an additional Phase 2 fox bone from Boscombe Down.

3.1.6 Bear
A single bear scapula was found in the pit at Ratfyn (Phase 2) (Jackson 1935).

3.1.7 Beaver
Beaver bones have been identified on six sites in Wiltshire; the Early Neolithic sites of Cherhill and Coneybury Anomaly and Late Neolithic sites of Durrington Walls, Durrington Walls environs and the West Kennet palisades. The beavers were not hunted in great numbers. The two Cherhill beaver bones may be Mesolithic rather than Neolithic (Grigson 1983), the West Kennet specimen is a single cervical vertebra recovered from the enclosure ditch (Edwards and Horne 1997), two bones were found at Durrington Walls (with no more information available; Harcourt 1971a) and a fragment of mandible with an incisor was found in a pit at Durrington Walls Environs (Hamilton-Dyer 2004). Butchery marks (cuts) were noted on a Durrington Walls bone (Kaagan 2000, 155). The Coneybury Anomaly beaver assemblage is more extensive, the primary pit fill containing 22 bones from at least two beavers (Maltby 1990c, 60).

3.1.8 Wildcat
Phase 1 ditch fills from Windmill Hill excavated in 1956-7 included 55 cat foot and tail bones, which Jope and Grigson considered to be from a single wildcat (Jope 1965, 143, Grigson 1965, 148; 1999, 234), noting that although they were immature, they were also comparatively small in size (Jope 1965, 145). A further four Phase 1 cat bones were recovered from the 1988 excavation (Grigson 1999, 234). No other Neolithic/Early Bronze Age sites in Wiltshire were included in Serjeantson (2011a), although Jackson

(1929, 63) records several limb bones of a cat "two feet deep" in C11 at Woodhenge, and they have been recovered from other Phase 1 and 3 sites in southern England.

3.1.9 Hare

A total of thirteen hare bones have been recorded from two Phase 1 sites in Wiltshire, but none are secure identifications. The ten metapodials bones from primary ditch fills at Windmill Hill identified by Jope (1965) as mountain hare could not be found for reanalysis, or therefore verified (Grigson 1999). Three possible hare bones were recovered from the forecourt area of Lanhill barrow, but in addition to the identification being uncertain, very scant contextual information is presented in the report (King 1966). The presence of hares in Wiltshire during Phases 1 to 3 is therefore uncertain.

3.1.10 Badger

As badgers are denning species, Serjeantson (2011a) only recorded their presence on sites when the analyst had not considered them intrusive. A total of 13 badger bones from four sites were recorded. The seven Phase 1 badger bones from Windmill Hill primary ditch fills identified by Jope (1965) could not later be found, or therefore verified, by Grigson (1999). The two Phase 1 badger specimens from South Street long barrow were teeth from secondary ditch fills, a context described as potentially mixed (Ashbee et al 1979, 268). Primary ditch fills at Horslip long barrow produced three further badger specimens, but no further information is published (Higham and Higgs 1979). The only Phase 2 badger bone in Serjeantson's (2011a) study was recovered from Durrington Walls, no further information was given (Harcourt 1971a). However, Higbee (pers comm) has recently recorded 41 badger bones (including burnt bones) from a Phase 2 pit at Boscombe Down. Given the contexts that they have been recovered from, and the lack of detail in the published reports, the presence of badgers in Early Neolithic Wiltshire seems likely, but cannot be confirmed. However, we have certain evidence for human interaction with badgers from the Late Neolithic.

3.1.11 Smaller mustelids: otter, pine marten and polecat

A Phase 2-3 radius from ditch fills at Windmill Hill may be otter, but this identification is uncertain (Grigson 1999, 234). The site also produced polecat remains, with a skull, mandible and a mustelid metapodial from Phase 1 contexts and a mandible from Phase 2-3 contexts. Grigson suggests that as only head and foot bones are present, the polecat may have been brought to site as a pelt (1999, 234). A Phase 2 pine marten bone was identified at Durrington Walls, with no further information reported (Harcourt 1971a). Stoats and weasels were not recorded in Serjeantson (2011a, 6), however Jackson (1929, 63) does record a weasel jaw from C13 ("four foot deep") at Woodhenge and Higbee (pers comm) also recorded three pine marten bones, a weasel or stoat bone and a further small mustelid bone from Phase 2 deposits at Boscombe Down.

3.1.12 Fish

Serjeantson (2011a, 55-6) reports that the only site to produce fish bones was Coneybury Anomaly pit, which included 11 bones from a trout (Maltby 1990c), and that fishbone are rare on all sites, even those which have been subject to a sieving strategy. This conclusion is supported by stable isotope analysis of human skeletons, suggesting that fish were not a significant component of the diet (see Chapter 7 – Diet).

3.1.13 Birds
A total of 22 countable bones (following Serjeantson 2011a) of wild birds have been recovered from five sites in Wiltshire: Coneybury Henge, Durrington Walls, Stonehenge, Woodhenge Millbarrow and Windmill Hill. The last three sites producing indeterminate bird bones. In addition, antiquarian reports of excavations at Knook barrow, Old Ditch long barrow and White barrow comment that bird bones were found (Eagles and Field 2004, Field 2006a). The bones are not available for analysis. Coneybury Henge produced a single lapwing bone together with two indeterminate bones from topsoil contexts, Maltby (1990d, 154) noting that all three bones may be intrusive. However, Coneybury Henge ditch (Phase 2) also produced a partially articulated, partial white-tailed sea eagle skeleton (Maltby 1990d). Durrington Walls (Phase 2) produced bones from five bird species: probable mallard, cormorant, kite, woodcock and raven (Harcourt 1971a, provenance not stated). A Phase 1 raven ulna was also recovered from Stonehenge (Serjeantson 1995, 446). If caught in the local vicinity, following Yaldon and Albarella (2009, 77), the bird species reflect an environment encompassing the local river (mallard and cormorant), but also a degree of woodland (kite, raven and woodcock). Yaldon and Albarella (2009, 77, 212) suggest that the kite would have been a red rather than black kite (although it is recorded as kite sp in the original report (Harcourt 1971a). Today red kites breed in open woodlands and hunt in more open environments (Snow and Perrins 1998, 298), but are also scavengers. Similarly, ravens can scavenge carrion, but also nest in tall trees and hunt and forage in open areas (Snow and Perrins 1998, 1483-5). The white-tailed eagle was much more abundant in the Mesolithic and Neolithic than today and is suggested to have been found along freshwater river valleys, although they are also carrion feeders (Yaldon and Albarella 2009, 66-7). Today white-tailed eagles prefer tall, mature trees (such as pines, beeches and oaks) for nesting (Snow and Perrins 1998, 304).

3.1.14 Additional wild species found in England, but not in Wiltshire assemblages
Red squirrel has been recovered from elsewhere in southern England. Lynx were also extant in Britain through until the first millennium AD (Hetherington 2010), and so may have been present in Neolithic Wiltshire. Bird species identified elsewhere in southern England include greylag goose, teal, crane, and small passerines (including starling, wren, robin and great tit) (Serjeantson 2011a, 58).

4. Domestic Species

A summary of the occurrence of domestic species in the area can be found in Table 5.11. It is apparent that domestic dogs, sheep, goats, cattle and pigs were all present in Phase 1. In addition to when each species was introduced, this section seeks to address what they would have looked like, their behaviour, husbandry and function.

Table 5.11 Summary of occurrence of domestic species in Wiltshire

	Late Mesolithic	Phase 1	Phase 2	Phase 3	Total
Dogs	✓	✓	✓	✓	
Cattle		✓✓✓	✓✓	✓✓✓	
Sheep		✓✓	✓	✓✓	
Goats		✓	✓		
Pigs		✓✓	✓✓✓	✓✓	
Horses			?	✓ (rare)	

Note: there is no evidence for domestic birds in this timeframe and no conclusive evidence for domestic cats. ✓✓✓= dominant species, ✓✓= common, ✓= present

The appearance of domestic animals comprises their body conformation, size and coat type or colour. We currently do not know the coat colour of domestic animals in the Neolithic and Early Bronze Age, although developments in genetic analysis (for examples see Telldahl et al 2011) offers hope of this for the future. We do however have some evidence for the size and shape of the domestic stock from osteometry. This information is presented by species in the following subsections.

It is particularly difficult to investigate the behaviour of prehistoric domesticates from Britain, as without documentary evidence or artistic representations, the only direct evidence we have is their bones. We can infer behavioural traits from the behaviour of modern herds and flocks, particularly of primitive breeds.

It is difficult to ascertain ancient domestic mammal husbandry requirements. However, we can be sure of some physiological requirements, such as a need for water, adequate food through grazing conditions and perhaps supplementary food. There is some evidence for seasonal stress in the animals suggestive of winter food shortages (identified through palaeopathology), although only identified in pigs from Durrington Walls (Dobney and Ervynck 2000). We can speculate that the stock may have required (or benefited from) winter housing. We can assume a need for protection from predators and scavengers, particularly young animals. As seen above, the Neolithic and Early Bronze Age farmers would have been faced with more large predators than today with the presence of wolves, bears, lynx, wildcat and some large raptors in the wild fauna. It has also been suggested that they would have tried to prevent their female stock from interbreeding with wild forms (aurochs, wild boar and wolf), as this could lead to difficult pregnancy and birth (due to large offspring) and undesirable behavioural traits in the offspring. Palaeopathology can also offer indications of the use of cattle for traction, although not conclusively present in assemblages considered here. Developments in chemical analysis of animal bones have facilitated study of movement of domestic stock. To date, this has informed our understanding of cattle and pig husbandry at Durrington Walls, within our study area.

Animal bone assemblages suggest that beef, pork, and occasional mutton, lamb and goat meat were eaten. Evidence for this can be found in isotopic studies of human remains, evidence of cooking and butchering on the bones and the age at death of cattle and pigs.

The provenance of domestic animal bones presented in sections 4.1.5, 4.4.5, 4.5.5 and 4.6.5 of this chapter is based on the data presented in Serjeantson (2011a and b).

4.1 Dogs

4.1.1 When were dogs first introduced into the area?
Domestic dogs are likely to have been present in our study area throughout the Mesolithic, Neolithic and Early Bronze Age. The earliest examples from Neolithic Wiltshire are the Early Neolithic individuals from Windmill Hill (Grigson 1999; 1965). Four dog bones from Cherhill may be Mesolithic or Neolithic (Grigson 1983). A recent survey (Clarke 2006) lists nine sites in Britain with Neolithic dog remains; four of these are from Wiltshire. Two more Phase 1, two Phase 2-3 and three Phase 3 Wiltshire sites were identified by Serjeantson (2011a) and these can now be aggregated with 136 Phase 2 and 2-3 dog bones from Boscombe Down (Higbee pers comm).

4.1.2 What did the dogs look like?
The recovered assemblages suggest that Neolithic dogs were between approximately 37 and 62cm tall at the shoulder (Clarke 2006), a range spanning approximately the size of modern fox terrier to German shepherd breeds. The size range of Bronze Age dogs in Britain is slightly smaller at 43-63cm (Clarke 2006) although we have fewer dogs from this phase, and only one measurable dog bone in Serjeantson's (2011a) survey: a metacarpal from Milton Lilbourne measured 65.9cm (Greatest Length (GL); Grigson 1986), equating to a shoulder height of 53-63cm, following the conversion factors of Clarke (1995). Long bone measurements from an articulated dog found in a pit associated with beaker pottery at Easton Down (Jackson 1935, 76), equate to a shoulder height of 43-45cm following Harcourt's (1974) conversion factors.

4.1.3 How did the dogs behave, what kind of habitats/ care would they have required?
We do not know whether the domestic dogs were feral or lived with people. Serjeantson (2011a) notes that dog coprolites from Windmill Hill indicate that they were fed on, or scavenged, bones. There is a suggestion that there may have been some interbreeding between domestic bitches and wolf dogs during the Neolithic (Clarke 2006).

4.1.4 What products would the dogs have produced?
There is little evidence that dogs were eaten, although Serjeantson (2011a, 37) references evidence of dismemberment at Windmill Hill (see this chapter, section 6.1), and Edwards and Horne (1997) record filleting and dismemberment marks on eight Late Neolithic dog bones from West Kennet. It is therefore unlikely that dogs were primarily kept for their meat, leading us to assume that dogs were kept as hunting animals, and to assist with herding and protecting stock.

4.1.5 In what kind of contexts are they found in the archaeological record?
Phase 1 dog remains have been found in ditch fills and primary occupation layers of the causewayed enclosure at Windmill Hill, and ditch fills at Stonehenge and Easton Down long barrow. Phase 2 dog remains have been found in ditches at the henge sites of Coneybury, and Durrington Walls, in the West Kennet palisade enclosures (in ditches, and bone dumps), in a long barrow ditch fill at Easton Down, and in pit fills at Boscombe Down and Windmill Hill. The dog from Coneybury Henge was an adult male which had survived a fracture of a hind leg. This left the leg shorter than the opposite side (Maltby 1990d, 152-3), perhaps reflecting a degree of care for the injured dog. Dog bones have also been found associated with the Phase 2-3 fills of ditches at Windmill Hill, Phases 2-3 and 3 funerary monuments of South Street long barrow, and Hemp Knoll, Durrington Down and Milton Lilbourne round barrows.

Serjeantson (2011a, 80) reports nine placed dog deposits from southern England, three of which are in our study area. The Phase 1 ditch terminal at Windmill Hill contained a dog skeleton and secondary ditch fills at Stonehenge included articulated foot bones (these may also represent the remains of a skin). Phase 2 Coneybury Henge primary ditch fill also included a dog skeleton. In addition Serjeantson (2011a) notes that a dog skull was found associated with a food vessel in a barrow at Amesbury.

4.2 Cats

4.2.1 When were domestic cats first introduced into the area?
Few cat bones have been recovered from Neolithic and Early Bronze Age southern England, although there is an apparent increase in cats in Britain from the Neolithic onwards (Kitchener and O'Connor 2010). However, Kitchener and O'Connor highlight the difficulty of distinguishing wild cats and domestic cats and note that the presence of cats at settlement sites may represent opportunistic predators rather than 'pets'. Current belief is that domestic cats were not present in the period of interest (Yaldon 1999, 125, Kitchener and O'Connor 2010).

4.3 Horses

4.3.1 When were domestic horses first introduced into the area?
Whilst wild horses were present in Early Mesolithic Britain, no directly-dated domestic horse remains are known from the Late Mesolithic period until the Middle Bronze Age (Bendrey et al 2013), some of the earliest dated remains being from Middle Bronze Age activity at Durrington Walls (OxA-6320, uncal 3045 ±50 BP and1423-1131 cal BC; Bendrey et al 2013; Kaagan 2000). In addition to Durrington Walls, other Phase 1 to 3 sites in Wiltshire have produced horse remains, but direct dating of these is also proving that they tend to be from later activity at the sites. For example, English Heritage has recently radiocarbon dated the only horse bone from Marden henge (Harcourt 1971b, 234-5) and revealed it to be Early Medieval (SUERC-44488, uncal 1093 ± 29 BP and cal AD 880–1020; Peter Marshall pers comm) and the reported Neolithic horses from Fussell's Lodge have proved to be from the Iron Age (Kaagan 2000). Other Phase 1-3 finds of horse remains are either potentially misidentified or contextually insecure.

Serjeantson (2011a, 37-9) and Kaagan (2000, 158-9, 162-3) consider the Phase 1 Wiltshire finds of horse bones recovered from deposits at Windmill Hill as potentially misidentified, and those from Millbarrow as contextually insecure. The horse bones from King barrow, Boreham (known only from their early nineteenth century excavator's notes) are now thought to be potentially intrusive (Field 2006a 4, Serjeantson 2011a, 39). A possible horse premaxilla is reported from Early Neolithic deposits at Horslip barrow (Higham and Higgs 1979, 225).

The Sanctuary and four Phase 2 henge sites have produced horse bones. The bones from Marden henge and Durrington Walls can now be discounted (above). Gray (1935) reports horse remains from Avebury, but these are from later ditch fills (some Roman) and the horse remains could not be located for reanalysis by Kaagan (2000). The single horse bone fragment from Coneybury Henge upper ditch fills (Maltby 1990d, 153) has not been directly dated. A single horse bone was also recovered from a post-hole at The Sanctuary, originally identified by Jackson (1931), and its identify confirmed by Kaagan (2000, 159). However, the bone is not necessarily contemporary with the monument; the original report does not identify the depth from which it was recovered. Several authors (Bendrey 2010, 12, citing Bendrey 2007; Bendrey et al 2013; Serjeantson 2011a, 37-9) conclude that the presence of any horses in Neolithic England is, at best, insecure. Assertions that horses were associated with Late Neolithic ceremonial sites, including The Sanctuary, Marden and Durrington Walls (for example Pollard 2006, 144-5), are being disproved by direct dating of these remains.

Until recently, horses were thought to have been present in Early Bronze Age England, a horse skull from Grimes Graves, Norfolk being cited as to be the earliest directly-dated post-Mesolithic horse bone (BM-1546), its age estimate spanning the Late Neolithic and Bronze Ages (Phases 2 to 3): 2900-1600 cal BC (for example, Bendrey 2010, 10; Kaagan 2000; Serjeantson 2011a). However, its age has recently been retested, and shown to be Roman rather than prehistoric (OxA 1635: Higham et al 2007; Bendrey et al 2013). Horse remains are recorded from three Early Bronze Age Wiltshire sites: deposits from the upper fills of ditches at Amesbury barrow 42 contained three horse bones (Maltby 1990e, 105), although the context is not secure; the barrow mound at Hemp Knoll contained a tooth and sacral vertebra (Grigson 1980); and four of the five Early Bronze Age round barrows at Milton Lilbourne each contained one or two horse teeth or foot bones (Grigson 1986), but it's not clear from the report whether these could be intrusive. None of these remains have been directly dates and the presence of horses in Phase 3 remains unproven.

4.4 Cattle

4.4.1 When were domestic cattle first introduced into the area?
Domestic cattle were introduced into Britain during the Neolithic and not domesticated from wild aurochs locally (Edwards et al 2007). Domestic cattle have been identified from all phases of interest, including the four earliest Neolithic sites. Cattle were the most prevalent species in the large Phase 1 assemblage from Windmill Hill. A cattle bone from Coneybury Anomaly produced a radiocarbon date of 3980-3708 BC (OxA-1402; Richards 1990, 42; Hedges et al 1989).

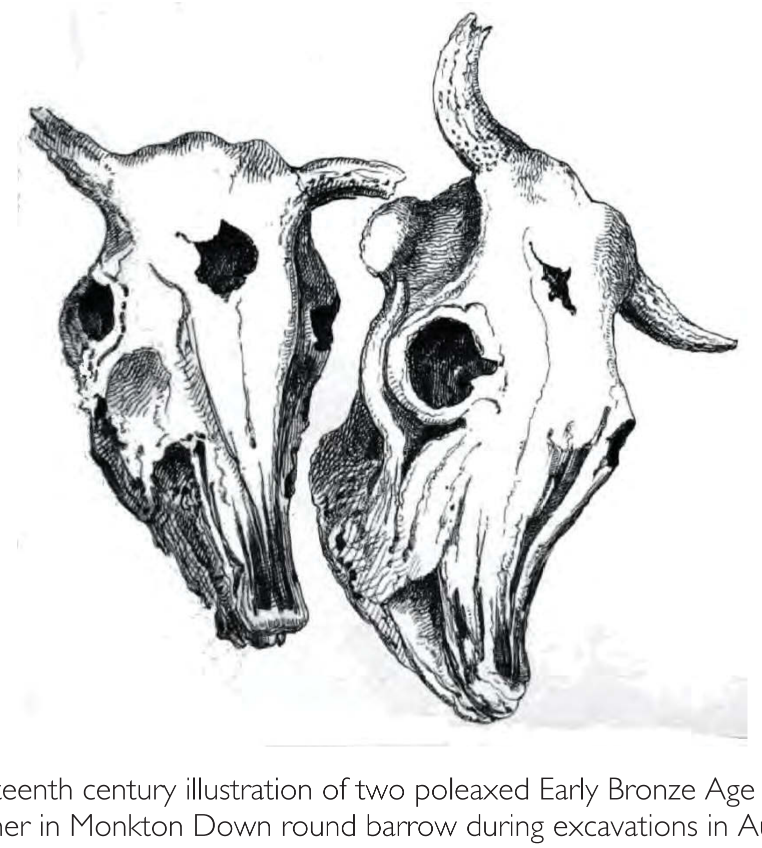

Fig 5.1 Nineteenth century illustration of two poleaxed Early Bronze Age cattle skulls found together in Monkton Down round barrow during excavations in August 1849. The skulls measured nine inches between the orbits (Merewether 1851, 105). Illustration amended from Merewether (1851, plate Y)

4.4.2 What did the cattle look like?
Serjeantson (2011a, 21) suggests that the Neolithic cattle had a wide skull and long curved horns (as described by Jackson (1929) from Woodhenge and Stonehenge) and stood at around 1.2m at the shoulder (citing Grigson 1984), or 1.1-1.4m for cattle at Windmill Hill (following Grigson 1999, 214). Serjeantson (2011a, 21) concludes that by the Early Bronze Age, a second type of cattle was also present and that both are found contemporaneously during the Bronze Age. The second type had shorter horns, was around 20-30 cm shorter and correspondingly more gracile. She also asserts that the animals would have been hairy, rather than smooth coated (citing Zeuner 1963).

4.4.3 How did the cattle behave, what kind of habitats/care would they have required?
A recent study has investigated stable isotope composition of contemporary aurochs and domestic cattle bones from Neolithic and Bronze Age England (Lynch et al 2008) and concluded that aurochs exploited forested or wetland habitats, and that these were not the habitats favoured for domestic cattle. The evidence for this was a greater depletion of 13C referred to as a 'canopy effect' in aurochs, compared to domestic cattle from the same sites. However Lynch et al (2008) note that their samples from Durrington Walls do not conform to the pattern seen at other sites, the 13C values for cattle and aurochs being similar (0.3 ‰ difference), but the 15N values differing (c 2.2‰ difference). A recent PhD project (Viner 2010) has shown that cattle found in the Late Neolithic assemblage at Durrington Walls were raised in varied geological zones (whilst between the ages of 9-24 months), with only two of the thirteen individuals investigated being raised on chalkland, while others must have travelled distances of at least 30km and 90km to reach Durrington Walls (Viner et al 2010). Those raised on the chalk were not necessarily from the locality, the chalk ranging from Dorset to Norfolk with a second band ranging from Wiltshire to parts of Hampshire, Sussex and Kent. A similar investigation of cattle and aurochs remains from Early Bronze Age barrows in the midlands (Towers et al 2010) also identified some evidence for movement of cattle. It is not known whether the Durrington Walls cattle bones studied by the Lynch et al (2008) and Viner et al (2010) projects were from the same individuals, but from Viner et al's (2010) results we can suggest that the habitat preferences identified in Lynch et al (2008) do not necessarily represent local animals.

Cattle husbandry may include castration (particularly if the animals are required for traction). Serjeantson (2011a, 23) reports that osteological evidence for castration during this period is inconclusive.

4.4.4 What products would the cattle have produced?
Cattle are generally husbanded for meat, traction, dairy and by-products. Butchery marks on cattle bones from Durrington Walls indicate that cattle carcasses were more frequently butchered than pig carcasses (Albarella and Serjeantson 2002) and show evidence of accessing the cattle bone marrow. Pathologies possibly, but not necessarily, caused by traction have been identified at Windmill Hill and Durrington Walls (Serjeantson 2011a, 24).

Cattle age-at-death profiles and sex ratios have been used to suggest that the populations were used for dairy (Serjeantson 2011a), with superfluous males calves killed during the summer months (and used for meat), the exact timing dependant on the intensity of farming. While Serjeantson (2011a) found evidence for this in Bronze Age British assemblages, she notes that there are too few cattle mandibles to test this

osteologically for the Neolithic, though processing of milk is evident from lipid analysis of residues found in pottery vessels from Windmill Hill (Copley et al 2003).
(See also **Chapter 7 – Diet**).

4.4.5 In what kind of contexts are they found in the archaeological record?
Cattle are the most common taxon in the dataset and are found at the majority of sites. They appear to have particular associations with funerary monuments (see this chapter, section 4.8.2 – 4.8.4). Serjeantson (2011a, 80) recorded 75 placed deposits of cattle bones in southern England, half of which are from sites in Wiltshire. Phase 1 deposits at Windmill Hill causewayed enclosure included eleven cattle skulls in ditches, usually ditch terminals and sometimes with articulated bones from other species. Ditches at Stonehenge included six deposits of skulls, jaws and occasionally other bones and Whitesheet Hill causewayed enclosure similarly included a cattle skull in the base of a ditch. Cattle and aurochs skulls were also deposited in eight Phase 1 funerary monuments (see this chapter, section 4.8.2). Articulated cattle feet were recovered from a pit at Robin Hood's Ball causewayed enclosure and a ditch at Whitesheet Hill causewayed enclosure; and articulated vertebrae were recovered from the ditch at South Street long barrow. As discussed in section 6 of this chapter, articulated foot bones may also indicate skins or leather working waste. A pit at Hemp Knoll contained a calf skeleton. The only certain Phase 2 placed cattle deposit was an articulated spine in the ditch at Longstones enclosure. The six Phase 2-3 and Phase 3 placed cattle deposits are all skulls or skulls and feet from funerary monuments (see this chapter, section 4.8.3 – 4.8.4).

4.5 Pigs

4.5.1 When were domestic pigs first introduced into the area?
Domestic pigs have been identified in sites of all phases, including the four earliest sites in the dataset, and are the most prevalent species in some sites, particularly the large Late Neolithic assemblages. It is likely that pigs were domesticated from European wild boar, rather than domesticated in the near East and imported (Larson, et al 2007a, Larson et al 2007b), as is the case for sheep, goats and cattle. Larson et al (2007b) included three pig bones from Durrington Walls, all of which proved to have European haplotypes.

4.5.2 What did the pigs look like?
The large number of pigs from Durrington Walls has also been used to investigate the size and shape of Neolithic pigs (Albarella and Payne 2005). The pigs would have stood at approximately 71cm at the shoulder (Serjeantson 2011a, 31), considerably bigger than contemporary sheep/goats and dogs. The largest males, would have been similar in size to contemporary female wild boar (Albarella 2010). They would also have had a similar body conformation to wild boar with a long snout and relatively long legs (Serjeantson 2011a, 31). While Serjeantson (2011a, 31) suggests that the pigs are likely to have been dark coloured and hairy (like wild boar), recent DNA analysis (Fang et al 2009) has suggested that domestic pigs may have exhibited diversity in coat colour from early in their domestication, and that this diversity may have been actively bred as an aid to husbandry by selectively breeding out the naturally camouflaged coat colours of wild boar. No coat-colour studies have directly investigated British Neolithic pigs.
4.5.3 How did the pigs behave, what kind of habitats/care would they have required?
Wild boar, and therefore pigs are often considered a woodland species, but they can

also inhabit agricultural land, scrub, grasslands and marshes. Pigs root up ground, but Albarella et al (2007) show that this can be prevented by inserting a rod or ring in their snout and results in their doing no more grazing damage to crops than cattle or sheep. Perhaps in a pre-metal society, a wood, rope, bone or antler object would have had the same effect. Albarella et al (2007) also note that newborn piglets can be subject to fox predation and are therefore offered shelter, even where their herd is free-roaming. In Neolithic and Bronze Age Wiltshire, this may also have been the case, or perhaps dogs were used to ward off foxes (and possibly other large carnivores and birds of prey). Dobney and Ervynck (2000) used palaeopathological evidence of developmental stress in pig's teeth (presence of Linear Enamel Hypoplasia: LEH) from Durrington Walls to suggest that the pigs only had one litter a year (in the spring) and that the husbandry strategy led to nutritional stress during the winter. However the interpretation of single or multiple farrowing from LEH has been questioned by other authors (Vanpoucke et al 2007).

Although pigs are the dominant animal in many sites, they may not have all been raised locally. A current study (Madgwick et al 2012) has shown that some of the pigs found at Durrington Walls may have been born away from the chalk downs.

4.5.4 What products would the pigs have produced?

Pigs at Durrington Walls were slaughtered between one and three years (Albarella and Serjeantson 2002), which is in keeping with raising them for meat. Butchery marks and evidence of burning on the pig bones has also provided evidence for how the meat was processed at the site (see **Chapter 7 - Diet**). It is likely that pigs provided few products other than meat. Although their skin can be used like leather, it is also edible. It is probable that, like many other hunted and domestic animals, their hair, body fats, bones, teeth and soft tissues were also utilised in artefact production rather than wasted.

4.5.5 In what kind of contexts are they found in the archaeological record?

As the second most common domestic mammal in the dataset as a whole, and the most common in Phase 2, pigs have been found at nearly all sites. Most of the sites which did not produce pig remains are long barrows and round barrows. Pigs are often found in pits and ditches. They are often the best represented species at henge sites. Recent excavations at Marden henge, recovered a midden of pig (and perhaps wild boar) bones, possibly associated with a floor surface with a large hearth (Leary et al 2010).

Serjeantson (2011a, 80) reports 28 placed pig deposits from southern England, making them the second most common taxon deposited in this way. Ten of the placed pig deposits (some comprising more than one pig) are from Wiltshire. The Phase 1 long barrows at King barrow and Millbarrow each included pig teeth (a tusk in the former and three mandibles in the latter). The pit at Robin Hood's Ball causewayed enclosure contained an articulated pig foot, and three piglet skeletons were recovered from Phase 1 ditch fills at Stonehenge, one of which was neonatal. Three piglet skeletons were also recovered from a Phase 2 pit at King Barrow Ridge and a second articulated foot from the Phase 2 ditch terminal at Longstones enclosure. Pig bones were found associated with the Phase 2-3 human burial at The Sanctuary and with Phase 3 cremated human bones at Ogbourne St George.

4.6 Sheep and Goats

4.6.1 When were domestic sheep and goats first introduced into the area?
Sheep and goats have very similar bones and are often not distinguished in archaeological assemblages, including approximately half the assemblages referenced in Serjeantson (2011a), with several other assemblages recording 'sheep' without categorically dismissing the possibility of goat. Assemblages of all phases contained sheep/goat remains, indicating the importation of domestic stock in or before the Early Neolithic in Wiltshire. A total of 13 sites positively identify sheep, the earliest being Phase 1 sites of Hemp Knoll pits, Robin Hood's Ball, Windmill Hill and Whitesheet Hill Environs, all of which are Early or Middle Neolithic in date (Table 5.12). Goat bones have only been identified in small numbers at a minority of sites, and at only four sites in Wiltshire: Windmill Hill, Durrington Walls, Horslip and Boscombe Down (Table 5.12). The goats from Early Neolithic Phase 1 deposits at Windmill Hill are therefore the earliest in the county.

4.6.2 What did the sheep and goats look like?
Evidence for the size and shape of sheep and goats in Neolithic Wiltshire is limited, due to their rarity. A sheep from Windmill Hill stood at around 57cm (Grigson 1999), and evidence from southern England as a whole suggests that there was no size change during the Neolithic and Early Bronze Age (Serjeantson 2011a, 33). The size of Neolithic sheep from elsewhere in southern England has been compared to modern feral soay sheep, Legge (2008, 550) suggesting that those from Hambledon Hill were slightly more robust than male soays, but based on only four bones. The majority of goat bones are from the early and mid 20th century excavations at Windmill Hill where they were only identified from cranial elements (Grigson 1999, 223) with post-cranial remains not distinguished between sheep or goat. There is no more information about the goat bone from Horslip. It is therefore not possible to estimate the size of the goats. However, one adult Early Bronze Age goat from Twyford Down stood at 56-58cm tall (Serjeantson 2011a, 35). Although hornless sheep are known from the Early Neolithic elsewhere in Europe, Ryder (1983, 38) suggests that they were unknown in Britain at this time. There is no evidence for hornless sheep or goats from Neolithic and Early Bronze Age Wiltshire.

4.6.3 How did the sheep and goats behave, what kind of habitats/care would they have required?
Modern sheep breeds show behavioural variability, for example some primitive breeds of sheep do not flock and so cannot be controlled as a group, but rather must be caught individually using dogs. In flocking breeds of sheep, a goat is sometimes used to lead the flock (Ryder 1983, 7). Other husbandry concerns may have included castration and shelter. It is likely that some male sheep would have been castrated, but the paucity of measurements negates testing this zooarchaeologically. It is also likely that husbanded sheep would have been given some shelter when lambing, and perhaps over winter.

4.6.4 What products would the sheep and goats have produced?
Serjeantson (2011a, 34) concludes that sheep would have been kept for meat, milk, skin and dung, commenting that the skin is easier to work that cattle hide and the dung provides better nutrients for cereal crops than that of pigs or cattle. There are too few sheep mandibles to look at the mortality profile; however Serjeantson (2011a) refers to mortality of young lambs at contemporary sites outside Wiltshire in support of milking.

Table 5.12 Sites with positively identified sheep and goat bones

Phase	Sites with sheep	Sites with goat
1	Hemp Knoll pits Robin Hoods Ball Windmill Hill Whitesheet Hill environs Stonehenge (phase 2)	Horslip Windmill Hill
2	Durrington Walls King Barrow Ridge Longstones West Kennet palisade enclosure 1 West Kennet palisade enclosure 2 Windmill Hill, outer Late Neolithic pits	Durrington Walls Boscombe Down*
3	Amesbury barrow 39 Milton Lilbourn	-

*Not in Serjeantson 2011a.

Their relative scarcity in the archaeological record suggests that sheep would have been of less importance for meat or milk than cattle. One product unique to sheep in Britain is wool. However, the fleece of Neolithic sheep would have been more hairy than that of modern sheep (Ryder 1983), perhaps becoming woollier in the Early Bronze Age (Ryder 1993 cited in Serjeantson 2011a, 34). The fleece is likely to have been coloured rather than white. Wild sheep and some primitive breeds of sheep, for example Shetlands and Soays, moult their fleece naturally and were plucked historically, rather than shorn.

4.6.5 In what kind of contexts are they found in the archaeological record?
The majority of sheep/goat bones are from Phase 1 deposits, and most of these are from the primary occupation and ditch fills at the causewayed enclosures on Windmill Hill and Whitesheet Hill. Phase 1 sheep/goats were also identified in assemblages from the ditches at Stonehenge, Stonehenge Lesser Curses, six long barrows and pit clusters at Windmill Hill and Hemp Knoll. Phase 2 sheep/goat bones were recovered from pit fills at Boscombe Down and Windmill Hill, occupation at King Barrow Ridge, the henges at Marden, Durrington Walls and Coneybury, the enclosures at Longstones and West Kennet, and secondary ditch fills at Easton Down long barrow. Phase 2-3 and 3 sheep/goat bones were recovered from eight round barrows, a later ditch fill at a long barrow and outer ditch fills at Windmill Hill.

Serjeantson (2011a, 80) reports 20 placed deposits of sheep or goat bones, but only one of these was from Wiltshire. A Phase 1 sheep skeleton was recovered from the causewayed enclosure at Whitesheet Hill. Sheep were therefore the least commonly 'placed' domestic mammal in Wiltshire sites. This may be used to suggest that they held less importance than cattle and pigs to both the economy and belief systems of Neolithic and Early Bronze Age Wiltshire.

4.7 How do the relative amounts of different animals change across the phases?

It has been suggested that in order to compare the relative frequency of the three main domestic species (usually cattle, sheep/goat and pig) each assemblage must have at least 100 identified specimens of each species, and given the disparity in species prevalence expected, a minimum sample size of 500 for the three species combined (Hambleton 1999, 39). As demonstrated above, few assemblages of this size have been recovered from Neolithic contexts in Wiltshire, and none from Phase 3 assemblages. The only large enough assemblages for comparison are those from Phase 1 deposits at Windmill Hill, Phase 2 deposits at West Kennet palisades, Durrington Walls and Boscombe Down, although the Durrington Walls data is only available as a MNI (Minimum Number of Individuals) (Table 5.13).

This data provides evidence for a shift from a Phase 1 husbandry strategy heavily reliant on cattle, with some sheep/goats and slightly fewer pigs, to a Late Neolithic pattern heavily reliant on pigs with fewer cattle and only occasional sheep/goats. With a total of 450 cattle, no sheep, goats or pigs, the Phase 1 Coneybury Anomaly assemblage is too small to include in the table, but conforms to the pattern, which is also generally born out in the southern English dataset as a whole (Serjeantson 2011a, 17-20). However, Late Neolithic deposits from Boscombe Down, not available to Serjeantson's 2011a study, show a similar NISP of cattle and pig, raising the possibility that site type may influence species proportions in the Late Neolithic, the Boscombe Down Late Neolithic assemblage being mostly from pit fills. Considering the Boscombe Down data through MNI rather than NISP changes the relative proportion of species, but leaves the proportion of cattle and sheep/goat elevated above that seen at other sites, and more like the proportions that Serjeantson (2011a, 18-20) observed at Late Neolithic/Early Bronze Age sites.

Table 5.13 Relative proportion of sheep/goat, pig and cattle bones

Site	NISP Cattle	NISP Pig	NISP Sheep/Goat	Sum
Phase 1				
Windmill Hill (primary occupation)	342 (60%)	90 (16%)	138 (24%)	750
Phase 2				
West Kennet palisade enclosure 1	72 (10%)	631 (88%)	10 (1%)	713
West Kennet palisade enclosure 2	202 (18%)	913 (79%)	35 (3%)	1150
West Kennet palisades total	274 (15%)	1544 (83%)	45 (2%)	1863
Boscombe Down	355 (52%)	291 (43%)	32 (5%)	678

Site	MNI Cattle	MNI Pig	MNI Sheep/Goat	Sum
Phase 2				
Durrington Walls	85 (29%)	198 (69%)	6 (2%)	289
Boscombe Down	7(39%)	8 (44%)	3 (17%)	18

Only Durrington Walls and Windmill Hill contained positively identified sheep and goats. In these assemblages sheep outnumbered goats by 75:25 at Windmill Hill (NISP) (Grigson 1999, 223) and 71:1 (NISP) or 5:1 (MNI) at Durrington Walls (Harcourt 1971a, 343). Assuming the sheep/goat bones at other sites represent the species in a similar frequency, sheep were considerably more common than goats.

4.8 Can we see different ways in which animal bones were treated in the archaeological record?

4.8.1 Animal bones from non-funerary sites.

The relative proportions of bones of different taxa from non-funerary monuments can be seen in Fig 5.3 (but note that the sample sizes from different sites vary). These are restricted to Phases 1 and 2 and comprise occupation layers, pits or pit clusters, a cursus, henges and enclosures. Three general chronological themes can be determined from Fig 5.3, firstly a dominance of cattle in Phase 1 assemblages which is generally replaced by pig in Phase 2, secondly a general reduction in the number of bones of deer, although largely due to their prevalence on two Phase 1 sites, and thirdly a persevering low level representation of the bones of other wild taxa. It should be noted that the data from Serjeantson (2011a; 2011b) used in this figure excludes antler tools (see section 5.1).

The data from enclosures demonstrate a change from the dominance of cattle in Phase 1 causewayed enclosures to an increase in pig (and in the case of West Kennet, dominance of pig) in Later Neolithic enclosures. This is also the case with pits and pit clusters. Of all non-funerary monuments recorded by Serjeantson (2011a), the Phase 1 causewayed enclosures also show the greatest number of placed deposits of domestic mammals (predominantly cattle, but with some pig, sheep/goat and dog), most of which are from Windmill Hill.

The henge monuments are predominantly Late Neolithic (Phase 2), and show some variety in relative proportions of pig and cattle. Animal bones from the 2010 excavations at Marden henge have not yet been subject to full analysis, however, an assessment indicates that the Neolithic assemblage is predominantly pig with 75 pig (and perhaps wild boar) bones, only 14 cattle bones and no sheep or goat (Worley 2011). Earlier excavations at Marden produced an assemblage with equal numbers of cattle and pigs (MNI 8 of each; Harcourt 1971b). Coneybury Henge had more cattle than pig, (237, 79 NISP), as did Stonehenge, but to a lesser degree (102, 87 NISP). The henge at Durrington Walls produced an assemblage dominated by pig over cattle (198, 85 MNI). The assemblage from Avebury henge is mostly from upper ditch fills and is unlikely to be Neolithic. The henge monuments have fewer placed deposits than the enclosures – they are found at only Coneybury Henge and Stonehenge. At Coneybury, one dog skeleton was recorded, but Stonehenge contained ten placed deposits (mostly cattle, but also pig and dog). In terms of placed deposits, Stonehenge has more in common with enclosure monuments than other henges, although again, this conclusion is based on a relatively small dataset.

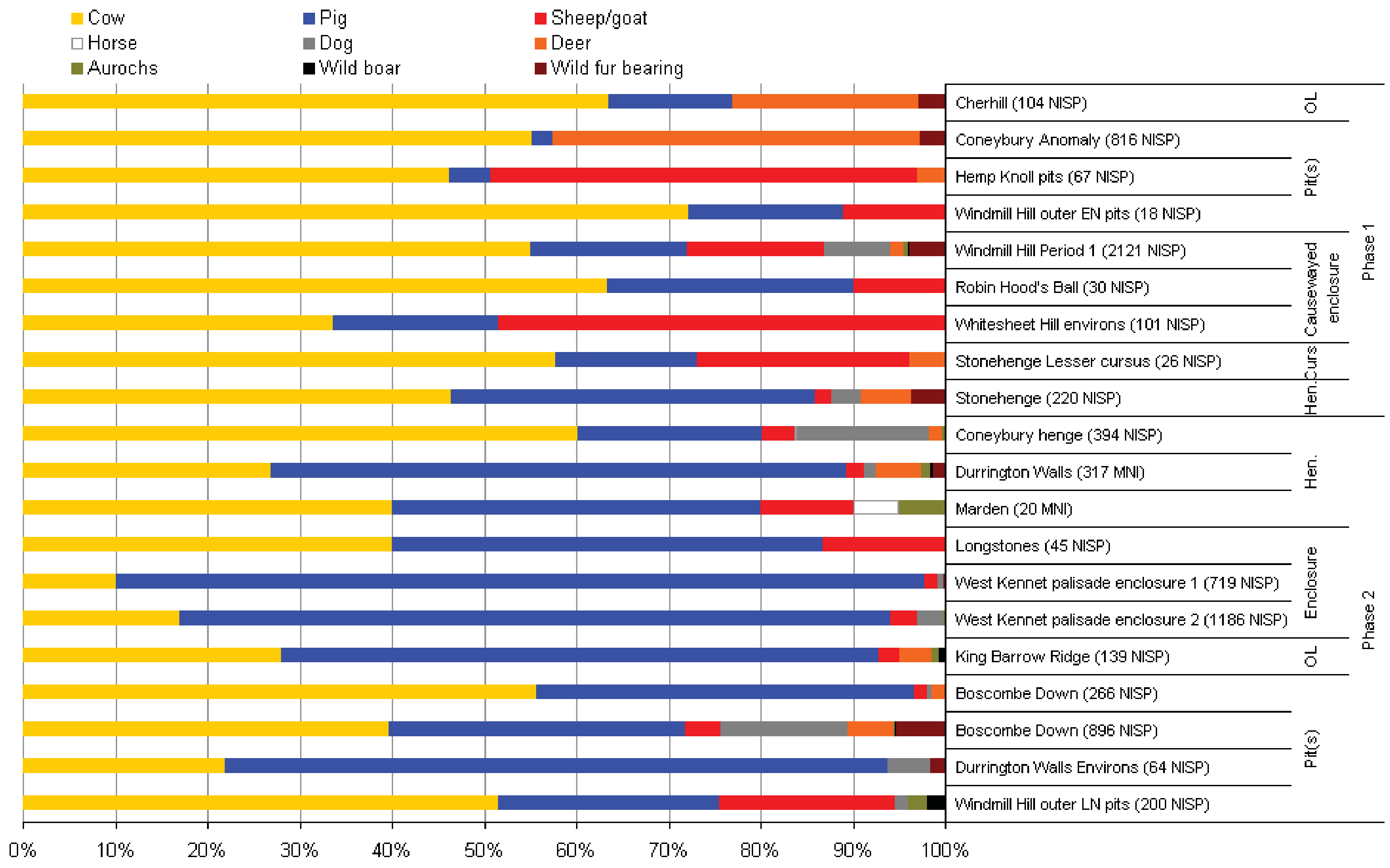

Fig 5.2 Relative proportion of bones of different taxa (NISP) in non-funerary sites. Data from Serjeantson (2011a; 2011b, supplemented with data for Durrington Walls Environs (Hamilton-Dyer 2004) and the larger assemblage from Boscombe Down (Higbee pers comm). Sites with a total NISP of less than 10 are omitted (Key: Hen. henge, OL occupation layer, Curs. Cursus)

Table 5.14 Significant primary animal bone deposits associated with long barrows

Long barrow	Cattle/aurochs bone deposits in mound	Red deer antler deposits in mound	Cattle/aurochs bone deposits in ditch	Red deer antler deposits ditch	Comments
Amesbury Barrow 42	Cunnington (1914) reports parts of at least 3 domestic cattle: "several entire carpi and tarsi, every bone, down to the sesamoids, being *in situ*, and parts of a pelvis and a skull of the same animal... one carpus and two tarsi, the bones of which were perfect enough to be articulated. They had evidently been cut off from the carcass with the hoofs and probably integuments [skin] entire. "		A cattle calcaneum was the only bone in the primary fill	2 fragments in ditch??	Flint knapping in ditch. Antiquarian and later excavation.
Beckhampton Road	Three domestic cattle skulls, one with mandible and 6 cervical vertebrae	10 picks, 2 rakes and 7 fragments. Five were buried in two piles			
Boles barrow	Heads and horns of several oxen	Antler with cattle bones			Antiquarian excavation.
Easton Down	Cattle humerus on old ground surface (burial area not investigated)			Tine in ditch base	Very small excavation and short report
Fussell's Lodge	Cattle skull and separate deposit with the bones of three feet and the tail.	Antler tine in chalk	Cattle tibia in one ditch. Compact deposit of cattle bones including some in articulation in south ditch	5 shed antlers, 1 tine	Antler with nest of flints –on site knapping

Long barrow	Cattle/aurochs bone deposits in mound	Red deer antler deposits in mound	Cattle/aurochs bone deposits in ditch	Red deer antler deposits ditch	Comments
Horslip			Compact deposit of cattle bones. Elsewhere also a partial aurochs skull.	Antler pick and tine	
King barrow	Overlies animal bones including cattle	Antler in the mound			Antiquarian excavation.
Knook barrow	Cattle horns close to cist Probable aurochs skull above cairn	Antler on floor near the cist and also immediately below turf			Antiquarian excavation.
Lanhill	Forecourt area included cattle ribs, vertebrae and partial skull.		NOT EXCAVATED	NOT EXCAVATED	Small excavation
Millbarrow		Unshed antler from bottom of pit in front of monument and a fragment in a stone hole	Cattle jaw in primary fill	Antler and fragments from 3 ditches	
Old Ditch		Small pieces of antler close to base, larger fragments in mound			Antiquarian excavation.
Sherrington barrow	A pit with a cattle skull	Antler with cattle skull			Antiquarian excavation.
South Street	Four cattle scapulae. Cattle mandible was the only additional intentional animal bone.	2 rakes, beam, 3 picks.	2 scapulae. 4 articulated vertebrae	Pick (in secondary fill)	Badly damaged mound and may have never been complete

Long barrow	Cattle/aurochs bone deposits in mound	Red deer antler deposits in mound	Cattle/aurochs bone deposits in ditch	Red deer antler deposits ditch	Comments
Tilshead 5	Two cattle skulls, one also with six or seven cervical vertebrae. A metatarsal and some phalanges were found about 30cm above.	"several fine antlers" found with the cattle foot bones.			Antiquarian excavation.
White barrow		"'a few antlers" presumed to have been in the mound make-up			Antiquarian excavation.

4.8.2 Animal grave goods in long barrows (Phases 1, 2 and 2 – 3)
Serjeantson (2011a) records animal bones from 18 long barrow assemblages, the bones from six of which (Boles barrow, King barrow, Knook barrow, Old Ditch barrow, Sherrington barrow and White barrow) are known only from Cunnington's very early nineteenth century excavation notes, cited in Field (2006a) and Eagles and Field (2004). The majority of the long barrow assemblages are dated to Phase 1 (Table 5.5). The assemblages from Amesbury barrow 42, South Street and Easton Down, recorded as Phases 2 and 2-3 are all from secondary or later ditch fills, so not contemporary with the construction of the monument. This section will only consider those animal remains thought by the excavators to be contemporary with the monuments.

Grigson (1966, 65) notes that, in the mid twentieth century, cattle bones had been recovered from almost all excavated long barrows in Britain. Grigson (1966, 65-6) points to the Wiltshire assemblages from Tilshead Lodge (also known as Tilstead 5, not in Serjeantson (2011a) presumably as it was never published (Cunnington 1914, 402-3), Boles barrow (also known as Heytesbury 1), Amesbury 42, Knook 2, Boyton 1 (also known as Corton; not in Serjeantson (2011a), but there is no record of animal remains in an early twentieth century gazetteer description (Cunnington 1914)) and Sherrington 1. Serjeantson (2011a) includes animal bones from five long barrows published after Grigson's (1966) paper, and one published in the same year. All but one cite cattle bones as significant deposits.

A range of species have been identified in primary barrow deposits and ditch fills including cattle, aurochs, sheep or goat, pig and bird (including cf. heron) bones, and red or roe deer antlers. Further species (horse, fox, dog, badger, red deer, roe deer and rodent) have also been identified, but were all described as probably residual, intrusive or had very poor contextual information. The cattle/aurochs bones and deer antlers show recurrent patterns of deposition. Eight of the fifteen barrows (including Tilstead 5) contained skulls (and sometimes other bones) of cattle or aurochs within their mounds (Table 5.14), the only animal bone thought to have derived from primary deposits in the mound of a ninth barrow (South Street) was a cattle mandible. The barrow had been severely plough damaged prior to excavation, raising the possibility that the skull may originally have been present.

4.8.3 Animal bones from round barrows (Phases 2-3 and 3)
Serjeantson (2011a) records twelve animal bone assemblages from round barrows, which, together with one flat grave assemblage, comprise the entire Phase 3 dataset for Wiltshire. The majority of the animal bones from the Milton Lilbourne graves (barrows 1-5) are described as coming from occupation debris in the barrow's loam cores, rather than grave goods (Ashbee 1986, 72-3, Grigson 1986). This is also the case for the majority of animal bone from the barrow contexts at Hemp Knoll (Grigson 1980), Amesbury barrow 39 (Ashbee 1981) and Amesbury barrow G51 (Clutton-Brock 1974). These barrows represent four cremation burials, one without a central burial and one possible inhumation.

The inhumation funerary rite at Monkton Down G9 and Hemp Knoll demonstrate similarities in that both contained domestic cattle skulls (Cleal 2005) above the inhumations, two poleaxed skulls in Monkton Down (Merewether 1851, 105 and plate Y; see also Fig 5.2) and one skull and mandible (from a long-horned female) with almost all of the bones of all four feet in Hemp Knoll (Grigson 1980). The Hemp Knoll skull was probably fleshed when interred as both the skull and mandible were present and it is interpreted as a cattle hide by Grigson (1980). A domestic cattle horn core with a fragment of frontal bone is recorded as having been found "below the pelvis of human burial A" at Amesbury barrow G51 (Clutton-Brock 1974, 2), also an inhumation. No other animal bones are recorded as associated with the burial. The inclusion of cattle skulls as grave goods is also seen in the earlier long barrows (see section 4.8.2).

The grave assemblage from Hemp Knoll also included a shed roe deer antler (Robertson-Mackay 1980, 138-43, Grigson 1980). The cremation in Ogbourne St. George G1 is described as being associated with the 'leg' of a pig (Cleal 2005).The final round barrow, Durrington Down, contained red deer antler fragments, including one worked, an aurochs sized thoracic vertebra and a cattle lumbar vertebra associated with the primary inhumation (Maltby and Richards 1990).

4.8.4 Animal grave goods in flat graves (Phases 2, 2-3 and 3)

At The Sanctuary (Phase 2-3) "A few cattle and pig bones and a fragment of red deer antler had been placed on the body" (Cleal 2005, 131) and Amesbury inhumation grave 1502 (Phase 3) contained a cattle skull fragment and a second fragment of large animal bone in its fill, with further cattle longbone and skull fragments and a sheep or goat humerus in a disturbed fill (Grimm 2008). Unworked 'boars tusks' were deposited in the Phase 2 flat graves of the Amesbury Archer (grave 1289) and the Companion (grave 1236) (Fitzpatrick 2011). The Amesbury Archer and nearby Boscombe Bowmen's graves also contained worked boars tusks, as well as worked antler and shell pendants (Fitzpatrick 2011) - artefacts not considered here.

5. Animal use

5.1 What archaeological evidence is there for the use of different parts of both wild and domestic animals for food, tools and other uses?

Discussion of evidence for animal use for fur and skin is presented in section 6. An animal product not considered in these sections is antler (usually red deer) utilised as a tool. There is a large dataset of red deer antler tools from Neolithic and Early Bronze Age Wiltshire, which has been extensively studied (for example, Worley and Serjeantson forthcoming). The best studied Wiltshire assemblages are those from Windmill Hill (Phase 1) and the Late Neolithic henges of Stonehenge, Avebury, Durrington Walls, Woodhenge, and Marden, and Late Neolithic monumental mound of Silbury Hill. Durrington Walls is the largest assemblage containing at least 332 antlers, the other sites containing less than 100 each. The Wiltshire sites show that selected antlers were used, these were usually shed (65-87% of larger assemblages) rather than cut from the head of deer, were generally well developed antlers, and showed no particular preference for the left or right. The scarcity of antlers cut from deer shows that deer were not often, if at all, hunted for antler. Post-cranial animal bone evidence also shows that deer were not often hunted for meat (see above). The antlers were converted to picks by dividing the beam above or below the trez tine (85% of those at Stonehenge were divided above the trez; Serjeantson and Gardiner (1995)), sometimes with the aid of fire (56% of 84 Stonehenge antlers had charring on the beam (Serjeantson and Gardiner 1995)). The brow tine was usually used as the blade of the pick; sometimes, but not always, the bez tine was removed. Battering on the back of the pick, seen on the majority of examples at Durrington Walls and Marden and about half the Stonehenge picks, suggests that they were either hit with a stone or another antler, or used as a hammer themselves. For further discussion of bone tools, see **Chapter 11 – Technology and Domestic Objects**.

5.2 What does that tell us about lifestyles, seasonality and movement of people?

Studies of strontium isotopes in cattle and pigs from Durrington Walls have suggested that a proportion of the animals were born elsewhere and brought to Durrington Walls, probably on the hoof. The populations who raised the animals may have brought them to the Stonehenge region, although it is also possible that they were migrated through the landscape in a series of transactions, the original breeders never reaching Stonehenge themselves.

Seasonality can be addressed through age-at-death, generally of young individuals (based on seasonal reproductive cycles) and the annual regeneration cycle of antler. As shown in section 5.1, the majority of red deer antlers recovered from (particularly Late Neolithic) monuments are shed and show little evidence for scavenging by wild animals, suggesting that they were collected soon after they fell from the deer in the spring (March/April). The minority of unshed antlers were taken from animals that died between about August and February, the phase during which the antlers are developed and hard but retained by the stags. The rutting behaviour of red deer stags makes them powerful and dangerous animals during the autumn (September/October), while they are much more placid at other times of the year. So it may be that red deer stags were not hunted during the autumn. This question is yet to be addressed zooarchaeologically.

LEH on Durrington Walls pig teeth has been used to suggest that the pigs were only bred once a year, although this has been challenged (see section 4.5.3). Assuming that they were only born once a year, Serjeantson (2011a, 31) reports that half of all pigs at Durrington Walls were killed during their first autumn, suggesting a seasonal ceremonial activity at the site. It should be noted that this is seasonal consumption at the site, it is not clear how this interacts with the strontium evidence: were the seasonally slaughtered animals bred on site or brought to site for slaughter? Seasonal slaughter of stock is a husbandry strategy that reduces the need for additional winter feed and it would not be surprising for this, together with a need to protect pregnant, birthing and suckling sows, ewes and cows, and to collect seasonal resources such as antler, to be tied into a seasonal behaviour of the people. It is also likely that this seasonality was entwined with the world views of the people.

6. Leather and pelt

6.1 What evidence do we have for leather and skins preparation?

Osteological evidence for leather and skins production comprises presence of fur bearing species, restricted skeletal distributions suggestive of those bones retained with the skin (generally foot and head bones) and cut marks suggestive of skin removal.

There are several fur bearing species in the Wiltshire assemblages: bear, wolf, fox, dog, beaver, wild cat, badger, hare, pine marten, polecat and possibly otter (see section 3.1). These species are currently the subject of doctoral research at the University of Exeter (Howard: Commensal or Comestible? The role and exploitation of non-ungulate mammals in prehistory), which should provide better understanding of their role. With the exception of the cut mark noted on a Durrington Walls beaver bone (no further information recorded; Kaagan 2000, 155), and a butchered fox bone from Stonehenge (interpreted as flesh removal rather than skinning; Serjeantson 1995, 448-9) no cut marks have been noted on any of the wild fur bearing species' bones. An Early Neolithic dog humerus from Windmill Hill had possible butchery marks, which Grigson (1999, 230-1) suggests could represent skinning or dismemberment. While an animal can be skinned without leaving marks on the bones, we have no conclusive cut mark evidence of skinning fur bearing species in this dataset. Element distributions have been interpreted as suggestive of pelts of a dog, mustelid and wildcat at Windmill Hill (Grigson 1999, 234-5), the Windmill Hill hare bones were all from feet and may similarly have been from a skin. Finally the Woodhenge fox and weasel bones (Jackson 1929) comprised only head bones and so may have resulted from a skin.

Domestic animals may also have provided leather. Cut marks suggestive of skinning have been identified on cattle bones (for example, at Boscombe Down (Powell and Clarke 1996), Coneybury Anomaly (Maltby 1990c) and Windmill Hill (Grigson 1999, 226-7)). Pig skin is edible so need not have been removed from carcasses destined for consumption; however it may also have been used for leather. Serjeantson (2011a, 68) cites evidence for this, but not from any Wiltshire assemblages. No evidence for skinning cut marks on sheep or goat has been found in the Wiltshire dataset. The feet or head and foot cattle deposits found in some sites have also been interpreted as skins, for example cattle foot bones at Stonehenge (Serjeantson 2011a, 87) and Whitesheet Hill environs (Maltby 2004), and cattle skulls and foot bones in barrows (see section 4.4). For further discussion of leather, see **Chapter 11 – Technology and Domestic Objects**.

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Chapter 6. People
Simon Mays

The evidence

Remains of about 2000 individuals excavated from Neolithic sites in England are held in museums or other institutions; there are about double this number of Bronze Age remains (Mays nd). These totals include both inhumed and cremated remains. Although cremation burials are very useful for what they can tell us about past funerary practices (McKinley 2000; Mays 2010, 311-30), the highly fragmented nature of cremated bone means that their potential to provide insights into the skeletal biology of these populations is rather limited. Of the English Neolithic remains, about 1500 individuals are represented by unburnt bone and there are about 2000 Bronze Age inhumations. Most of the Neolithic material is from the earlier part of the period; there are relatively few Late Neolithic remains. There are several factors concerning inhumations from these periods which limit the skeletal biological information that can be obtained from them. Most of the Neolithic remains are disarticulated and co-mingled rather than discrete skeletons. Much of the skeletal material has not been subject to modern scientific study, and little problem-orientated analysis directed at shedding light on prehistoric lives has been conducted. This is particularly so for the Bronze Age material. Few burials can be placed chronologically within the three phases of the Stonehenge Landscape project; most are simply dated as Neolithic or Early Bronze Age (the latter including remains with Beaker associations).

The Stonehenge People project (Vincent and Mays 2010), assessed (*sensu* Mays *et al* 2002) inhumations representing 94[3] Neolithic and Early Bronze Age individuals from the Stonehenge Landscape (as defined by Darvill 2005, 6) along with 123 cremation deposits (Vincent and Mays 2010). The inhumations, split by phase according to the chronology followed by the Stonehenge Landscape project, are shown in Table 6.1.

Table 6.1 Numbers of articulated inhumations dating from the Neolithic – Early Bronze Age from the Stonehenge Landscape. Data from Vincent and Mays (2010)

Phase						
1	1-2	2	2-3	3	Unphased	Total
14	1	1	30	23	25	94

The assessment (Vincent and Mays 2010) yielded age and sex data for the Stonehenge Landscape remains. Some further data are available from osteological reports and scientific research papers.

In view of the limitations of the evidence base, the approach taken in this article is to use the English skeletal evidence as a whole to attempt to gain an overview of the skeletal biology of Neolithic – Early Bronze Age populations and to illustrate general points with examples from the Stonehenge Landscape or, failing that, from other burials of the period.

[3] This figure excludes the data from Winterbourne Monkton, included in error in the Vincent & Mays (2010) work

Because of the problems posed by cremated remains, the emphasis is on the evidence from inhumations.

Population composition and population movement

The age composition of human remains from some southern English Neolithic and Early Bronze Age sites is shown in Table 6.2. Also shown are data from inhumations from the Stonehenge Landscape, together with data from the largest series of cremation burials from that area, those from the Shrewton barrows.

Table 6.2 The age at death composition of some Neolithic – Early Bronze Age human remains

	N	Adult	Juvenile	Infant	Reference
Early Neolithic southern England long barrows	258	74%	26%	-	Smith and Brickley (2009, table 7)
Early Bronze Age Dorset round barrows	172	73%	27%	-	Garwood (2007a, table 7)
Stonehenge Landscape inhumations	94	68%	26%	6%	Vincent and Mays (2010)
Shrewton cremations	42	76%	24%	-	Wells (1984)

Notes, Smith and Brickley: Adult 21+ years, Juvenile<21yrs, infants not distinguished from juveniles
Garwood: Adult 17+ years, Juvenile <16 years, infant not distinguished from juvenile
Vincent and Mays: Adult 18+ years, juvenile 2-17 years, infant<2 years.
Wells: age categories not specified

The sex ratio of adults from Neolithic and Bronze Age contexts, together with those from inhumations from the Stonehenge Landscape and the Shrewton cremations are shown in Table 6.3.

Table 6.3 Sex ratios of adult burials

	Males	Females	M:F	Reference
Early Neolithic long barrows, southern England	65	40	1.6: 1	Smith and Brickley (2009, table 7)
English Neolithic crania	54	29	1.8: 1	Brodie (1994)
English Early Bronze Age crania	108	49	2.2: 1	Brodie (1994)
Stonehenge Landscape inhumations	42	14	3.0: 1	Vincent and Mays (2010)
Shrewton cremations	17	10	1.7: 1	Wells 1984)

Notes: Brodie's study material was crania in museum collections sufficiently intact for craniometric study. There is minimal overlap between the study material of Brodie (1994), Smith and Brickley (2009), and Vincent and Mays (2010).

The detailed composition of the Stonehenge Landscape group by age at death and sex is shown in Table 6.4.

Table 6.4 Stonehenge Landscape inhumations: demographic data

	Phase						
	1	1-2	2	2-3	3	Unphased	Total
Male	7	1	1	11	9	13	42
Female	4	0	0	5	2	3	14
Unsexed adult	1	0	0	4	3	0	8
Juvenile	2	0	0	8	7	7	24
Infant	0	0	0	2	2	2	6
Total	14	1	1	30	23	25	94

Table 6.2 shows that the balance between adult and non-adult individuals among the Stonehenge remains is similar to that in pooled data from the Neolithic and Early Bronze Age. In recent populations lacking modern medical care and standards of hygiene, between about one fifth and one half of all deaths generally occur under 16 years of age (Hewlett 1991). Normally, mortality is highest in infancy and declines during childhood, reaching its lowest level in adolescence (Waldron 1994). Studies of recent non-industrial horticulturalist and pastoralist societies show about 20% of infants die in their first year of life (Hewlett 1991). The 5% of burials under 2 years of age at Stonehenge is therefore not likely to be a true indication of infant mortality at that time. In part this may reflect the vagaries of bone survival: infant bones are more fragile than those of adults, so are less likely to survive in the soil (Guy *et al* 1997). It may also reflect collection bias in early excavations: antiquarians were not averse to recovering and / or retaining only material that was pertinent to the research questions of the time – ie adult skulls to look at questions of population history. In addition, it is clear that sometimes early excavators did not recognise infant or young child remains as human (Smith and Brickley 2009, 89).

Given the small numbers of burials from both the British Neolithic and Bronze Age, consensus is that only a minority of people can have been granted formal burial (eg Burgess 1980, 171-2; Bradley 1984, 86; Parker Pearson 2005a, 42; Smith and Brickley 2009, 87). The majority were likely disposed of in such a way as to leave no regular trace archaeologically (eg by exposure of the corpse or deposition in water). It may be that infants, and perhaps children, were less often selected for formal burial than were adults.

The Stonehenge adult remains show a bias in favour of males (it is not normally feasible reliably to determine the sex of children from their bones), and in this respect they are typical of remains from this period (Table 6.3). In most human societies the adult sex ratio is about 1: 1 (Hewlett 1991). It is difficult to explain the biased sex ratio in terms of sexing error (determination of sex from adult human remains is quite reliable, even when there is only the skull to go on (Meindl *et al* 1985)). It also seems unlikely that female remains were selectively discarded by antiquarians. It would appear that in the Stonehenge region, as elsewhere in England, males were more often selected for formal burial than females.

A number of changes in the archaeological record occur at the transition from the Neolithic to the Bronze Age. In addition to the introduction of metalwork, these include burial beneath round barrows accompanied by grave goods including finely made pottery beakers and other items such as copper or copper alloy knives, barbed and tanged flint arrowheads and archer's wrist-guards (see **Chapter 10 - Design, Clothing and Personal Adornment**). The type of grave goods and the mode of burial associated with the 'Beaker culture' in Britain were introduced from Continental Europe. However, the question remains as to whether this was primarily a movement of people or of goods or ideas. The osteological evidence is of interest here as it has long been noted that there is a difference in skull shape between individuals from Neolithic contexts (chiefly long barrows) and those interred in Beaker culture graves.

The differences between Neolithic and Beaker skulls are confined to the cranial vault. Although there is overlap between the two groups, British Neolithic skulls tend to be rather longer (from front to back) and narrower than the Beaker skulls. This difference was first noted back in the 19th century, and has since been confirmed using modern multivariate statistical methods (Brothwell and Krzanowski 1974; Brodie 1994). Although the majority of Beaker burials are males, the difference between Neolithic and Beaker skulls applies equally to both sexes. A potential difficulty in comparing Beaker and Neolithic skulls is that most Neolithic material comes from Early and Middle Neolithic contexts; centuries separate this from the Beaker period. However, the small number of Late Neolithic skulls studied resemble the earlier Neolithic material in form (Brodie 1994). This would appear to suggest that the change in skull form did indeed occur around the transition to the Bronze Age, but with so little Late Neolithic material it is hard to be sure.

Skull form is strongly determined by genetic factors, so different world populations differ in skull shape (Mays 2010, 101-6). This makes the study of skull form a powerful technique for investigating relationships between populations in the past and for studying population movements. However, extraneous factors such as climate, diet and nutrition, also influence skull shape, and this complicates interpretation. A recent reconsideration of the evidence from the Neolithic-Bronze Age transition in Britain (Mays 2010, 114-24), notes that the parts of the skull that are most sensitive to changes in extraneous factors such as nutrition, diet and climate, do not in fact change at this time. Although further work is required, particularly comparative studies using British and Continental European skeletal material, the arrival, at least in limited numbers, of migrants from Continental Europe, may be the most parsimonious explanation of the discontinuities observed in the archaeological record at the Neolithic – Bronze Age transition in Britain.

Analysis of stable isotopes of strontium and oxygen in tooth enamel provides insights into migration in the past. Strontium isotopes vary according to local geology, oxygen isotopes according to values in local waters. These isotopic values are transmitted to human tissues via food and drink. The isotopic composition of tooth enamel is laid down during childhood when the tooth crowns form, and does not alter thereafter. Therefore, the isotopic composition of dental enamel reflects the locale in which the individual lived as a child. By comparing the dental enamel strontium and oxygen isotopic composition with that of the location where the skeleton was found, we can study migration of individuals in the past (Mays 2010, 277-89). A major project has recently been initiated to investigate stable isotope ratios in Beaker period skeletons in Britain (Parker Pearson 2006). The results of this have yet to be disseminated, but some small-scale studies have been published on remains excavated from sites in the Stonehenge Landscape.

A burial accompanied by Beaker pottery, flint arrowheads (equivalent to a quiver of arrows), archer's wrist-guards, copper knives and other items including a cushion-stone (a probable metalworking tool), was discovered on Amesbury Down in 2002. The skeleton was of an adult male about 40 years of age, and archaeologists christened him the Amesbury Archer (Fitzpatrick 2002). A radiocarbon determination indicated a date (OxA-13541) of 2470-2280 cal BC (Barclay *et al* 2011b). Stable isotope analysis of his teeth suggested he grew up in Continental Europe, perhaps near the Alps (Chenery and Evans 2011). The radiocarbon date indicates that he would have been one of the earliest metalworkers in Britain. The composition and style of some of the artefacts buried with him suggest manufacture in central and western parts of Continental Europe, so he may have travelled widely before arriving in the Stonehenge area (Fitzpatrick 2009). A second skeleton was buried nearby at about the same time. He was another male, in his early 20s. Isotopic data (Chenery and Evans 2011) suggest he may have spent his early childhood in Wessex, but in later childhood he resided elsewhere, possibly in a similar location in Continental Europe to the Archer, although the isotope values are not identical. Fitzpatrick (2011) suggests that this may indicate retention of links with an ancestral homeland. Both burials shared an unusual anatomical variation of the foot bones (calcaneo-navicular coalition). This led to the suggestion that they shared a close genetic relationship and might even have been members of the same family (McKinley 2011).

A grave of similar date was found close by, on Boscombe Down (Fitzpatrick 2004; 2011). The grave contained the remains of at least seven individuals, together with Beaker pottery, barbed and tanged flint arrowheads, and other items. Stable isotope analysis showed that 3 adult males from the grave had migrated from at least 150-200km away (Evans *et al* 2006). Wales is the nearest possibility. An initial suggestion for their origin was the Preseli Hills, the likely origin of the Stonehenge bluestones, and that these individuals might have been involved in trading between there and Stonehenge (Fitzpatrick 2004). However, recent revisions to the dating of Stonehenge show that the first bluestone setting is several centuries earlier (Parker Pearson *et al* 2007a; 2009); in addition, south Wales is only one possibility for the origin of the Boscombe men – others include south-west England, Brittany and Portugal (Evans *et al* 2006).

Not all burials with Beaker associations were migrants. The two males, one from the ditch at Stonehenge and one from Normanton Down, had isotope values consistent with a local origin (Evans *et al* 2006), as do three burials from single inhumation graves on Boscombe down (Chenery and Evans 2011). We should also recall that Neolithic populations were not necessarily static. Analysis of four burials, an adult female and three children, from Cranborne Chase, Dorset, dating to 3550-3150BC, showed that the adult had travelled from a place at least 80km away, perhaps in the Mendip Hills, and the children had also moved over significant distances during their lives (Montgomery *et al* 2000).

Physique

It is popularly thought that people in the past were shorter than they are today, and this seems to be born out by osteological data. The lengths of arm and leg bones bear a consistent relationship to standing height, so that stature can be estimated from bone measurements. Mean stature figures for Neolithic and Bronze Age populations are given in Table 6.5.

Table 6.5 Stature in Neolithic and Bronze Age British populations, together with modern figures

	Male		Female		
	N	Mean (cm)	N	Mean (cm)	Reference
Neolithic	71	165	36	157	Roberts and Cox (2003, table 8.1)
Bronze Age	61	172	20	161	Roberts and Cox (2003, table 8.1)
Modern	419	176	272	164	Freeman *et al* (1995)

Stature is dependent both on genetic and environmental factors. Less favourable conditions (poor nutrition, heavy disease load) during the growth period may mean that the person falls short of their genetic potential in final adult stature. Not surprisingly then, prehistoric people were shorter than their well-fed modern counterparts. What is perhaps more surprising is the marked difference in stature between the Neolithic and Bronze Age periods (Table 6.5). Whether this is a reflection of a general difference between populations living at those times is unclear. As explained above, the likelihood is that only a select few were given formal burial during either period; if selection criteria changed between Neolithic and Bronze Age this could complicate interpretations. There seems little evidence for differences in disease (see below) or diet (see **Chapter 7 – Diet**) between the burials from the two periods that might account for the substantially higher stature of the Bronze Age burials. Perhaps the explanation is genetic – ie the Beaker burials are migrants from Continental European populations of higher average stature than the 'native' British Neolithic groups. Further work would be needed to resolve this question, not least osteological comparison with Continental populations.

Warfare and violence

Until recently, there was a tendency in archaeology to downplay the role of violence and warfare in prehistoric times (Parker Pearson 2005b). This is despite the fact that very few societies shun violence. In many small-scale societies of the type that apparently existed at around the time of Stonehenge, warfare and raiding are endemic (Keeley 1996; Earle 1997, 106; Gat 1999). Homicide rates in this type of society vary greatly, but are often very high - rates of over 100 per 100,000 per annum (Knauft 1987) have been documented. For comparison, the current homicide rate in England and Wales is 1.35 per 100,000 per annum (Smith *et al* 2011).

Recent work (Schulting and Wysocki 2005) has demonstrated that about 5-7% of adult Neolithic skulls show injury likely due to violence, with about 2% showing evidence for lethal trauma. This means that at least 1 in 20 adults suffered skull fracture due to violent assault during their lifetime. The overall rate of violent injury is likely to be much greater than this. Firstly, Schulting and Wysocki were cautious in their interpretations, discarding uncertain cases. Secondly, the skulls they examined did not preserve the rather delicate facial bones so these could not be examined for evidence of injury. Thirdly, they did not examine post-cranial elements. Fourthly, many lethal and non-lethal assaults leave no mark on the bones. The great majority of cranial injuries observed were blunt impacts, probably from thrown stones or from blows from blunt instruments such as wooden clubs, a few examples of which have been found in waterlogged Neolithic contexts (Schulting and Wysocki 2005). The majority of injuries were to males but this simply reflected the greater number of male skulls examined; the frequency rates for the sexes were in fact similar. Violence affecting substantial numbers of females is different from the pattern seen in historic period cemetery sites where victims of violence, particularly lethal violence, tend overwhelmingly to be male (Boylston 2000). Various explanations for this were considered by Schulting and Wysocki (2005), but one they suggest is that most violent death and injury were a result of raiding – surprise attacks on enemy settlements where raiders would kill indiscriminately. This is the dominant form of violence in small-scale societies, in contrast to the more organise 'pitched battles' between armies of state-level societies.

Mercer (1999) has emphasised the suitability of the Neolithic leaf-shaped arrowhead as a weapon of war, and there is ample evidence for its use for this purpose. Large numbers of leaf-shaped arrowheads have been found around the entrances to some Neolithic enclosure sites, suggesting organised assaults upon them (eg Crickley Hill, Gloucestershire – Dixon 1988). Finds of Neolithic skeletons with leaf-shaped arrowheads embedded in their bones are consistent with this (Mercer 1999; Smith and Brickley 2009, 104-6).

The likelihood that most Neolithic deceased were not accorded formal burial presents a difficulty in assessing the frequency of violence in Neolithic society. For example, estimates would be greatly affected if those dying violent deaths or those who had been severely injured but survived were more (or less) likely to be selected for interment.

Evidence for violence is contrastingly paltry for the Early Bronze Age (Harding and Healy 2007, 247), although the type of detailed osteological study that Schulting and Wysocki (2005) conducted for Neolithic material has yet to be carried out. It has been suggested that the type rather than the level of violence changed, with a decline in the use of clubs and arrows, and a rise in the use of stabbing weapons such as daggers (Harding and Healy 2007, 247) whose use might leave little trace on bone. However, it is far from clear whether copper and bronze daggers of the Early Bronze Age would really have been better for attacking one's enemies than the clubs, arrows and stones of earlier times, and it may be that their role was primarily symbolic.

In the ditch surrounding Stonehenge was found an Early Bronze Age burial of an adult male (Evans *et al* 1984) (Fig 6.1). He was in his early 20s when he died, and isotopic analysis (Evans *et al* 2006) was consistent with him being brought up in the Stonehenge area. The burial dates to 2340-2195 cal BC (Parker Pearson *et al* 2009, 24; Allen and Bayliss 1995). He was accompanied by three barbed and tanged arrowheads and an archer's wristguard, which led archaeologists to call him the Stonehenge Archer. Study of the bones (O'Connor 1984) revealed that he had died a violent death. The tip of a flint arrowhead was buried in the back of his sternum. The left 11th rib bears a groove on its upper surface, suggesting the passage of a sharp edge between the 10th and 11th ribs on this side. This was probably made by the arrowhead whose tip was found in the sternum, indicating a shot from behind and somewhat to the left of the victim. His left 4th rib has a flint tip embedded in its outer surface, indicating a shot hitting the chest from the left. A third wound is evidenced by a narrow groove on the upper part of the right 9th rib indicative of a sharp edge (presumably another arrowhead) passing between the 8th and 9th ribs. The arrow that ended up in the rear of the sternum would have passed through the man's heart. O'Connor (1984) felt that the arrows were probably fired at close range as they did not appear to show the downward trajectory of more distant shots. One of the three arrowheads buried with the skeleton was the one whose tip was broken off in the left 4th rib. The short range of the shots, the 'overkill' with at least three arrow wounds to the torso, and his presumably significant location adjacent to Stonehenge, suggests to some (Gibson 1994, 187) that the Stonehenge Archer may have been a human sacrifice.

Fig 6.1 The 'Stonehenge Archer'. Photograph © Salisbury and South Wiltshire Museum

Surgery

The practice of trepanation, the opening of the cranium with therapeutic intent, is known from the Neolithic period onwards in Britain. This operation would have involved making an incision, peeling back the scalp and cutting into the underlying bone. That such an operation can, with a compliant patient, be achieved in the absence of effective anaesthetics is demonstrated by accounts from tribal societies around the world that continued the practice until recent times.

Trepanation does not seem to have been a very common operation. According to a recent survey of British evidence (Roberts and McKinley 2003), just five trepanned skulls are known from the Neolithic and six from Bronze Age contexts. A total of six of these show evidence for healing, indicating that the 'patient' survived the operation a little more than half the time. In the historic period in Britain, trepanation was, on occasion, used as treatment to relieve depressed cranial fracture (Mays 2006), a role which it continues to fulfil in the operating theatre today. However, despite the fact that skull fractures seem to have been rather common in the Neolithic, there is no evidence for surgical treatment of them. Because Neolithic and Bronze Age trepanned skulls show no sign of disease or injury, it is unclear why the operation was performed, but recent non-Western societies that practiced trepanation did it for motives that included relief of headache or epilepsy, and treatment of mental illness (Margetts 1967).

Amesbury barrow 51 Burial B is an Early Bronze Age inhumation of a male who died in his early 20s. A roundel of bone, about 11cm in diameter, has been cut from the back of his skull, apparently by scoring a progressively deeper V-shaped groove around it. There was no sign of healing and the removed roundel was found with the skull (Brothwell *et al* 1978). Whether this was a botched operation that killed the patient, or whether it was a mutilation visited, for unknown reasons, upon a lifeless corpse is not clear. There is a similar case from a broadly contemporaneous male burial at Crichel Down, Dorset: a large roundel was removed from the rear of the skull by scoring a groove around it, the lesion showed no sign of healing and the roundel was left in place (Piggott 1940; Lisowski 1967). Brothwell *et al* (1978) suggest that the same 'surgeon' may have operated on both men.

A male adult, buried at Amesbury barrow 71 at Earl's Farm Down, and approximately contemporaneous with the barrow 51 example above, shows a large sub-rectangular trepanation in the back of the skull (Powers and Brothwell 1967) (Fig 6.2). The edges of the hole are smoothly healed, indicating that the person survived the operation, probably for many years, and are bevelled, suggesting that it was made by scraping away at the bone until a hole of the desired size and shape had been made.

Fig 6.2 The trepanned cranium from Amesbury barrow 71 Photograph from Powers and Brothwell (1967). © The Prehistoric Society

Health

In most archaeological skeletons the most common bone disease is osteoarthritis, and Neolithic – Early Bronze Age British material is no exception. Osteoarthritis is a degeneration of the cartilage at a joint, which may lead to pain and stiffness. There are multiple risk factors, including heavy mechanical loading on a joint, age, sex, and genetic predisposition (Jurmain 1999; Weiss and Jurmain 2007). In their survey of British palaeopathology, Roberts and Cox (2003) suggest osteoarthritis was more common in the

Bronze Age than in Neolithic times (17% of individuals affected versus 10% in the Neolithic), but, as they point out, this comparison is problematic as most Neolithic material is disarticulated making the actual number of individuals represented uncertain.

Osteoarthritis is primarily a disease of middle aged and older people. However, there is only scant evidence of the classic diseases of old age such as osteoporosis (the thinning of the bones that renders the skeleton fragile in elderly people) and cancer. At Ascott-under-Wychwood Neolithic tomb, Oxfordshire, there is an example of a Colles' fracture of the radius (Galer 2007, 202). As this is a disarticulated assemblage, the age and sex of its owner is not known, but this is a typical osteoporotic fracture. There is a case of bone cancer from Bronze Age Scotland (Roberts and Cox 2003, 87). Perhaps this paucity of diseases of old age means that such conditions were simply not as common in the elderly as they are today. To some extent this may be true, as risk factors for cancer, such as smoking and carcinogens from modern industrial processes, would not have been present. However, one suspects that, as was the case in historic times, people generally died from other things before they reached an age where these conditions become common. Although it is clear that some individuals from the time of Stonehenge did survive into old age (for example, the bones of female from Tilshead suggest that she died when she was well over 50 years of age), until someone conducts a systematic study of age at death in the Neolithic and Bronze Age using up-to-date scientific techniques, a fuller picture of adult longevity in these periods will remain elusive.

Until recently, acute infectious diseases were the dominant cause of death, and this would certainly have been the case at the time of Stonehenge. We don't normally see skeletal evidence for these as they do not usually affect the bone. However, some of the more chronic infections do have the potential to affect the skeleton. The most common response of bone in these cases is the production of new bone beneath the periosteum, the membrane that surrounds the bone in life. Although other, non-infectious conditions may do this too, it is usual to treat periosteal new bone in ancient skeletons as a sign of infection, even though we cannot normally tell what particular disease caused it. There are some skeletons from the age of Stonehenge that show this type of lesion. For example, a male adult from a grave on Boscombe Down has periosteal new bone on the inner surface of his ribs (McKinley 2009) (Fig 6.3), indicating a chronic chest infection. The bone lesions were active at time of death, so that whatever it was it eventually killed him.

Fewer than 3% of individuals from British Neolithic and Bronze Age contexts show signs of periosteal new bone (Roberts and Cox 2003), markedly less than is the case for historic periods. This may be because the infectious disease burden was lower at the time of Stonehenge than it was in later periods. The lower population density and lack of urban centres would have presented less favourable conditions for transmission of disease, either person-to-person or via water supplies contaminated with human waste. Another reason for the paucity of bone changes may be because Neolithic and Bronze Age people had a lesser resistance to disease than, for example, Medieval city dwellers. This is a corollary of the point made above - if prehistoric people did not have the long-term exposure from birth to a heavy burden of pathogenic bacteria that later British populations did, then their resistance to disease would have been lower. It takes time for an infectious disease to affect the bone, and it may simply be that most prehistoric people succumbed to infection before it had the chance to cause bone changes.

Another possible example of infection in a burial from the Stonehenge landscape comes from the Amesbury Archer. The specimen presents diagnostic difficulties, but the left knee seems to show septic arthritis, possibly sequential to a fracture. Asymmetries in the leg bones show that the individual would have walked with a limp (McKinley 2011). Since at

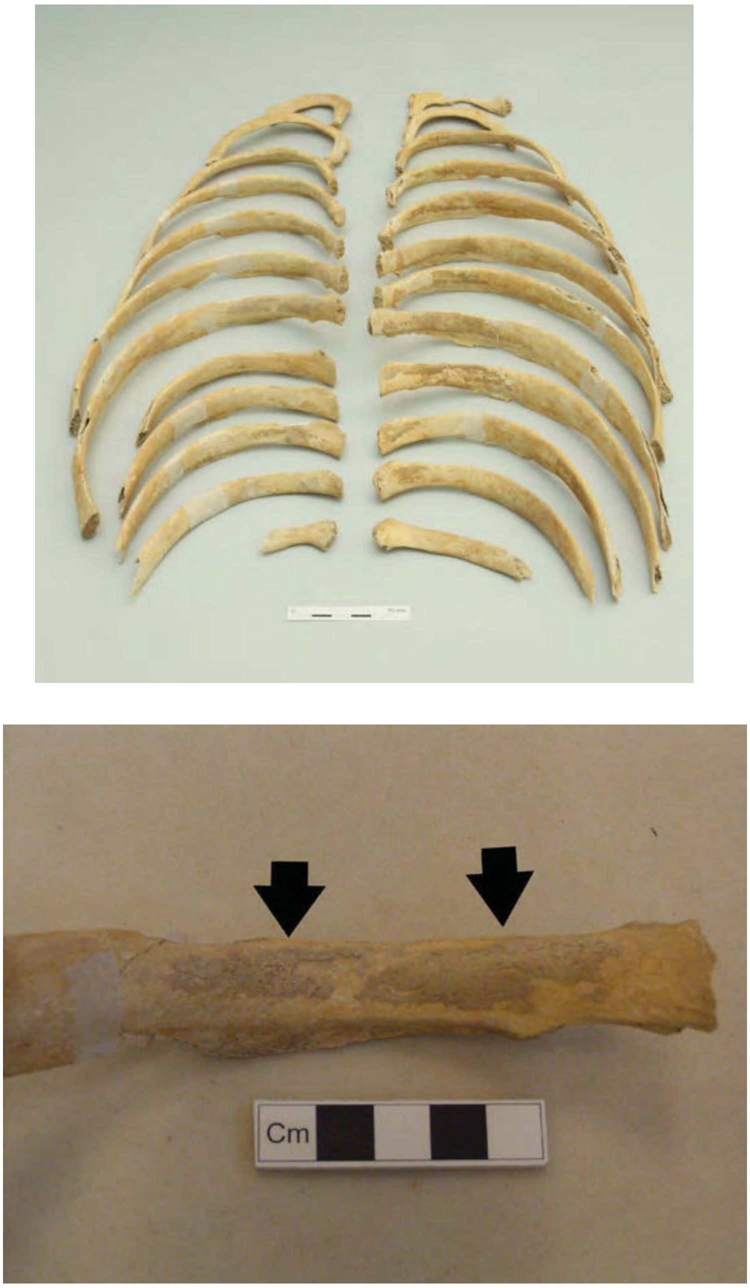

Fig 6.3 (a) Ribs from a burial from Boscombe Down. The dark deposits of new bone visible on the ribs are periostitis. (b) Detail of the internal surface of a rib from the Boscombe Down burial, showing periostitis (arrows). Photographs by Jackie McKinley © Wessex Archaeology

least Medieval times, bluestones have been said to have healing properties. The Amesbury Archer's injury seems to have led Darvill (2006) to suggest that people may have been attracted to Stonehenge to seek supernatural help for their ailments. He claims that a "surprising number of the burials of third millennium BC date, including the Amesbury Archer, were suffering from long-term health problems which they may have hoped would be cured by presenting themselves to the gods at Stonehenge" (Darvill 2006, 156). The Amesbury Archer is not unique in having a disabling leg injury; coeval cases are known from other parts of the country (eg Anderson 2002). In any event, to provide support for this statement one would need to demonstrate that frequencies of skeletal diseases were greater among those buried in the Stonehenge region than in contemporary age and sex matched control groups from elsewhere. A comparison of this sort has yet to be carried out.

It is possible to diagnose some specific diseases from the signs they leave on the skeleton. The most important of these are tuberculosis, leprosy and syphilis. Of these, tuberculosis is the most commonly seen, but even this affects less than 5% of skeletons even in later historic periods when we know the disease was common. There is no evidence for any of these conditions in British Neolithic and Bronze Age skeletons: the earliest British case of tuberculosis is Iron Age; the oldest syphilis and leprosy come from the Early Medieval period. It may be that these diseases only arrived in Britain later on, but as bone changes are not very common, the dearth of cases may also reflect the lower numbers of skeletons we have from the Neolithic and Bronze Age compared with later periods.

Summary

It is fairly clear that only a minority were given formal burial in the British Neolithic and Early Bronze Age, and that this treatment was less likely to be accorded to women or the very young. Because we are dealing with a minority who were not a random sample of the whole population, this makes generalisations concerning the skeletal biology of populations at this time problematic. Nevertheless, the burials we have from Early Bronze Age contexts differ in physique from their Neolithic predecessors; they have a different cranial form and were also on average 5-6cm taller. A possible explanation is that those buried with Beaker-style artefacts were incomers from Continental populations that differed in physique from native British Neolithic folk.

There is no evidence for any great differences in disease between Neolithic and Bronze Age periods. Signs of violent injury are common in Neolithic, but appear rare in Early Bronze Age skeletons. This may well reflect a genuine decline in the level of violence, but it is worth remembering that Neolithic remains have been more intensively studied than Early Bronze Age skeletons. Trepanation was occasionally carried out in both periods. We don't know why, but it does not seem to have been used to treat the skull fractures that appear to have been a fairly regular part of life in Neolithic times. Evidence for infectious disease is low, maybe because infections were generally less common in these fairly dispersed populations than in later times, but also perhaps because few people had enough resistance to disease when they did fall ill to survive long enough for it to show on the bones. The skeletal biology of the Stonehenge Landscape people seems similar to that of other Neolithic and Bronze Age burials. One exception is the Stonehenge Archer: Beaker period burials showing arrow wounds are a rarity.

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Chapter 7. Diet

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Introduction

There are three principal sources of evidence regarding diet at the time of Stonehenge. Firstly there are the remains of plants and animals from within archaeological sites and natural deposits which tell us about the range and availability of different natural resources. Secondly, the structures recorded, the type and form of artefacts, and the waste materials recovered from archaeological investigations can tell us about how food was prepared and eaten, whilst residues surviving both on vessel surfaces and absorbed into the fabric of pots give information on the type of food the vessel once contained. Thirdly, human remains can give us some information about the proportions of different foods in people's diet (in particular the marine component) whilst the condition of people's teeth also provides clues to diet and lifestyle.

Plant foods

The introduction of cereal cultivation can reasonably be presumed to have gone hand in hand with the knowledge of how to produce a variety of foods including bread and beer. However we really do not know what form the bread took. The example of barley 'bread' from Yarnton (Robinson 2011b, 189; Hey and Robinson 2011a, 247) suggests the use of coarse-ground cereals within some form of matrix, presumably involving water or milk, but this material might also represent a malt cake (see below). Simple saddle querns, which must have been used for grinding grain (though they probably had multiple uses) are relatively common in the Early Neolithic. Interestingly quern stones are much rarer on later Neolithic and Early Bronze Age mainland sites (Curwen 1937; Stevens 2007), coinciding with an apparent decrease in the proportion of cereals recovered relative to hazelnut shell (Stevens and Fuller 2012; Robinson 2000). It is yet to be demonstrated if this represents a real decrease in the use of cereals for human consumption in the Late Neolithic (see **Chapter 4 – Plant Resources**).

In addition to bread, both wheat and barley could also have been used to make porridge and a variety of thick soups, stews or pottages with meat, marrow, pulses and other edible plants added to make a variety of dishes. There is also evidence for the use of tubers as an alternative source of carbohydrates, though only occasionally do we have the archaeological evidence for the use of a particular species such as pignut (see **Chapter 4 – Plant Resources**). Several writers have suggested that wetland plants which produce large tubers such as white water lily (*Nymphaea alba*) and bulrush (*Typha latifolia*) may also have been exploited. While the seeds of these species have been identified from Neolithic sites, direct evidence in the form of tubers from archaeological contexts has yet to be found in Britain (Mears and Hillman 2007; Wood 2011, 152).

There is plenty of evidence for the use of native fruits and nuts, and even of one exotic fruit, in the form of grape (see **Chapter 4 – Plant Resources**), but because of the rarity of Neolithic and Early Bronze Age waterlogged contexts associated with settlement sites, evidence for the use of green leafy vegetables is largely based on supposition as well as historical and ethnographic evidence.

Renfrew (1993, 26-7) lists fat hen (*Chenopodium album*), stinging nettle (*Urtica dioica*), orache (*Atriplex* sp), white dead-nettle (*Lamium album*), cleavers (*Galium aparine*) and mustards/cabbages (*Brassica/ Sinapis* sp) as possible green vegetables. She also mentions a number of plants that could be used to impart different flavours: jack-by-the-hedge *(Alliaria petiolata*) and ransoms (*Allium ursinum*) for onion flavour, biting stonecrop (*Sedum acre)* lady's smock (*Cardamine pratensis*) for a peppery flavour, sorrel *(Rumex acetosa*) for a vinegary flavour, and salad burnet (*Poterium sanguisorba*) the leaves of which have a taste similar to cucumber, as well as other plants with specific tastes such a mints and juniper berries. Behre (2008) recently examined the evidence for the use of wild plant seeds by prehistoric peoples. He argued that for a seed of a given species to be considered as deliberately collected, archaeological finds of pure, and preferably large assemblages of that species are needed and/or repeated records in the intestines of dead (bog) bodies. He concluded that there was good evidence for the collection and consumption of seeds of fat hen, pale persicaria (*Persicaria lapathifolia*), black bindweed (*Fallopia convolvulus*), brome grass (*Bromus secalinus*) and sweet grass (*Glyceria fluitans*) with two other possible candidates: millets or bristle grasses (*Setaria* sp) and sheep's sorrel (*Rumex acetosella*). *Setaria* sp grasses are not native to this country and have not been recovered from prehistoric sites in Britain (Stace 1997, 914-5). The separation of charred grains of *Bromus secalinus,* another introduced species, from native species of brome such as *B. hordeaceus* is not easy (Stace 1997, 885-6; Körber-Grohne 1964, 44-5). However *Bromus* sp grains are often recovered in small quantities from Neolithic sites eg Windmill Hill (Fairbairn 1999) and it seems probable that the large grained *Bromus* species were consumed by prehistoric peoples. Of the other plants in Behre's list, all are native and would be readily available from various disturbed habitats including cultivation plots (Stace 1997).

Beer and other drinks

It is likely that the earliest alcoholic drinks resulted from the accidental or spontaneous fermentation of the juice of sugar-containing fruits (Corran 1975, 11). Fragments of crab apple (*Malus* sylvestris) along with other fruits such as sloe (*Prunus spinosa*) are found from the earliest Neolithic onwards in Britain with whole crab apples and sloes found deposited in Grooved Ware pits (see **Chapter 4 – Plant Resources**). Although none of these records provide definite evidence for early cider making, it is possible that this is a very ancient tradition.

Evidence for Neolithic beer is somewhat elusive. Some writers (eg Fowler 1983, 187; Renfrew 1993, 24) see the appearance of Beakers at the end of the Neolithic as synonymous with the discovery of beer. However there are no convincing records of the two forms of archaeobotanical evidence that would normally be taken as indicative of brewing: sprouted cereal grain and remains of beer-flavouring plants (van Zeist 1991, 118). However, this absence of evidence may be to do with the method used to brew beer in the Early Neolithic.

In order to produce beer from any cereal, it is necessary to germinate the grain and then halt the germination process. In cereal grain, the food reserve the plant calls upon when it first germinates is stored as starch. When the grain germinates a group of substances collectively known as diastase convert this starch reserve to sugar for use by the developing plant. The aim of malting grain is to produce sufficient diastase to allow the conversion of starch to sugar for the production of alcohol but not to allow germination to proceed too far resulting in nearly all the starch food reserve being converted to sugar or used up by the developing shoots. The process of malting starts with the soaking the grain in water overnight, causing it to swell and starting the germination process. The water is then drained off and the grain can be either spread on a malting floor or kept in a pot or other vessel and mixed or turned frequently to ensure even germination. Once the grain is sufficiently sprouted (normally taken as when the sprouts are ⅔ the length of the grain) germination needs to be halted by killing the grain. This was generally achieved in the past in two different ways, each of which produces a stable product, suitable for storage, which can then be activated when needed to produce ale or beer.

In the first method, thought to have begun in Egypt, the sprouted grain is pounded to make a paste consisting both of the grain itself and chaff, in the case of hulled grain (see **Chapter 4 – Plant Resources**). This paste is then made into small balls or patties, dried and cooked on the edge of the fire to produce malt cakes. These can be stored until needed. In the second method, thought to be Babylonian in origin, the sprouted grain is dried whole, either in vessels in a fire (pot roasting), or in ovens, malting kilns etc. The chaff or hulls still adhering to the grain along with the sprouts, known as the 'comings', are rubbed off the grain to produce the malt. This malt can then be ground into a coarse meal or flour, which can be kept for up to a year.

To brew beer or ale the ground malt or malt cakes are mixed with hot water at around 65°C. This process is known as mashing and results in a brown liquid known as wort. The wort can then be boiled with flavourings or used without further processing. Yeast is then added and fermentation takes place. At about 6% alcohol by weight, beer yeast is killed due to the antiseptic effect of the alcohol (Corran 1975, 12-22). Once fermentation ceases the dead yeast will sink to the bottom of the brewing vessel and the beer can be decanted into a clean vessel and drunk. Beer made from malt cakes will still contain fragments of chaff and other sediment unless it is poured through a sieve. Egyptian illustrations show beer being drunk through straws, presumably to avoid ingesting fragments of chaff and so on (Fig 7.1).

It will be immediately apparent to the reader that, of the two processes described above, the Egyptian method, involving the production of malt cakes is unlikely to produce archaeobotanical evidence in the form of charred remains that can readily recognised or that will survive well within archaeological deposits. Malt cakes, either accidentally or deliberately burnt are likely to be very fragile and break up into little bits; so even if found intact will to look similar to burnt dung or even coarse bread. However, if the Babylonian method is used the drying of whole malted grain and the fact that the 'comings' are often used as fuel (Fenton 1978, 394) is far more likely to result in representation in the archaeological record (Hillman 1981; 1984).

Deposits of sprouted cereal grain and 'comings' are only found from the Roman period onwards in Britain indicating that the Babylonian method of brewing may have been introduced at this time (Campbell *et al* in press). In terms of finds of malt cakes, the charred barley 'bread' from Yarnton, Oxfordshire (Robinson 2011b, 189; Hey and Robinson 2011a, 247; Dinley and Dinley 2000; see also **Chapter 4 – Plant Resources**) would seem a good candidate and might suggest that brewing using the Egyptian method was practiced from the earliest Neolithic.

Pollen analysis of residues adhering to the inside of Beaker vessels from Ashgrove Farm, near Kirkcaldy, Fife, from Nadrup Mors, Jutland and from Breginge, Sjealand indicate the presence of honey, characterised by high pollen levels of lime (*Tilia* sp), varying amounts of meadowsweet (*Filipendula* sp) as well as white clover (*Trifolium repens*) in the Danish examples and heather in the Beaker from Fife (Dickson and

Fig 7.1 Egyptian relief showing a woman offering beer; note the straws protruding from the vessels. Photograph by Gill Campbell

Dickson 2000, 78-81, Dickson 1978). This suggests the presence of mead which is made by diluting honey in water and allowing the solution to ferment (Nelson 2005, 9). The main yeast (*Saccharomyces cerevisiae*) used in making alcohol occurs naturally in honey and is activated by the dilution. Honey can also be used as a yeast source when brewing ale (McGovern 2009, 5-6, 68). Honey fermented ale might be one possible explanation for the presence of high levels of meadowsweet pollen along with cereal pollen recovered from a residue adhering to the inside of a Food Vessel from North Mains, Perth and Kinross. However, very little pollen from other insect-pollinated plants was recovered from this vessel and it was argued that the contents could have been a cereal-based porridge or ale flavoured with meadowsweet (Dickson and Dickson 2000, 82; Bohncke 1983).

To complicate matters the find of complete flowers of meadowsweet in a dagger burial at Forteviot, Perth and Kinross and dated to between 2279-1882 cal BC (SUERC 29198-9) confirms that meadowsweet was used as a funerary flower from at least the Early Bronze Age (Noble and Brophy 2011). This had long been suspected and confirms that in some cases the high levels of meadowsweet pollen recorded in some Bronze Age burials derives from floral tributes rather than mead or honey (Dickson and Dickson 2000, 82)

McGovern (2009, 144) has postulated that there may have been a type of northern grog which consisted of a mixture of mead, barley beer and fruits based on the results obtained from the analysis of a birch bucket found at the foot of a 20 year old woman buried between 1500-1300BC at Egtved, Denmark. The ingredients for such a brew could be echoed in the contents of Grooved Ware pits but until further evidence is forthcoming the existence of this northern grog remains somewhat in doubt.

Fig 7.2 Meadowsweet growing on a river bank. Photograph by John Vallender

Meat and marrow

Animal bones from consumption sites can inform us about what meats were eaten, although as Serjeantson (2011a, 69-70) suggests, meat can be stewed or roasted off the bone, without leaving evidence in bone assemblages. Meat may also have been preserved through smoking, without leaving archaeological evidence. The data from Wiltshire indicate that, with some exceptions, during Phase 1 cattle provided the majority of meat, with some domestic pork and some sheep or goat meat also consumed. The primary exception is the site of Coneybury Anomaly, which might indicate feasting on roe deer. During Phase 2, while beef was still consumed, the large assemblages from Durrington Walls and West Kennet, together with smaller assemblages including those from Marden Henge, King Barrow Ridge and Longstones enclosure indicate that pork had become a much more prevalent meat and was associated with feasting

Fig 7.3 Roasting a pig. Illustration by J Dobie

Albarella and Serjeantson (2002) and Maltby (1990d) investigated meat preparation and cooking practices through burning and butchery marks on bones, both concluding that the evidence supports roasting of pork and beef, and utilisation of bone marrow from both species, accessed by scorching and then breaking the bones. Similar cattle bone marrow utilisation has been recognised in Phase 1-2 deposits at Stonehenge (Serjeantson 1995) and Phase 2 pits at Boscombe Down (Powell and Clarke 1996). In one case from Durrington Walls, Albarella and Serjeantson (2002, 41) suggest that a rib was used to extract the bone marrow from a pig humerus. Many of the Phase 1 roe deer bones from Coneybury Anomaly had also been broken open for bone marrow (Maltby 1990c).

Carcasses would have been butchered with stone tools, which have left very fine cut marks defining points of carcass division. At Coneybury Anomaly (Phase 1) the roe deer were disarticulated, with cut marks indicating the removal of the feet, separation of the bones of the forelimb, removal of the mandible from the skull and separating ribs from the spine (Maltby 1990c). At Durrington Walls (Phase 2) there is consistent evidence for older pig carcasses having been divided at the elbow (humerus/radius) of the forelimb and ankle (tarsals) of the hind limb, and scorching on the exposed bones (radius, humerus and tarsals) (Albarella and Serjeantson 2002, 41-2). Albarella and Serjeantson (2002) conclude that this may represent the use of leg meat cuts or that the carcasses were roasted largely intact, but with the feet removed at these points, and the lower foreleg also being roasted. Albarella and Serjeantson (2002) also suggest that smaller pigs may have been roasted whole. Elsewhere there is evidence for the division of pig mandibles in Phase 2 (Durrington Walls Environs; Hamilton-Dyer 2004).

In the phase 2 assemblage from Coneybury Henge, Maltby (1990d) noted butchery marks suggesting that beef was cut from the flank of the carcass, and invoked an absence of butchery marks as evidence that the humerus and radius may have been part of a single beef joint, contrary to that seen in cattle at Phase 1 Whitesheet Down Environs (Maltby 2004) and Phase 2 pigs at Durrington Walls (Albarella and Serjeantson 2002). At Stonehenge (Phase 1-2), Serjeantson (1995) recorded cut marks on a cattle scapula indicating the filleting of meat. Cattle heads from Boscombe Down showed filleting of head meat (Powell and Clarke 1996).

Oils, fats, and dairy products

Flax, opium poppy and potentially some form of cabbage or mustard (*Brassica/Sinapis* sp) could have been grown for their oil as much for their other properties in the early prehistoric. Also there is clear evidence from pottery for the use of pork fat and milk or milk products (see below). While we cannot be certain that cheese and butter were made and consumed it seems a reasonable assumption to make.

Pottery as a record of diet and cuisine

Pottery was not the only type of container available to people in the Neolithic and Early Bronze Age – wooden and bark vessels, skin/leather bags and reed baskets were no doubt all used – but it is usually only the pottery that survives at most archaeological sites. Rare exceptions include broken wooden buckets from the Wilsford Shaft, south-west of Stonehenge, one of which has been dated to the 4th millennium BC, though this is considerably older than anything else from the shaft (Ashbee *et al* 1989, 51–9, 68); further afield, there are a number of wooden bowl fragments from a later Neolithic pit at Etton causewayed enclosure, Cambridgeshire, at least one of which seems to imitate Peterborough Ware pottery (Pryor 1998, 152–5). Conversely, some of the forms and surface treatments of pottery vessels may have been inspired by containers in other materials (skeuomorphs, see **Chapter 10 - Design, Clothing and Personal Adornment**), particularly decoration recalling basketry or stitched bark. Pottery was not just a more durable imitation of older organic technologies, however; it was a true innovation allowing new methods of cooking, not least the ability to boil liquids directly over a fire and produce stews, porridges and broths.

An investigation of the function and use of prehistoric pots needs to be situated within a contextual understanding of any given ceramic tradition. Many styles of pottery were used between 4000 and 1500 BC in southern Britain (see Gibson 2002), several of them overlapping in their currency: the Carinated Bowls of the earliest Neolithic (*c* 4000–3650 BC) are the oldest known, the Plain and Decorated Bowls (in different regional styles) of the developed Early Neolithic (*c* 3800–3300 BC) and Impressed Wares of the Middle Neolithic (*c* 3300–2900 BC), principally the Ebbsfleet, Mortlake and Fengate styles of Peterborough Ware, are insular developments which represent increasing elaboration of forms and decoration within the bowl tradition. Significant changes occur with the Grooved Ware of the Late Neolithic (*c* 2900–2200 BC, though it probably originated in Orkney a little earlier): its repertoire represents a clear break with the bowl tradition in both forms and decoration.

After this, large assemblages of the sort associated with causewayed enclosures and some henge monuments become rare, so domestic pottery is less well understood than grave finds; however, there is little evidence of typological or functional differences between pots accompanying burials and those used in settlements. The Beaker pottery of the Chalcolithic and Early Bronze Age (*c* 2500–1700 BC) is typified initially by bell-shaped vessels of Continental derivation with new styles of decoration. In the Early Bronze Age proper, indigenous sub-styles of Beakers in 'devolved' forms develop alongside Food Vessels (*c* 2200–1700 BC), which may represent a continuation or resurgence of the Impressed/Grooved Ware traditions, and subsequently Collared Urns and Biconical Urns (*c.*1900–1600/1500 BC), which are primarily found with cremation burials. Beyond our period of interest, the Deverel-Rimbury style of the Middle Bronze Age continued the urn tradition, which was only superseded by a new ceramic repertoire of jars and bowls in the Late Bronze Age. For further discussion of ceramic styles, see **Chapter 11 – Technology and Domestic Objects**.

Not all vessels would have been used for food preparation, consumption or storage but the majority probably were. Archaeological evidence for such use can take several forms: the spatial distribution and contextual associations of excavated material; common-sense inferences related to the shape and size of vessels (note, for instance, the long-standing terminology of 'Beakers' and 'Food Vessels'); and the physical traces of use, both visible (sooting, use-wear) and invisible (chemical residues inhering in the fabric of the pot).

Detailed spatial analysis is hardly ever possible in England because house floors and ground surfaces are so rarely preserved; instead most Neolithic pottery comes from deposits surviving in pits and ditches at settlements or monuments, often associated with other types of material; while in the Early Bronze Age the majority of vessels come from graves, as mentioned. Interpreting finds from cut features depends on understanding how they got there (see **Chapter 9 - Depositional Practice**); while pit deposits may derive from domestic middens, assemblages of potsherds and animal bone at Neolithic monuments probably represent the remains of feasting on a larger scale.

The shapes and sizes of pots also vary over time, as charted by Ann Woodward (2008, 301). 'Common sense' would dictate, for instance, that very large pots are more likely to have been used for storage and very small ones for individual consumption; thus the range of vessel capacities and the presence of distinct size categories is one way of getting at their function. In the Early-Middle Neolithic bowl tradition, there is a limited range of forms but a continuous spread of capacities from small cups to large bowls, though the lack of very large pots (with capacities above 7 litres) might suggest that food preparation, even for feasts at major monuments, was undertaken within family groups (Schulting 2008, 104–5). Grooved Ware has a rather more varied series of buckets, tubs and bowls in smaller and larger size categories, reflecting the appearance of some very large pots (the biggest vessels in Orkney have capacities of more than 30L). However, it is not until the Middle Bronze Age that well-defined size categories are found, along with significant variations in fabric, as demonstrated for central southern England by Woodward (1995); the inter-relatedness of 'style' and 'function' is shown by the fact that pottery came to differentiate social groups with distinct territories at the same time that clear functional classes of vessel emerged. This foreshadows developments in the Late Bronze Age, beyond our period of interest, when distinct classes of coarseware and fineware vessels are found, associated respectively with storage/preparation and consumption of food and drink (see, for instance, the assemblage from Must Farm, Cambridgeshire: Knight 2009).

Vessel shapes and the presence or location of decoration may also hint at how they were used. Most pots in the Neolithic bowl tradition were round-bottomed (though small flat bases appear in the Fengate style of Peterborough Ware). Although a few have lugs or drilled holes, suggesting they were suspended on string or cord, and the increasingly heavy rims of Peterborough Ware pots could also have served this purpose, the restriction of decoration to the upper parts of most vessels suggests they were set in pits, hollows or hearths and the lower parts were not meant to be seen. In a mobile society, vessels could have been left in such settings between episodes of occupation. This contrasts with the flat-based, all-over decorated Grooved Ware pots, which were clearly designed to stand on surfaces like the paved floors and stone 'dressers' of the Orcadian Neolithic houses, perhaps indicating more sedentary lifestyles in the Late Neolithic.

Physical traces of use have not always been recorded by analysts more concerned with establishing typologies or relative chronologies, and there are few systematic studies for the period in question. But carbonised residues and soot deposits on sherds, along with limescale from boiling water, may help identify cooking vessels (if they can be distinguished from post-breakage or post-depositional accretions) and are useful for radiocarbon dating, though their composition can rarely be directly identified. In Orkney, Andy Jones (1999) has identified different patterns of use for plain bowls and Unstan Ware based on the distributions of soot on vessel surfaces. Other visible evidence of function may include abrasion from moving pots around or scraping/stirring their contents, probably indicating vessels used for food preparation and consumption, whereas storage vessels would show less use-wear.

The direct study of vessel function has been revolutionized in recent years by the development of lipid analysis, which extracts the organic residues inhering and absorbed into the fabric of pots (Evershed 2008). At present, ruminant (cattle/sheep/goat) and non-ruminant (pig) fats can be distinguished, as well as plant waxes (eg leafy vegetables). Within the ruminant group, dairy fats can also be distinguished from meat (adipose) fats. Key studies include a comparison of Peterborough and Grooved Ware vessels from Wales by Dudd *et al* (1999), which suggests that the former were used for cooking ruminant meat while the latter contained pig as well as ruminant fats (an association consistent with the faunal evidence from Grooved Ware sites) and were probably not directly heated; there was no evidence for the cooking of vegetables, though in Orkney barley was stored in some of the larger Grooved Ware vessels (Jones 1999). A subsequent study found significantly higher occurrences of pig fats in Grooved Ware from 'ceremonial sites' (ie henges and related monuments) than from 'domestic sites' (pit clusters) (Mukherjee *et al* 2008). Another major project by Copley *et al* (2003) investigated the evidence for dairy products in the Neolithic and Bronze Age (including samples from Windmill Hill causewayed enclosure), which were found to be far more prevalent than previously suspected – though the practice of 'sealing' pots through boiling milk may account for some of this.

Lipid studies have so far failed to confirm the longstanding theory of an association between Beakers and alcohol (Šoberl *et al* 2009) in contrast to pollen analysis of residues adhering to the inside of vessels (see above). It is worth noting that pottery is not the only cultural material which retains traces of its use, and the evidence of lithic microwear for food processing, among other tasks, should also be considered.

Organic residues provide a different line of evidence to traditional dietary indicators because they are primarily a record of cuisine: Jones (1999) makes the important point that despite "a picture of overall stasis in animal and plant husbandry practices throughout the Orcadian Neolithic … the evidence of the organic residue analysis and the change in pottery technology suggest considerable change in the social practices surrounding food". Having established these methods, similar work is needed in England to relate evidence for use to other attributes of vessels, including their size, form, fabric and depositional contexts. For example, one current research project is investigating whether pots found in Early Bronze Age graves were made especially for burial or had previously been used in domestic contexts (Šoberl *et al* 2009).

Methods of cooking

A number of methods of cooking food could have been practiced during this time in addition to roasting and boiling. Jacqui Wood (2011) has experimented with cooking food by wrapping in clay, straw or dough. These wrapped items were then either cooked directly in a fire or in cooking pits lined with stones. In the latter case, a fire was lit in the base of the pit to heat the stone lining and the meat then placed on top of this once the fire had burnt out. Another fire alongside the pit was used to heat stones; these were then placed over the meat in the pit, covered with turf and left for several hours. Wood points out that although this method appears labour intensive once the cooking pit has been loaded and covered, it can be left unattended and is conservative in terms of fuel use (Wood 2011, 98-9). While there is little sign of burnt stone in any quantity on Neolithic and Early Bronze Age sites, if large stones used in fire pits or placed over wrapped meat were re-used many times we might not expect them to be present in any quantity, so this method of cooking remains a possibility.

Diet from human remains

We know from studies of the jaws and teeth that diets in the past were much tougher and chewier than the soft, factory-produced foods we eat today. The tough consistency of the diet meant that people's teeth wore down appreciably during life. Both upper and lower jaws were squarer and more robust than they are today (Goose 1962, Moore *et al* 1968), reflecting the stronger chewing muscles needed to cope with ancient diets. Studies of tooth wear (Brothwell 1963) and jaw shape (Moore *et al* 1968) show no great change between Neolithic and Bronze Age periods.

The frequency of dental caries (tooth decay) in past populations is an index of the amount and type of carbohydrates in the diet. The rate of caries in the Neolithic period (3.3% of total teeth examined) and Bronze Age (4.8% of total teeth examined) are similar (Roberts and Cox 2003, table 8.2). These frequencies are lower than in the historic era. This probably reflects a lack of sweet, sticky foods in prehistoric diets. The frequency of caries in prehistoric times is only about one quarter of that in urban populations in the 18th - 19th century. Partly this is because diets in towns had become softer and less abrasive by that time, facilitating build up of dental plaque, but mainly it reflects the baleful effects of imported sugar on Georgian and Victorian dental health.

Carbon and nitrogen stable isotope ratios in human bone collagen (bone protein) vary with those in the diet, so analysis of collagen extracted from human skeletons can tell us about ancient diets(see also **Chapter 6 – People**). Sea foods have different isotope ratios from other foods, and measurement of isotope ratios in Neolithic skeletons (Richards and Hedges 1999; Richards *et al* 2003; Smith and Brickley 2009, table 8) suggests that marine foods made a negligible contribution to diets, even in coastal communities. Nitrogen stable isotope values differ somewhat in foods according to trophic level: vegetable foods and animal products (meat, dairy products) have slightly different values. It has been argued from nitrogen stable isotope data that protein in Neolithic diets was derived largely from animal rather than plant foods, and that this is consistent with a subsistence economy emphasizing domestic stock rather than crops (Richards 2003). However, lots of other factors besides the meat: vegetable ratio of the diet influence human bone collagen nitrogen stable isotope ratios. Therefore, interpretation of nitrogen stable isotope ratios in terms of relative animal and plant contributions is fraught with difficulty. There is no isotopic evidence for differences between male and female diets (Smith and Brickley 2009, table 8). Human bone carbon and nitrogen isotopic data have yet to be collated for Early Bronze Age burials.

Concluding remarks

While direct archaeological evidence for the consumption of many food stuffs in the Neolithic and Early Bronze Age continues to elude us, there is sufficient information to suggest a varied diet to which very few new foods were added until after the Roman invasion (van der Veen *et al* 2008). What is perhaps surprising is apparent avoidance of the fruits of the sea and the birds of the air. What appears to be important is the consumption of large amounts of meat and potentially alcohol as a way of expressing status and engendering social cohesion and bonding (van der Veen 2003). However, this view of diet needs to be set against the paucity of information available for the every day diet as opposed to the patterns of consumption seen at ceremonial sites.

That some foods were avoided is becoming increasingly evident. While a small amount of marine fish or shellfish may have been consumed from time to time by some groups and individuals (Richards and Schutling 2006) it is possible that they were considered taboo. The committing of the dead into rivers with their eventually perceived arrival at the sea and incorporation into it may have led to sea and freshwater creatures being identified with the dead and therefore seen as unclean (Thomas 2003; Serjeantson 2011a, 71). Similar arguments may pertain to animals that feed on carrion such as wolves, foxes and some birds (Pollard 2004), although it is also possible that the consumption of meat from wild animals may have been linked to infection by *Trichinella* or other parasites. Wild animals such as bear and deer may also have been processed at the kill site with very little bone ending up on settlement or ceremonial sites. However, the consumption of domestic species and the avoidance of wild mammals, birds and fish may have been largely due to taste, the fact that meat, and probably more importantly milk (Serjeantson 2011a, 132), were readily available from livestock.

Chapter 8. Houses and Settlement

Susan Greaney and Jonathan Last

Introduction

The recent discovery of Late Neolithic buildings at Durrington Walls and another at Marden Henge, both in Wiltshire, has revitalised the debate on the nature of domestic lifestyles and our understanding of both settlements and monuments in the 3rd millennium cal BC. The aim of this chapter is to set these finds in the wider context of current knowledge about Neolithic and Early Bronze Age houses. The last comprehensive overview of Neolithic houses in England was that by Darvill (1996), but in the last 15 years, there have been many new finds and dating programmes as well as changes in the way archaeologists think about Neolithic lifestyles. Hence some of Darvill's corpus and categories can now be questioned, revised or added to based on new discoveries and models. However, such structures remain rare enough that any consideration of how people may have inhabited the Stonehenge landscape in the Neolithic and Early Bronze Age requires a review of the evidence from across Britain, especially given the long-distance connections evident in the parallels between the Durrington Walls buildings and those found in Orkney.

The Mesolithic background

It is important to point out that the houses found at Durrington Walls and Marden are far from the oldest known in Britain. In fact several sub-circular sunken-floored buildings are now known from the Early Mesolithic, a period traditionally seen as entirely nomadic – though of course substantial dwellings are not incompatible with a foraging lifestyle if seasonal resources are regularly abundant in a particular area. They need not have been occupied year-round, a point also relevant to later periods traditionally seen as more sedentary. The Early Mesolithic structures, all from northern Britain, include a 9th millennium cal BC example from Star Carr in North Yorkshire (Taylor *et al* 2010), and 8th millennium cal BC examples from East Barns near Dunbar in Scotland (Gooder 2007) and Howick in Northumberland (Waddington 2007), as well as the closely comparable buildings from Mount Sandel in Northern Ireland (Woodman 1985; Bayliss and Woodman 2009). Although not directly relevant to the Stonehenge area they are clear evidence that post-holes like those in the Stonehenge car park were not the only way of marking permanent places in the Early Mesolithic landscape.

It is notable that few comparable buildings are known from the Late Mesolithic, when settlement sites appear to be smaller and occupation less permanent, in part reflecting changing environments. Perhaps the best attested structures of this period in southern Britain are the small huts beneath the Neolithic causewayed enclosure at Crickley Hill, Gloucestershire, which have recently been dated to the late 5th millennium cal BC (Whittle *et al* 2011, 450–1). Closer to Stonehenge, there are claims for 5th millennium house floors, some of considerable size (15 x 10m), and hearths at Golden Ball Hill on the Marlborough Downs near Avebury, but the site is not fully published (Dennis and Hamilton 1997). Stakeholes, scoops and cooking pits from Castle Hill, Downton, may indicate the presence of temporary structures (Higgs 1959) while there are claims of small structures at Wawcott in the Kennet valley (Hey and Robinson 2011b, 211). However, most Mesolithic occupation is marked by lithic scatters without cut features.

Despite the evidence for activity of this period in the Stonehenge landscape, we have no clear idea of the locations or forms of settlements of this date. However, a concentration of Late Mesolithic find-spots on the Avon-Till interfluve, particularly along King Barrow Ridge, suggests that occupation may have been focussed in this area. A larger site, possibly a base camp, was investigated at Cherhill, near Avebury (Evans and Smith 1983). Recent finds of Mesolithic flints from the area of Vespasian's Camp have yet to be fully reported (Cook 2011).

Early-Middle Neolithic (4000–3100 cal BC)

Thus the earliest Neolithic structures that appear around 4000 cal BC are not part of a pre-existing tradition of domestic architecture, though Continental parallels are also hard to find (Last 2013). Only two definite houses appear to predate 3800 cal BC: those from White Horse Stone in Kent and Yarnton in Oxfordshire. Both can be interpreted as pairs of abutting 'modules' or smaller buildings (ibid).

The house from White Horse Stone measured 17.5m long and 6.5–7m wide; it was constructed using at least six longitudinal rows of posts as well as shallow bedding trenches around three sides of the structure (Garwood forthcoming; Hayden with Stafford 2006). Within the structure there were two possible hearths (though one is probably a later feature), as well as domestic material, including Carinated Bowl pottery. The building was probably constructed in 4065–3940 cal BC (68% probability) and used for several centuries (Whittle *et al* 2011, 380). A second, probably similar but slightly smaller structure (10.5m long) was found close by at the Pilgrim's Way site; it remains undated, but the southern part of the White Horse Stone building appears to be aligned on it (Garwood, forthcoming).

The post-built house at Yarnton measured 21m long and up to 11m wide (Hey and Robinson 2011a); it was probably constructed in 4000–3805 cal BC (68% probability), though this is a cautious estimate (Whittle *et al* 2011, 421). Less material was found in association with the building than at White Horse Stone; an adjacent cremation deposit, dated to the 37th or 36th century cal BC, may be broadly contemporary with the abandonment of the structure.

Other structures of this early phase found underneath later long barrows may also be interpreted as houses. At Ascott-under-Wychwood, Oxfordshire, two groups of post-holes could represent a single building some 9m long with a central hearth, which has an estimated date of 3980–3820 cal BC at 95% probability, based on Gr-A 23933 (Bayliss et al 2007; McFadyen *et al* 2007). The preferred interpretation as two structures could fit the earliest Neolithic model of paired modules, though they would be much smaller than the other examples. Another small post-built structure of less regular form was found beneath the Gloucestershire long barrow at Hazleton North; it contained a hearth and measured about 5m long (Saville 1990). The pre-monument activity here started before 3800 and ended by 3650 cal BC (Meadows et al 2007). Similar evidence comprising post-holes, shallow gullies and a hearth was revealed under Sale's Lot, also in Gloucestershire (O'Neil 1966), where the deposition of human remains started before 3650 cal BC (Whittle *et al* 2011, 470), though the pre-mound finds included Windmill Hill-type pottery which may imply a slightly later date than the other examples. The forecourt enclosure at Nutbane was interpreted as a freestanding roofed building, but there was no

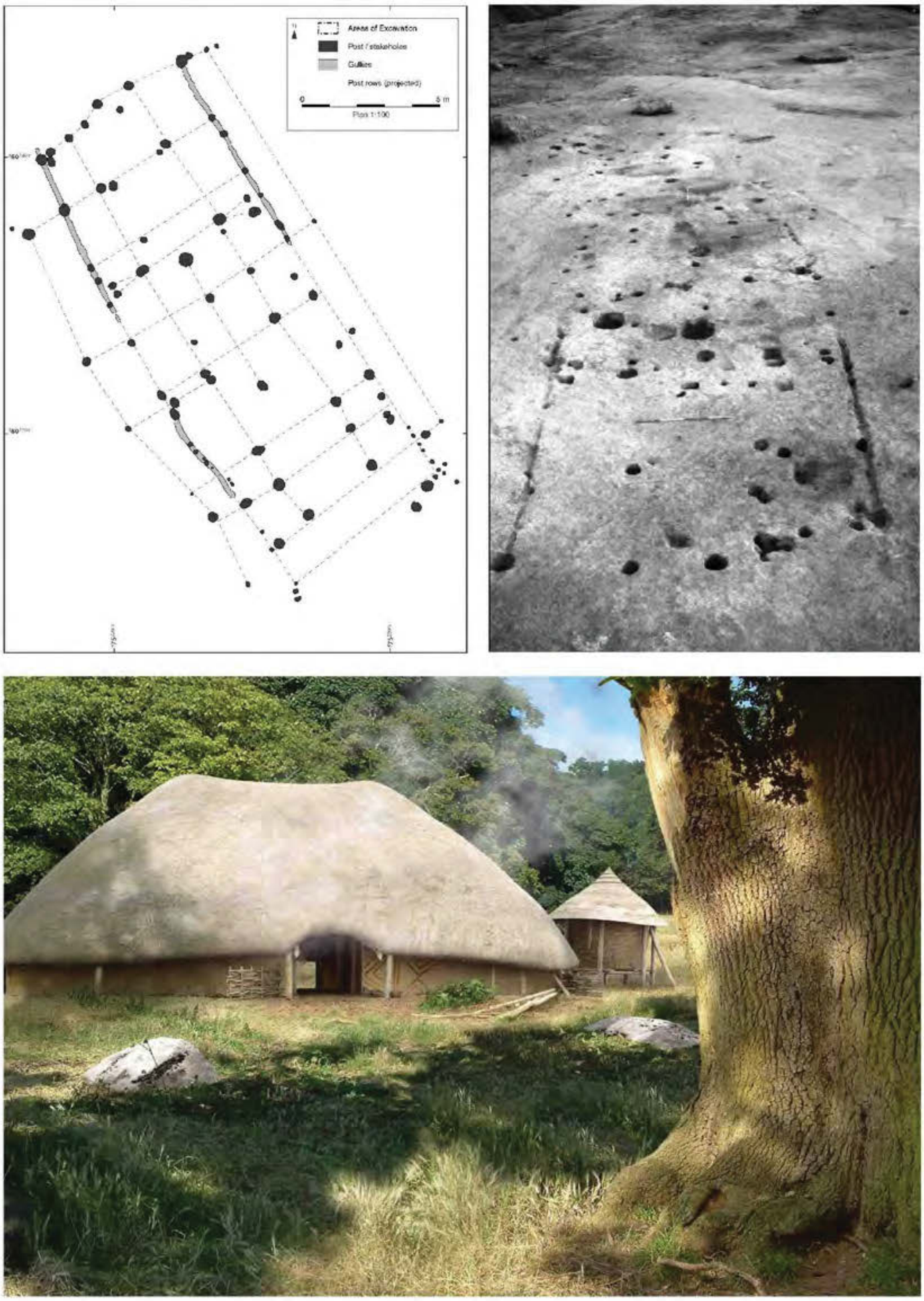

Fig 8.1 A preliminary reconstruction of the Early Neolithic house at White Horse Stone, Kent, by Peter Lorimer, together with a plan and photograph of the excavated house (from Hayden with Stafford 2006). The building has been given a substantial thatched roof, and some element of decoration. The small building to the right should be ignored as this dates from later in the sequence. © HS1 and Oxford Wessex Archaeology

evidence of domestic occupation (Morgan 1959).

It seems unlikely these structures were preserved under the later barrows purely by chance; either they comprise part of the early ritual or funerary activities at the site, or the monuments were deliberately constructed over earlier settlements. In either case, pre-barrow activity was often substantial as shown by the middens associated with the structures at Hazleton and Ascott. None of the earthen long barrows around Stonehenge have produced such evidence, though they have seen only limited investigation as yet.

The site of Lismore Fields in Derbyshire seems to mark a transition from the earliest Neolithic structures to a much better attested group of houses that mostly fall into the period 3800–3600 cal BC. The two buildings here were post-built with internal divisions and measured 15m and 7.5m long. Building I, which appears like the earlier buildings to comprise a pair of adjoining structures, dates to the first half of the 38th century cal BC; Building II probably dates to the 37th century cal BC (Garton 1991 and pers comm).

Of similar date are at least eight roofed timber 'halls' known from eastern Scotland and associated with Carinated Bowl pottery (Brophy 2007), including Balbridie and Warren Field, both in Aberdeenshire (Fairweather and Ralston 1993; Murray et al 2009), Claish, Stirling (Barclay et al 2002), Lockerbie Academy, Dumfries and Galloway (Kirby 2011), and Doon Hill, East Lothian (Hope-Taylor 1980). These large buildings, with a mixture of post and trench construction, are all over 20m in length and have a distinctive arrangement of internal partitions. Their currency probably spans the period 3800–3650 cal BC. The numerous Irish houses appear to date to a relatively short period in the 37th century cal BC. Usually trench-defined spaces, sometimes with smaller spaces at one or both ends; they are generally smaller than the Scottish 'halls' with the largest, such as Tankardstown 2, approaching 15m in length (Grogan 1996; Smyth 2011).

A few structures that resemble the Irish houses are now known from England and Wales, though none of the definite examples come from Wessex. The best-known are those at Llandygai, Gwynedd (Kenney 2009), Horton, Berkshire (Pitts 2008), Gorhambury, Hertfordshire (Neal et al 1990) and Fengate, Peterborough (Pryor 1974; 2005).

In eastern England the post and trench-built house at Horton in the Colne valley measured about 9.5 x 6.5m and was divided into two rooms of unequal size. It probably dates to around 3700 cal BC. A similar structure has been recorded nearby at Cranford Lane (Hey and Robinson 2011a). The less well-preserved structure at Gorhambury may have been very similar in layout and size (Neal et al 1990); a bulk sample of oak charcoal from one slot provided a terminus post quem date (HAR-3484) of 3760–3380 cal BC (Whittle *et al* 2011, 270). The better of two inconsistent dates from the plank- and post-built structure at Padholme Road, Fengate, Peterborough, seems too late for the Early Neolithic assemblage with which it is associated (Whittle *et al* 2011, 313–4). The building as published is nearly square (8.6 x 7m) and lacks a hearth but it may be incomplete (Pryor 1993, 139), one end truncated by later activity on the site.

Fig 8.2 The excavation plan and photograph of the Early Neolithic House at Horton, Berkshire, together with a reconstruction. The wall slots here imply walls built of upright planks, with more substantial posts only at the corners, supporting a thatched roof. © Wessex Archaeology

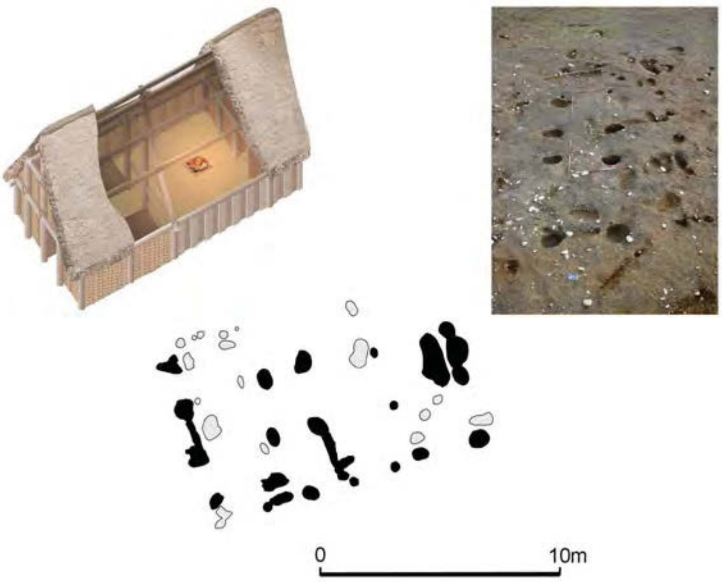

Fig 8.3 The excavation plan and photograph of the Early Neolithic House at Llandygai II, Gwynedd, with a reconstruction of the very similar Llandygai I. The walls appear to be a combination of plank built and wattle construction, with substantial gable posts. Again, thatch has been conjectured for the roof, although like all the Early Neolithic houses shown in this chapter, alternative materials such as turf or brushwood are possible. Reconstruction and excavation images from http://www.heneb.co.uk/llandegaiweblog/neolithichouse.html and plan from http://www.heneb.co.uk/llandegaiweblog/neopotteryandplan.html
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In western Britain, the site of Llandygai, like Lismore Fields and White Horse Stone/Pilgrim's Way, comprised a pair of houses. That excavated in the 1960s (Llandygai I) was a post-built structure measuring *c* 13 x 6m. The more recent discovery (Llandygai II) measured *c* 11 x 7m and was of mixed post-hole and trench construction (Kenney 2009); it has a *tpq* date (Gra-20012) of 3720-3520 cal BC (Whittle *et al* 2011, 548). Part of a rectangular trench-built structure with a hearth dated to 3975–3675 cal BC (Beta127175) was found at Oversley Farm, Manchester Airport, though a supposed second phase of the structure produced 3rd millennium dates (Garner 2007). In the south-west, a large rectangular post-built structure at Penhale Round in Cornwall, measuring more than 19m long and 10m wide, has been dated (Wk-9839, Wk-9840) to *c* 3800–3650 cal BC (Whittle *et al* 2011, 516). Some doubt has now been cast on the date of the house associated with the causewayed enclosure at Hembury, Devon (Whittle *et al* 2011, 490) but if associated with the enclosure it belongs in the 37th or 36th century and is a similar 7m-long sub-rectangular structure containing a hearth and cooking pit (Liddell 1931).

Rather than relating to the very first farmers, therefore, most Early Neolithic houses in Britain appear to date to a slightly later phase, though perhaps starting earlier in some areas (ie Scotland) than others (Ireland). This tempo resembles trends in monument construction and the chronology is broadly contemporary with that of long barrows and causewayed enclosures (Whittle *et al* 2011), all of which perhaps suggests that the houses had some ritual or communal significance, rather than being a long-lived tradition of primarily functional relevance. Evidence for their use is equivocal: some structures have finds assemblages that suggest domestic activity; others are 'clean' or have specialised assemblages, such as the large quantities of charred grain associated with a number of structures. There is also evidence for deliberate destruction by fire in some cases, especially in Ireland and Scotland.

The conundrum of meaning is exemplified by Pryor's changing interpretation of the Padholme Road house from domestic building to mortuary structure (Pryor 1993; 2005, 66). However, ethnographic analogy strongly suggests that to see such buildings as either purely domestic or purely ritual would be erroneous (eg Waterson 1990). On that basis, some other examples interpreted as mortuary structures could be reconsidered, including the rectangular post structure from Cat's Water at Fengate, on the same alignment as the Padholme Road house, which measured 8 x 5m and was associated with Early Neolithic Plain Bowl pottery (Pryor 2001, 48–9). The same might go for the 9m-wide square enclosure outside the Windmill Hill causewayed enclosure at Avebury: possibly comprising a bedding trench for posts, the few finds are not incompatible with a Neolithic date (Smith 1965; Whittle et al 1999).

A number of structures are known which do not fall into the Horton-Llandygai 'tradition' but are associated with Early Neolithic artefacts. Some are much smaller, including a circular structure near the earlier house at Yarnton, which measured just 2.5m in diameter and has been dated to around 3600 cal BC (Hey and Robinson 2011a), and an irregular group of post-holes which appeared to represent a small building 3.6 x 3m in size, associated with Windmill Hill pottery, at Chew Park, Somerset (Rahtz and Greenfield 1977). At Croft, Leicestershire, possible palisade gullies for post-ring round-houses have been tentatively dated to the earlier Neolithic (Hughes and Roseff 1995), while a circular depression with a hearth, interpreted as a hut, was found at Stanton-on-the-Wolds, Nottinghamshire (Bird and Bird 1972).

Others are somewhat irregular arrangements of pits and post-holes which can be interpreted as (parts of) rectilinear structures. There are a number of examples in eastern England, including Etton Woodgate in Cambridgeshire (French et al 2005b 17–20) and Spong Hill in Norfolk (Healy 1988, 6–10), which respectively measured some 7 x 4m and 10 x 6.5m in size. A similar post-built structure measuring 8 x 4.5m was found at Chigborough Farm in Essex and may belong to this phase but the dating is tenuous (Wallis and Waughman 1998, 63–5). A putative Early-Middle Neolithic structure at Sewerby also falls into this category (Fenton-Thomas 2009). At Colney, Norfolk, a rectangular structure about 7 x 5m in size with a flint cobble floor was found within a shallow hollow (Whitmore 2004). Elsewhere, possible houses have been found at Southwell, Dorset, measuring 4–8m long and 4m wide (Bellamy 2000) and Willington, Derbyshire, measuring *c* 8 x 4m (Wheeler 1979).

In the south-west, a number of house structures may be contemporary with the tor enclosure at Carn Brea, Cornwall, which could span the 38th to the 33rd centuries cal BC (Whittle *et al* 2011, 509). One of these, a lean-to building against the rear of the enclosure wall, measured 10.6 x 3m in size and was associated with working hollows and a fire pit (Mercer 1981; 2002). At Haldon, Devon, a house of trapezoidal shape measuring 6 x 5.3m, with stone walls and post-holes suggesting a pitched roof, may also belong to this period (Willock 1936). At Crickley Hill a house platform (or possible shrine) measuring some 5 x 3m appears contemporary with a ditched enclosure of the 36th century cal BC (Whittle et al 2011, 450–1).

Undoubtedly many Early Neolithic structures of insubstantial construction have been lost, but it is also true that if they were ubiquitous we would have found more, given the large areas of prehistoric landscape that have been investigated over the last 20 years. Attention should also be paid to indirect evidence, such as the groups of Neolithic pits at Kilverstone, Norfolk, which appear to mark the corners of former structures now lost; however, these would have been very small and there may be other explanations for the patterned arrangements of pits (Garrow et al 2005, 153).

It is notable that Wessex in general and Wiltshire in particular has very little evidence for houses of this phase. While the ephemeral nature of the evidence demonstrated by some of the sites should lead to caution in drawing any firm conclusions, the lack of evidence for houses in this area does seem to indicate that people led a mobile lifestyle, involving seasonal cycles of movement, transhumance and temporary settlement.

The principal evidence for the inhabitation of the Stonehenge area in this period comes from lithic scatters. Data from fieldwalking undertaken as part of the Stonehenge Environs Project (Richards 1990, 265) showed that certain areas of the landscape, particularly King Barrow Ridge and Coneybury Hill, saw concentrated Early Neolithic activity. What these flint scatters mean in terms of the nature, chronology and tempo of occupation is unclear, however, and more analysis is needed (see **Chapter 9 - Depositional Practice**).

Small pits and other evidence of Early Neolithic activity have been found under the bank at Durrington Walls (Wainwright and Longworth 1971, 192–3) and at Woodhenge (Pollard and Robinson 2007), as well as in the area of King Barrow Ridge (Richards 1990, 265). Other pits, like the Coneybury Anomaly and those at Robin Hood's Ball causewayed enclosure, also suggest domestic activity, but the nature and range of material deposited may indicate ritual deposition and the marking of places in the landscape rather than mere ‘occupation’ (see **Chapter 9 - Depositional Practice**).

The transition from the Early to Middle Neolithic can now be set around 3500 cal BC, as the causewayed enclosure building tradition waned and was replaced by cursus monuments (Whittle *et al* 2011, 907–8). Houses from the second half of the 4th millennium are extremely scarce nationally and currently absent from Wiltshire. A small post-hole structure at Burghfield in the Thames Valley was associated with Mortlake Ware (Hey and Robinson 2011a) while another small, possibly Middle Neolithic structure was found at Stretton-on-Fosse, Warwickshire (Gardiner et al 1980). Post-built structures assigned to this phase have been found at Tatton Park, Cheshire (Higham and Cane 1999), though some of the radiocarbon dates might suggest they are Bronze Age (Hodgson and Brennand 2006, 37). A roughly-square trench-defined structure at Barford Site C, Warwickshire, which measured 12 x 10m and was associated with Peterborough Ware (Oswald 1969, 16–19) may be a mortuary enclosure rather than a domestic building (Loveday 1989); it resembles the feature from Windmill Hill mentioned above.

In the Stonehenge landscape, no pits associated with Peterborough Ware are known, but surface scatters of this type of pottery were found on Wilsford Down, north of the Cursus, and on King Barrow Ridge (Richards 1990, 267), showing at least some activity in the period broadly contemporary with the use of the Cursus.

Late Neolithic/Chalcolithic (3000–2200 cal BC)

As in the Early Neolithic, therefore, Late Neolithic buildings lack clear antecedents. It is in this phase that the major monuments were constructed, however, and there is evidence for long-distance contacts; these facts are no doubt connected to the appearance of houses at Durrington Walls and Marden, as well as monumental elements that may draw on the symbolism of houses.

The nine buildings at Durrington Walls were excavated by the Stonehenge Riverside Project team in 2006 and 2007 (Parker Pearson *et al* 2007b; 2008b). Five of the buildings at the eastern entrance were interpreted as domestic, based on the evidence that they had regularly-burnt hearths, regular erosion of the floors, use and discard of pottery and association with nearby middens. The buildings were roughly square with rounded corners and most were about 5 x 5m in size (Fig 8.4). The walls were defined by stakeholes, some perhaps with chalk cob construction, and the floors were puddled chalk with evidence for slots that may have been settings for wooden furniture. Large quantities of Grooved Ware pottery and animal bones, particularly those of pig and cattle, suggest seasonal feasting took place (Albarella and Serjeantson 2002).

Two further buildings of a similar size were positioned on either side of the Durrington Walls ‘avenue’ bank, probably with open sides facing the avenue (Parker Pearson et al 2008b, 23–9). Another two houses in the centre of the henge enclosure were set within timber palisades and ditched enclosures, which appear to have been kept clean (Thomas 2007).

The construction of the houses has been dated to 2525–2470 cal BC, before the construction of the henge enclosure bank (Parker Pearson with Willis 2010). Comparison has been made between these houses and those known at Skara Brae and other contemporary sites in Orkney, due to their similar size and possible interior layout. In particular, House 851 and its ancillary building 848 has been compared to Houses 6 and 7 at Skara Brae (Parker Pearson 2007, 140). Comparative dating of the Orcadian settlements remains somewhat obscure but Skara Brae may have been abandoned around the time Durrington Walls was occupied, and Barnhouse rather earlier (Ashmore 2005). However, the Ness of Brodgar, where work is ongoing, probably persisted until 2300 cal BC (Towrie

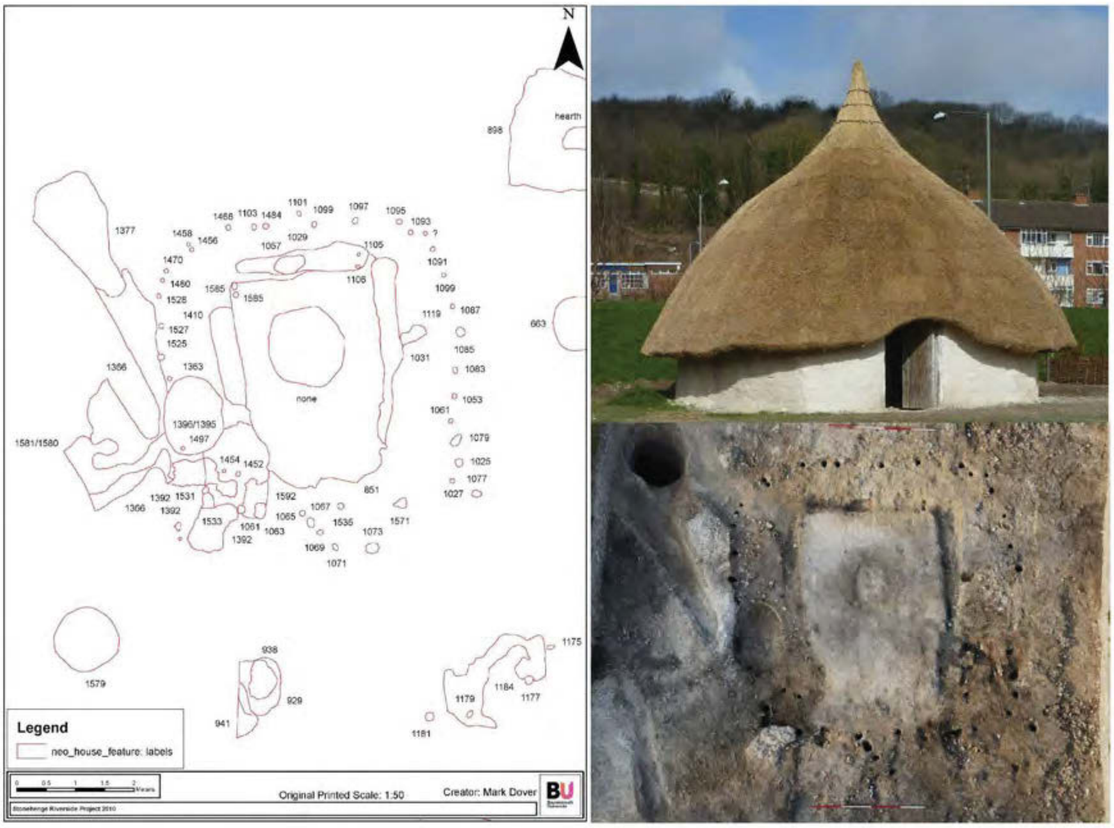


Fig 8.4 Plan and photograph of Late Neolithic House 851, Durrington Walls, Wiltshire, with a reconstruction created by East Sussex Museums Partnership at Moulsecoomb Primary School, Brighton. The building is constructed in the form of a beehive, with wattle walls continuing up to form the roof structure. Again, the thatched roof is conjecture but perhaps likely given the nearby River Avon which could have provided reeds. Reconstruction photograph: Susan Greaney; Plan: Courtesy Stonehenge Riverside Project. Vertical photograph: Adam Stanford © Aerial Cam/SRP

2011). Links between the two regions are also apparent in the nature of Grooved Ware ceramics (Wainwright and Longworth 1971, 243–8); Cleal (1999, 5) points out that a distinctive 'rosette' motif is found in Orkney and at Woodhenge but almost nowhere in between.

The house at Marden, discovered during English Heritage excavations in 2010, was positioned on the bank of a small henge monument within the larger enclosure (Fig 8.5). The building consisted of a sunken chalk floor, with a large central hearth. Low plinth-like chalk walls (or a raised floor) surrounded the central area, extending to form a platform on one side. Like the houses at Durrington Walls, it was surrounded by an extensive midden with burnt and ashy deposits, pig bones and Grooved Ware pottery attesting to possible feasting activities.

The Marden and Durrington houses appear to be very similar in style and date, and although we await full publication of both sites, there is a complex picture emerging of the different structures and monuments that existed within Late Neolithic henge enclosures. The buildings at Durrington had been protected by layers of deep colluvium and by a later henge bank, while the land at Marden had fortuitously never been ploughed. This suggests that other similar houses which once existed may have been destroyed by agriculture, but

Fig 8.5 Photograph of the Late Neolithic house at Marden henge, Wiltshire, during excavation. The sunken inner area of this building was dominated by a large hearth. This, together with a large quantity of burning debris outside the building, has led the excavator to suggest that this building is not domestic in purpose, but was used for some sort of sweat lodge, perhaps the location of purification rituals (Jim Leary pers comm). Photograph by Jonathan Last

also that more may lie hidden and undiscovered in lowland sites. Although it remains to be convincingly demonstrated that such houses were constructed in locations other than the major henge enclosures, parallels can be drawn with structures from Trelystan and Upper Ninepence, Powys, and Rothley, Leicestershire (Fig 8.6). The buildings preserved beneath later round barrows at Trelystan measured about 4m across and had central stone-edged hearths, a number of pits, and outer walls of stakes; they have been dated to *c* 2800–2500 cal BC (Britnell 1982). Though relatively small and slight, they have clear parallels to the Orkney-Wessex house tradition. At least one similar sub-circular stakehole structure, dated to around 2700 cal BC (SWAN-25), was preserved beneath a barrow at Upper Ninepence (Gibson 1999, 35–47). At Rothley, a possibly similar sub-circular building 5m in diameter associated with Grooved Ware pottery has been radiocarbon-dated to *c* 2700–2500 cal BC (Speed 2011).

Recent work at the Durrington/Woodhenge complex by the Stonehenge Riverside Project has highlighted the existence of another type of monumental structure which may be connected with the Orkney-Wessex houses, the 'four-post-in-circle' timber settings. Six of these have been found in the area, associated with the Northern Circle and first phase of the Southern Circle within Durrington Walls, the Western Circle, Durrington 68, Durrington 70 and another to the south-west of Durrington 68

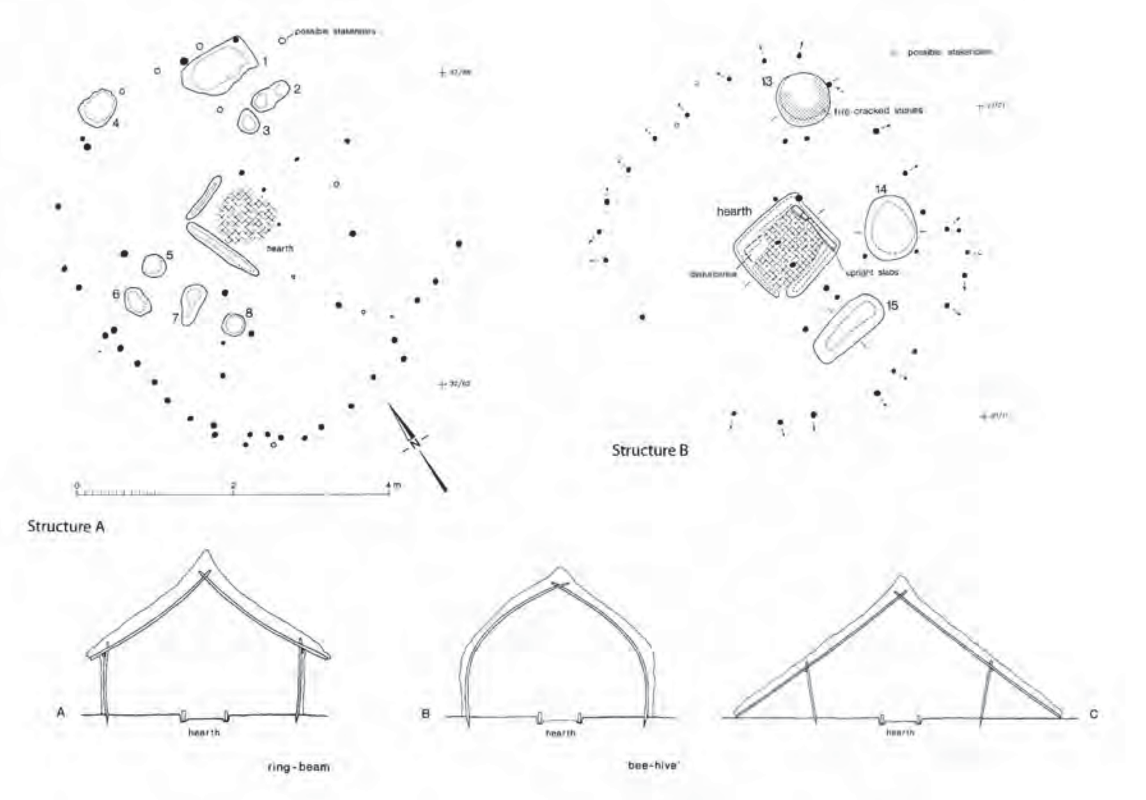


Fig 8.6 Ground plans of the two Late Neolithic structures excavated at Trelystan, Powys, with three possible ways in which they could have been roofed. The beehive shape (B) is similar to the one used to construct the replica Durrington house (Fig 8.4) and the example where the roof extends down to the ground is similar to the Sewerby reconstruction (Fig 8.7). These diagrams show that there are several plausible reconstructions from these simple ground plans. Reproduced from Gibson (1996) © Alex Gibson

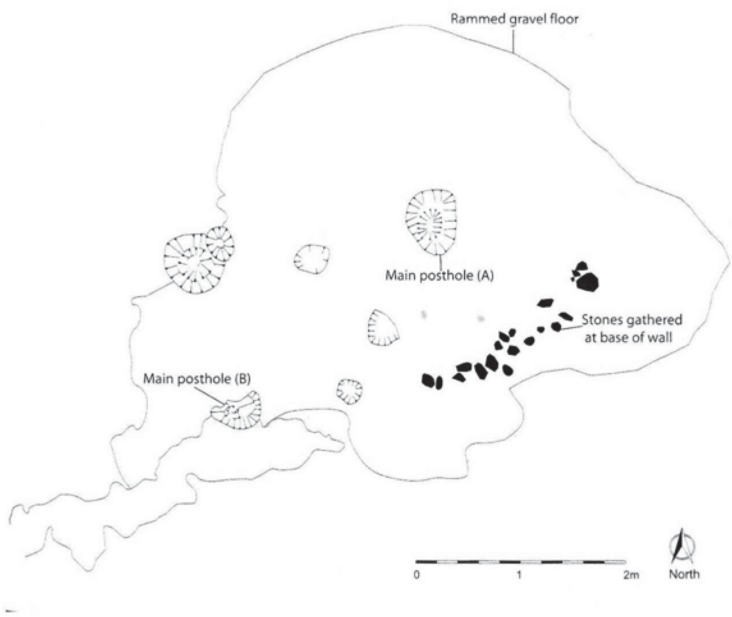
(Pollard 1995a; Parker Pearson et al 2008b). Similar structures are known at the nearby Coneybury Henge, at Wyke Down, Dorset, and further afield at Machrie Moor on Arran as well as Knowth and Ballynahatty in Ireland. The solsticial alignments and absence of finds from the examples on the Durrington ridge, in addition to their lack of floors or hearths, suggests a non-domestic function. The excavator has interpreted them as 'ceremonial structures' or platforms, and also as symbolic houses (Parker Pearson et al 2008b, 109). Some of them, such as those at Wyke Down (Green 2000, 73–5), appear to be convincing as roofed structures and even have clay and chalk-based daub fragments surviving, but even so these examples are associated with a nearby henge and with formal deposition. Those in the Stonehenge landscape appear more monumental. If they are monumentalised houses we need to understand whether and how they might derive from the Orkney-Wessex tradition. Parallels might also be drawn with monumental stone structures, such as 'four posters' and coves.

The structures from Durrington 68, the sites in Powys, and the postholes and hearths from beneath the barrow at Ringlemere in Kent (Parfitt 2006, fig 6) raise the question of how we interpret the widespread evidence for Grooved Ware activity beneath later round barrows. Were they ritual structures from the outset or were the barrows deliberately sited on former domestic sites? Around Stonehenge, there is abundant evidence of Peterborough Ware, Grooved Ware and Beaker material preserved underneath (and incorporated into) round barrows. Darvill (2005, 45) argues this is fortuitous but the evidence discussed above for the deliberate siting of some long barrows over earlier middens might suggest otherwise; a more systematic study is required. Structures that can be interpreted as Neolithic houses are rare, however. Apart from those already mentioned, there is a small rectangular post-in-slot structure associated with Grooved Ware that was sealed beneath a round barrow at Playden in East Sussex. Patches of wood ash and charcoal indicated hearths, and one of the hollows was lined with stone walling two courses high. Bradley (1978) considered this a domestic site but Cleal (1982) has argued that the structure was of ritual nature, perhaps a timber horseshoe setting.

Away from round barrows, a range of other types of Late Neolithic structure are known, including rectilinear and round or sub-circular forms. A recent review of Late Neolithic buildings by Garwood (forthcoming) notes extreme diversity 'in terms of their sizes, shapes, constructional technologies, internal design features and likely superstructures' though also some patterns in the association of pits and buildings.

Many of these buildings come from the eastern side of England. Post-built rectangular structures are known from two coastal sites in Essex: The Stumble and Stone Point, Walton-on-Naze, where the buildings were found in what is now the inter-tidal zone (Wilkinson and Murphy 1985; 1986; 1987). The one at Stone Point had walls or floors of interlaced small boughs, preserved in the waterlogged conditions (Warren et al 1936). A sub-rectangular house at Yarnton, measuring *c* 9 x 7m, dates probably to the 25th or 24th centuries cal BC (Hey and Robinson 2011a, 236). At Briar Hill causewayed enclosure in Northamptonshire, a small horseshoe-shaped structure was found, measuring 4.5 x 3m internally, defined on three sides by wall slots and associated with Grooved Ware pottery (Bamford 1985). A radiocarbon date (HAR 2607) for this structure spans the range 2880–2280 cal BC (Whittle *et al* 2011, 298–300). At White Horse Stone, Kent, already discussed in relation to the Early Neolithic activity (see above), two overlapping structures, one circular and one oval, each 3-4m across, were found in association with Grooved Ware pits (Garwood, forthcoming; Hayden with Stafford 2006).

Further north, the remains of a post-built rectangular building, measuring 8 x 7m, were found within a natural hollow at Mill Street, Driffield, Humberside (Dent n.d.; Manby et al 2003). At Aleck Low, Derbyshire, excavations uncovered the remains of four much-eroded sub-rectangular sunken floors associated with large pits and Grooved Ware (Hart 1985), which unfortunately have not been fully published. At Willington, a group of possible sub-rectangular and sub-circular structures defined by post-holes were associated with Grooved Ware and Beaker pottery (Wheeler 1979). In the north-west, possible 3rd millennium buildings were found within a palisade at Arthill Heath Farm, Cheshire (Nevell 1988). But the most detailed account concerns the sub-oval structure with two phases at Sewerby Farm, Bridlington, Yorkshire (Fenton-Thomas 2009). Preserved in a hollow, this had a rammed gravel floor with no evidence for walls, though it was conjectured these were made of turf; several internal post-holes could have supported a roof (Fig 8.7). The building was sealed by a dump of material containing Grooved Ware and has been dated to the 29th century cal BC.



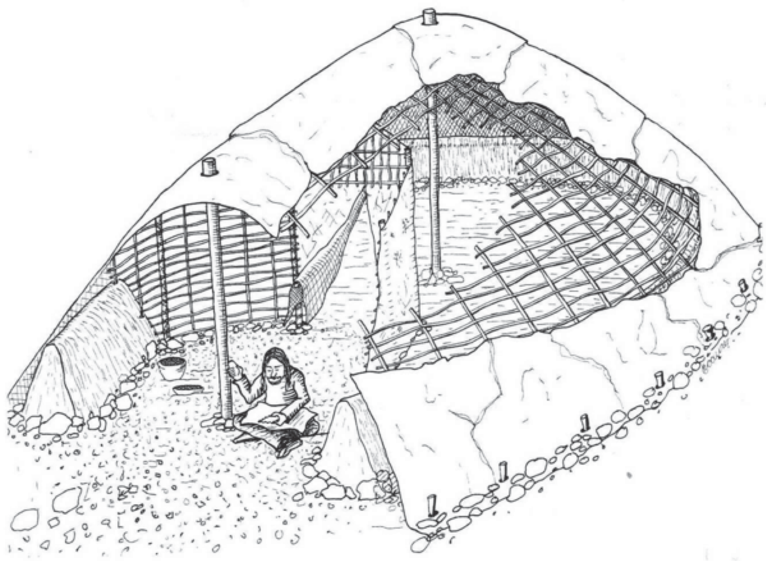


Fig 8.7 Plan and reconstruction of the Middle-Late Neolithic house A3 at Sewerby, East Yorkshire. This is a much less substantial construction, and would perhaps have been the most common form of temporary or seasonal structure. The lack of postholes or stakeholes around the wall line suggested to the excavators that the weight of the roof could have rested on a turf wall, with the roof frame, covered in skins or hides, extending beyond and resting on the ground. From Fenton-Thomas 2009, figs. 83 and 88; © On-Site Archaeology

In the Stonehenge landscape, the new discoveries at Durrington and at Marden appear exceptional and should perhaps not be viewed as typical houses; they appear to be closely related to ceremonial monuments and occupied for short periods. Other contemporary settlements, like those from earlier periods, lack clear evidence for structures. Excavated examples include the possible occupation site at Downton, near Salisbury (Rahtz and ApSimon 1962) as well as the pits on Boscombe Down (Lawson 2007, 97–8), near the Packway road (Cleal *et al* 2004, 220–3) and at Ratfyn, and a flint scatter with high phosphate concentrations on Wilsford Down (Richards 1990). Concentrations of Late Neolithic flint tools occur on King Barrow Ridge and in the area to the west of Stonehenge (Richards 1990, 270). The contents of other pits, such as the Chalk Plaque Pit (Harding 1988) and those at Woodlands, might suggest formal deposition rather than domestic rubbish.

Early Bronze Age (2200–1500 cal BC)

The Beaker period has been considered to be a time of increased agriculture and sedentism, evidenced by the regular occurrence of cereal grain impressions on pottery, charred grain and cultivation evidence (Evans *et al* 1993, 188–9) (but see **Chapter 4 – Plant Resources**). Although this may not imply permanent settlements, we might nevertheless expect to have more settlement evidence than is currently known from England. The lack of such evidence may be explained by the position of chalkland settlements in low-lying positions where they lie undiscovered under hillwash (Allen 2005).

Beaker structures therefore continue to be elusive in Wessex and elsewhere in Britain, with fewer than ten sites known (Allen 2005, 219). Most of the Beaker structures that have been claimed to lie beneath later round barrows can probably be interpreted as early stages of the monuments. As with the Grooved Ware cases, however, there are more convincing examples of freestanding structures under barrows, including two partly overlapping arrangements of post-holes and stakeholes at Swarkeston, Derbyshire: a square building with hearth and pits, and two long rows of slightly converging stake holes, associated with Beaker pottery (Greenfield 1960). Closer to Stonehenge, an oval post-in-slot structure set within a penannular enclosure at Little Cheney, Dorset, was associated with a later burial cairn and cremations (Catherall 1976).

Away from round barrows a possible rectangular building associated with Beaker pottery was found at Easton Down, Wiltshire (Stone 1933). Further afield, four probable small buildings were found at Belle Tout, Sussex; the earlier ones were rectangular in plan and the later ones oval or sub-circular (Bradley 1982), though as Allen (2005, 221–2) has pointed, out "they are so amorphous and ambiguous that they are difficult to recognise as easily defined structures". A circular 'occupation floor' at Hockwold, Norfolk, may indicate the location of a Beaker house (Bamford 1982, 10–11). A Late Neolithic/Early Bronze Age structure has also been found on the Carlton Colville by-pass, Suffolk (Medlycott and Brown 2008, 16).

In the Stonehenge landscape, no Beaker houses are known but scatters of Beaker pottery and diagnostic Early Bronze Age flints have been found in three locations: south of the Winterbourne Stoke crossroads, west of Stonehenge and north of the Stonehenge cursus (Richards 1990, 275). Functional assessment of these scatters remains problematic, but they may suggest settlement areas.

The evidence for settlement in the early 2nd millennium BC is very similar to that for the Beaker phase. Although there are occasional structures dated to this phase (see below), the Bronze Age roundhouse tradition does not emerge properly until the very end of our period, around the 16th century cal BC. In a few instances around Stonehenge, Early Bronze Age pottery has been found with groups of post-holes which are presumably the remains of house structures. On Boscombe Down, excavations in 2005 uncovered two such groups of post-holes which seemed to show the position of sub-circular houses (Lawson 2007, 261), while another possible roundhouse is known from Charnham Lane, Hungerford (Ford 1991). However, the only certain Bronze Age roundhouses from the Stonehenge landscape are located at Winterbourne Stoke crossroads (Richards 1990, 208–10) and date to the mid-2nd millennium BC, by which time the first field systems had been laid out.

Elsewhere there are a number of earlier roundhouses associated with domestic Beakers, Food Vessel or early Urn styles. At Sutton Hoo, Suffolk, a post-built roundhouse with a porch was associated with a group of Beaker pits (Hummler 2007), but the presence of a faience bead would suggest a date no earlier than *c* 1900 cal BC. A small (4–5m diameter) roundhouse with a porch from Yarnton was associated with sherds of Biconical Urn that suggest a date around *c* 1800 cal BC (Hey 2011). At Gwithian, Cornwall, a roundhouse formerly assigned to the Beaker phase is now associated with Trevisker material radiocarbon-dated (OxA-14568)
to 1890-1610 cal BC (Nowakowski *et al* 2007). At Oversley Farm three rather different circular structures and a rectangular building are associated with midden deposits containing sherds of Beaker, Food Vessel and Collared Urn; radiocarbon dates centre on the period *c* 1900-1700 cal BC (Garner 2007). In southern Scotland the site of Lintshie Gutter has provided some early radiocarbon dates for roundhouse architecture, one of which predates 2000 cal BC, though other dates from the same site are considerably later (Terry 1995). Finally, a group of huts under a round cairn at Sant-y-Nyll near Cardiff were associated with Food Vessel and Collared Urn pottery (Peterson 2007).

More work is needed on the origins of roundhouses but some connection to earlier round barrows is evident. Bradley (1998, 159–60) notes that Middle Bronze Age houses were organised on similar principles to nearby mounds, and may therefore represent a change in the focus of ritual from specially constructed monuments to the domestic sphere, which for the rest of prehistory became a major focus for symbolic elaboration.

Implications for settlement studies

While the Late Mesolithic remains something of a black hole, we now have a better understanding of Neolithic houses than when Darvill compiled his corpus. However, large-scale commercial excavation in many parts of the country has shown that they are extremely scarce compared to the number of sites defined by pit clusters (sometimes with post-holes that cannot be resolved into coherent structures) and flint scatters with few, if any, cut features. The same goes for the Early Bronze Age, when in Wessex not just houses but settlements of any kind "remain obstinately invisible" (Pollard and Healy 2007, 83). The record can probably be explained in terms of people generally living in informal or ephemeral buildings, probably associated with rather mobile communities, though whether we should envisage seasonal mobility of transhumant type or permanent but short-lived occupation on any given site requires further research. On the other hand, the known Early Mesolithic houses and the evidence for possible seasonal occupation of those at Durrington

Walls show that more elaborate structures do not necessarily connote fully sedentary communities. Investment in house-building implies something about the social or symbolic significance of such buildings, not just a practical need for shelter.

Most of the structures that have been excavated across England show a variety of sizes, forms and techniques that do not suggest such a degree of cultural or symbolic significance, certainly not comparable to that found at contemporary monuments or even to the structured deposits seen in many settlement pits. Despite its well-known monument complexes, Wessex does not stand out in terms of either the number of settlement sites or the types of structure represented. However, at certain points building traditions emerged that do have more in common with monumental traditions and were seemingly implicated in the reproduction of cultural identities and social structures; these occurred in the Early Mesolithic (Howick type), Early Neolithic (Horton-Llandygai type), Late Neolithic (Orkney-Wessex type) and Middle Bronze Age (roundhouse tradition), the last of these associated with a change in land tenure that ensured it endured throughout later prehistory. Only the Late Neolithic tradition seems to have a particular relationship to Wessex, and this is unlikely to be a coincidence given the other developments locally in this period.

Some of these 'significant' houses may also be difficult to recognise and of rather slight construction but their formality is a clear difference from the bricolage that characterises the domestic architecture seen in most areas and times through this period. The contrast between domestic structures and monuments should not be overstated, however; though the outcomes were very different, the 'quick architecture' that characterised building practice at some monuments, whereby mounds emerged from the intermingling of different building materials in complex and rather precarious ways (McFadyen 2007), seems to chime with the approach to dwelling structures seen at many settlement sites. The fact that structures are sometimes preserved fortuitously suggests they were originally far more common, though we might also suspect, from various precedents, that several of those currently dated to the Neolithic or Early Bronze Age will turn out to be later features dated by residual material. Many research questions therefore remain.

Appendix: Published Mesolithic to Early Bronze Age structures that we have rejected

- Bowman's Farm, Hampshire (Mesolithic): reinterpreted as Iron Age.
- Kemp Howe, East Yorkshire (Neolithic): a pit not a dwelling.
- Little Paxton, Cambridgeshire (Middle Neolithic): clearly a tree-throw.
- Durrington Southern Circle; the Sanctuary, etc (Late Neolithic): now seen as free-standing timber circles.
- Waulud's Bank, Bedfordshire (Late Neolithic): probably a tree-throw.

Chapter 9. Depositional Practice

Jonathan Last

Theoretical approaches

The material culture (artefacts and 'ecofacts') that forms the basis of our interpretations is a partial sample not only of what a society made and used – mediated through social practices of discard and deposition – but also of what was originally discarded and deposited, altered by a range of post-depositional factors including organic decay, the actions of soil fauna and truncation through cultivation. Together these constitute the formation processes for any given site or assemblage. Understanding how we get from the 'archaeological record' – a loaded term in itself, as John Barrett (1995, 32–3) has explained – to a narrative of prehistory that can be promulgated to visitors through text and images is crucial, because any honest interpretation for the public has to explain the nature of archaeological inference: this is an issue of ethics, in relation to both the people of the present, to whom we speak, and those of the past, on whose behalf we speak.

It was the New Archaeology of the 1960s and 1970s that first problematised the issue of site formation processes in an explicitly theoretical way; previously material remains had been generally accepted as a direct reflection of social conditions. For Michael Schiffer (1995) and other 'behavioural archaeologists', formation processes, whether cultural (C-transforms) or natural (N-transforms), were biasing factors that had to be overcome in order to reconstruct past behavioural systems. A major flaw with this approach is that discard and deposition were integral expressions of those past 'systems' (cultures/societies), not biases that somehow masked an underlying reality; they were culturally specific rather than expressions of some kind of universal law. Understanding the significance and symbolism of discard practice therefore became an explicit concern of post-processual theory in the 1980s, with its symbolic and contextual approach. Recognising the general lack of interest among social anthropologists in material culture and discard, both behavioural and post-processual archaeology developed ethnoarchaeological programmes to investigate on the one hand how the archaeological record was generated and whether activity areas could be recognised as such (eg Kent 1984), and on the other how material culture patterning could be interpreted in social and symbolic terms (eg Moore 1986).

Each has had an influence on British prehistory, though the activity-area approach has been utilised primarily in the study of later prehistoric settlements where houses can be clearly identified: Ann Woodward (2002) has shown how functional interpretations of material culture patterning at Bronze Age and Iron Age sites like Winnall Down and Black Patch were stimulated by David Clarke's ambitious but flawed model of the Glastonbury Iron Age settlement. For the Stonehenge landscape, which has few excavated prehistoric settlements but a plethora of ceremonial monuments with material deposited in ditches, pits and postholes, the post-processual approach has been more influential: the landmark study for this area was Colin Richards' and Julian Thomas's (1984b) structuralist analysis of patterning at Durrington Walls, which identified spatial oppositions between categories of material, mutually exclusive deposition of some artefact types, and differences in finds densities between different parts of the monument. Some aspects of this work have since been criticised, however (Serjeantson 2011a).

Richards and Thomas's work led to a series of studies investigating 'formal' or 'structured deposition' at other monuments (eg Pollard 1995b) and in other periods (eg Hill 1995; Parker Pearson 1996), often producing complex spatial readings of prehistoric sites. It seems indisputable that in the Neolithic and Bronze Age, material was frequently put in the ground deliberately, and that the meanings of particular substances and categories were consciously evoked. Acts of deposition would have served to reinforce in people's minds the differing significance of areas of monumental and settlement space, while object categories could have been manipulated to metaphorically support or naturalise aspects of the social world. While extremely stimulating – evoking possible world views and patterns of movement – the analysis of structured deposition is not without problems, however. One concerns the issue that in the absence of original land surfaces or house floors at nearly all prehistoric sites, spatial patterns have to be inferred from objects in the fills of cut features with variable formation processes (eg ditches may contain a mixture of placed, dumped and eroded material, while material from postholes need not be directly related to the use of the original timber structure); in other words, material that is technically out of context is implicitly assumed to be close to its original place of use or consumption. In making sense of discard processes there are lessons from the behaviouralist approach, eg the work by Hayden and Cannon (1984) in highland Maya villages, as well as Schiffer's (1976) original categorisation of refuse as 'primary', 'secondary' or 'de facto'. Secondly, there are ambiguities in the concept of 'structured deposition', which began to become synonymous with 'placed deposits' of selected objects, in opposition to generalised rubbish resulting from 'ordinary' domestic activity, effectively ignoring one of the main lessons from post-processual archaeology about the symbolic potency of refuse in general. Thirdly, there is Barrett's (1997, 123) objection to large-scale symbolic schemes, which "need have little to do with how those who once reworked some small segment of that material universe saw it for themselves"; overly-neat symbolic interpretations necessarily overlook a lot of variability.

More recent studies have begun to get to grips with some of these issues. Two approaches are worth further comment. One is a more detailed interest in the contents of Neolithic pits and tree-throws away from monuments. First addressed by Julian Thomas (1991) and taken forward by Josh Pollard (2001) and Duncan Garrow (2007), this work has identified changes over time in the nature of deposition. In particular, while earlier Neolithic pits usually appear to contain redeposited 'midden' material, later Neolithic (Grooved Ware) features more often contain objects which have been selected and sometimes carefully placed or arranged. The idea that Early Neolithic material was stored or curated in middens (presumably of the type sometimes found beneath long barrows, as at Ascott-under-Wychwood, or preserved in hollows, as at Eton Rowing Lake) which were then drawn upon occasionally for pit deposits suggests rather different motivations from the Late Neolithic 'structured deposits'. The earlier features could be seen as marking out particular places in the landscape, perhaps points of periodic return, or rites to ensure the fertility of the earth. Meanwhile the later pits hint at more detailed cosmologies related to the categorisation of things and people. Differences should not be overly stressed of course, since placed deposits are found in the earlier Neolithic, especially in causewayed enclosure ditches, and many later Neolithic features still look like generalised refuse. Formal treatment of animal remains throughout the period seems to be focussed on cattle (Schulting 2008), in contrast to later prehistory. Cattle (not including aurochs) represent 57% of 'placed deposits' in the Early/Middle Neolithic and 42% in the Late Neolithic/Early Bronze Age (Serjeantson 2011a, table 5.2).

Archaeologists love to categorise, but the difficulty of clearly separating degrees of intentionality or symbolism in pit deposits and the like suggests a more productive approach might be to consider the significance of differences in the condition of an assemblage. Pottery is particularly useful in this respect as the post-breakage history of sherds is recorded in their size, wear, colour and distribution. Evans *et al* (2009, 163–4) have charted the changing nature of ceramic assemblages in ostensibly very similar Grooved Ware, Beaker and Collared Urn pits at Fengate in terms of the temporality of occupation and depositional practices. The idea that material may not have been dumped into a pit immediately after it was broken focusses attention on what happened to it in the intervening period, a challenge taken up by Chapman and Gaydarska (2007) in their theories of 'fragmentation' (deliberate breakage of objects) and 'enchainment' (re-use of the fragments 'after the break' as objects of significance in their own right, circulated to create and maintain social relationships). Though the fragment enchainment model has primarily been applied to Balkan prehistory, it chimes with the work by Garrow *et al* (2005) at Kilverstone, Norfolk, where refitting potsherds and lithics may have been deliberately selected for deposition at different times, some of them modified by post-breakage burning, which hints at lengthy histories between their breakage and final deposition.

Ploughsoil assemblages, principally lithic scatters, may provide a way of getting at the distribution of material that was never deposited in cut features. Frances Healy (1987) suggested that at Spong Hill in Norfolk the different distributions of Early and Late Neolithic flintwork could be explained by different discard strategies - with deposition primarily in pits in the earlier period and on the surface in the later period. There is potentially great value in investigating the structure of flint scatters through fieldwalking and test-pitting, firstly because it provides some corrective to landscape interpretations based on monuments: for example, at Stonehenge Chan (2009) has pointed out that the occupation remains marked by surface lithic scatters clearly cross-cut the different symbolic 'domains' (of the ancestors and of the living) suggested by Parker Pearson and Ramilisonina (1998). Secondly, there is a lot of variability that we do not as yet understand: for example, of two Late Neolithic scatters investigated during the Stonehenge Environs Project one revealed several pits and stakeholes, the other almost no features (Richards 1990). Most would agree that while interpretation of ploughsoil lithic data remains troublesome it is nonetheless significant, and more work to understand the composition and chronology of scatters is required, especially around Stonehenge where the density of material is generally very high.

Examples from the Stonehenge landscape

In the Stonehenge landscape, the Coneybury Anomaly provides the best and oldest example of a Neolithic pit deposit (Richards 1990). It contained a mixture of charcoal, pottery, flint and animal bone but had some unusual features too. Whereas some of the pottery showed old breakage or wear, suggesting it derived from a midden, the rich faunal assemblage, including at least seven roe deer (see **Chapter 5 – Animal Resources**), looks more like a single feasting episode, while the presence of a whole (uneaten) trout must have carried a more specific meaning. At Robin Hood's Ball causewayed enclosure, which probably post-dates the Coneybury pit, limited excavation of the ditches in the 1960s "yielded a very great deal of broken pottery and domestic rubbish", including animal bones, many more from the inner ditch than the outer (Whittle *et al* 2011, 194). Only further excavation can tell us whether the assemblages have interpretative potential to match those from Windmill Hill (Whittle *et al* 1999). Among Early Neolithic monuments, intensive deposition in causewayed enclosure ditches and tomb forecourts suggests a concern with the symbolic marking of physically permeable boundaries.

In the Late Neolithic, deposition at Stonehenge itself is often characterised as sparse in relation to the rich deposits from Durrington Walls and Woodhenge, but deposits of animal bone from the enclosure ditch can be interpreted in similar terms (Pollard 1995b, 154). An additional aspect is that two cattle jaws from the ditch were considerably older than antlers from the same deposits, indicating that they had been curated before burial (Serjeantson 2011a). The 'Chalk Plaque Pit' on King Barrow Ridge, which dates to the early 3rd millennium BC, included two incised chalk plaques (Fig 9.1) along with Grooved Ware sherds, an antler pick and animal bones (Harding 1988); as with Garrow's East Anglian examples, there appears to be greater formality in the selection of material than in the earlier Neolithic. Many other Grooved Ware pits are known around Stonehenge (Darvill 2005, 56–8).

Fig 9.1 Decorated chalk plaques from the 'plaque pit'. © Salisbury and South Wiltshire Museum

Beaker pits have also been found, at Shrewton and Amesbury (Darvill 2005, 56, 59), though they are fewer in number than those of the earlier period, or contemporary graves. Early Bronze Age pits are scarce, and nationally, pit digging seems to have declined after this period, except in conjunction with roundhouse settlements; Jon Cotton (2009) has suggested that in the Thames valley pit-digging may have been rendered obsolete by the inception of field systems in the earlier 2nd millennium. Instead, later Bronze Age deposition is characterised by the floruit of metalwork hoards, though this kind of deposit starts in the Early Bronze Age when daggers began to be placed in rivers rather than graves.

Chapter 10. Design, Clothing and Personal Adornment

Alison Sheridan, with a contribution by Gill Campbell

1. What do we know about changing art, decoration and styles in pottery, jewellery and other objects?

The prehistoric inhabitants of the Stonehenge area had no concept of 'art' as we understand the term today, although the design and use of their material culture tell us a great deal about their identity, beliefs, preoccupations and external contacts.

The objects used by the earliest farming communities (ie the Phase 1 inhabitants) reflect their Continental background and are consistent with the idea that the process of Neolithisation had involved the arrival of small groups of colonists from northern France during the opening centuries of the 4th millennium, with some coming from the Nord-Pas de Calais region and spreading westwards, bringing the Carinated Bowl ceramic tradition (Fig 10.1, left), and others coming probably from Normandy, and bringing the kind of pottery seen in the Coneybury Anomaly pit (Fig 10.1, right) (see Sheridan 2010a and 2011a for further discussion; see also **Chapter 11 – Technology and Domestic Objects**).

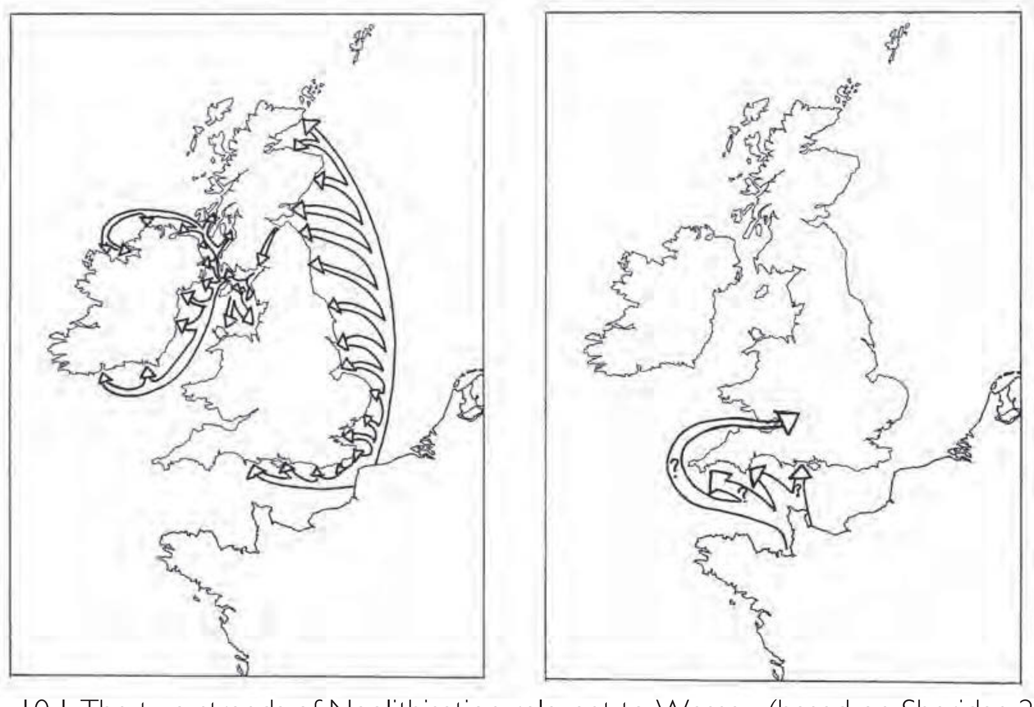


Fig 10.1 The two strands of Neolithisation relevant to Wessex (based on Sheridan 2010a; modified by the author, 2012)

Further evidence indicating a Continental (and specifically north French) background for these earliest farmers comes in the form of exquisite axeheads made of rock from the north Italian Alps a thousand kilometres away – namely jadeitite, eclogite and omphacite (Fig 10.2, see Sheridan *et al* 2010 and Sheridan 2011b for further details). These objects, which had circulated around western Europe, were probably centuries old when they were brought over from northern France, as precious and sacred treasures of an individual or of

the community. They were deposited in significant
locations in the landscape, especially wetland locations, such as beside the Sweet Track in the Somerset Levels (dendro-dated to 3807–3806 BC); this suggests that they were being ceremonially returned to an 'Otherworld' of gods and ancestors whence they were believed to had come. Such beliefs and practices are exactly echoed across the Channel.

Fig 10.2 Axehead of Alpine rock from the Sweet Track, Somerset. Collection: Museum of Archaeology and Anthropology, Cambridge. © National Museums Scotland

The subsequent development of Early and Middle Neolithic (Phase 1) society can be mapped out through the material culture as a process of regional diversification, with evidence for inter-regional contacts. The styles of pottery used at the causewayed enclosures at Windmill Hill (from the 38th century BC) and Maiden Castle (from the 36th century BC: see Whittle *et al* 2011 on dating) reflect this regionalisation and inter-regional contact, with fine bowls made of gabbroic pottery being brought from Cornwall, probably along with stone axeheads of Cornish rock. Features of the 'South-Western' or 'Hembury' style of pottery seen at both sites hint that contacts with Normandy may have continued, or been renewed. The subsequent emergence of coarser, more heavily decorated Middle Neolithic styles of pottery – 'Peterborough Ware' in use from around 3350 BC – shows us that the inhabitants of Wessex continued to share design ideas with neighbouring regions (cf Hey *et al* 2011, chapters 12 and 14. See also **Chapter 11 – Technology and Domestic Objects**). Other material culture in use during the Early and Middle Neolithic in Wessex includes leaf-shaped and tranchet flint arrowheads, the former definitely used to kill people as well as in hunting; flint and stone axeheads from a variety of sources; carved chalk objects including phalli, and deliberately-collected odd-shaped flint nodules. Jewellery and dress accessories – some of which were used to signal prestige and power – are dealt with below. A further type of Middle Neolithic prestige object that was in use a little to the east of Wessex around 3300–3100 BC is the crown antler macehead (Simpson 1996; Loveday *et al* 2007; Loveday and Barclay 2010).

Developments during Phase 2 reflect long-distance movements of ideas and objects, echoing the structural evidence from Stonehenge and Durrington Walls. Late Neolithic Grooved Ware pottery had originated in Orkney and its earliest examples in Wessex reflect Orcadian designs closely (see also **Chapter 8 – Houses and Settlement** and **Chapter 11 – Technology and Domestic Objects**); the spiral seen on some pots derives ultimately from the passage tomb cemeteries of the Boyne Valley, its transmission arguably being due to links (direct or otherwise) between Orkney and Wessex. Other evidence for such links, between *c* 3000 and 2600 BC, include the use of 'cushion', ovoid and pestleshaped maceheads, an Orkney-style 'bulbed' bone pin at Windmill Hill and a piece of stone bearing a pecked 'cup and ring' design found at the Knowlton South Circle (Lawson 2007, fig 4.29). Whether the incised plaques (See **Chapter 9 – Depositional Practice**, Fig 9.1) from Butterfield Down and Coneybury Ridge relate to the stylised anthropomorphic figurines found in Late Neolithic Orkney is debatable, but they remind us that here, as in Orkney and elsewhere, Grooved Ware designs were applied to various media. Highly-skilled, specialist flint-knapping is also a feature of Late Neolithic Britain, as exemplified by the recently-discovered, spectacular, long-tailed oblique arrowheads from Marden (Fig 10.3; Bishop *et al* 2011).

Fig 10.3 Marden long-tailed oblique arrowheads; detached 'tail' on right. Photograph © English Heritage

The Chalcolithic Phase 2 developments in material culture reflect the arrival of Continental novelties, brought by a small number of immigrants. These include a new style of pottery – the Beaker tradition – along with the first metal objects (of copper and gold), new styles and elements of archery paraphernalia, and novel jewellery and dress accessories, as discussed below. Although the funerary arena had already been used to highlight aspects of social differentiation earlier in Phase 2 and in Phase 1, we now see an explicit expression of a Continental tradition of single interment, in which the hunting/fighting prowess of high-ranking males is portrayed through an archery-and-knife ('dagger') kit.

Phase 3 – and especially the first half of the second millennium – sees the high point in the use of funerary practices to underline and define social status. For the first time, female high status is portrayed. The proliferation and elaboration of jewellery and dress accessories is detailed below. There is evidence for a flourishing and trend-setting centre of specialist production in Wessex, using precious, rare and arguably amuletic materials including imported Baltic amber, jet, tin and gold, which both drew upon and 'trumped' pre-existing fashions elsewhere in Britain, and incorporated Continental novelties such as the practice of making faience. A 'cousinly' relationship with the elite of Brittany can be traced in the parallel development of prestige items, with some items (including a now-lost silver bead from Wessex, and a jet spacer plate reused as an ornamental wristguard found in Brittany) representing actual imports/exports. The symbols of power were not just restricted to jewellery and dress accessories, but include battle axes and maces. The famous Bush barrow grave included fittings from the haft of a mace (Needham *et al* 2010), while a deposit in a huge barrow at Clandon included a macehead made from Whitby jet, Kimmeridge shale and gold (Fig 10.4; Needham and Woodward 2008). Other prestige items include small cups made in a variety of precious materials – amber, Kimmeridge shale, gold. These have been the subject of a detailed study (Needham *et al* 2006) which has refined our understanding of the dynamics, and varying identity, of Early Bronze Age society in different parts of Wessex; and introduced the valuable concept of the *maritory* to define an interaction sphere operating across and along the coast. Ceramically, Beakers continued to be produced (in insular styles) until around or just after 2000 BC (Needham 2005). Food Vessels were in use by that point; and cinerary urns had begun to be used by the turn of the millennium, with one urn in the Cornish 'Trevisker' style from Solstice Park, Amesbury, reminding us of the close links that existed between Wessex and the south-west peninsula at the time, relating to the movement of tin. Small, perforated pots found with cremated remains are likely to have contained burning embers for lighting the funerary pyre. A particularly fine series is known from Wessex, including examples whose design may echo the shape of the Stonehenge sarsens (Needham and Woodward 2008). As regards metal use, bronze had supplanted copper as the material of choice for axeheads, daggers and awls.

Fig 10.4 Clandon macehead. Collection: Dorset County Museum, Dorchester. © National Museums Scotland

2. Do we have any evidence for adornment, tattoos or other forms of body decoration for any of our periods?

Because no skin has survived on the Neolithic, Chalcolithic and Early Bronze Age human remains found in Wessex (or indeed anywhere else in Britain and Ireland), we simply cannot say whether tattoos were used, even though we do know, from the famous Ötztal Ice Man's body (from the Italian Alps) that the practice was carried out elsewhere in late fourth millennium BC Europe (ie contemporary with our Phase 1). Similarly, we do not know whether any cosmetics or perfumes had been used, although ochre and haematite could have been obtained and used to colour parts of the body, and ochre has been found at The Sanctuary (Burl 1981, 152). In this context, it is also worth noting the recently-discovered red paint, probably haematite-derived, on masonry and pottery at the Late Neolithic site at Ness of Brodgar on Orkney; this forms part of a tradition of using haematite and ochre as colourants in Late Neolithic Orkney and their use as bodily adornment seems likely, to judge from the small size of some of the containers used in their preparation: http://www.orkneyjar.com/archaeology/nessofbrodgar/excavation-background-2/painted-walls/.

Likewise, no scalp hair has survived, to inform us on hair styles and treatments. However, we do have a wealth of jewellery and dress accessories, especially from Phase 3, which allows us to say a lot about how people adorned their body, and to suggest why they did so. Furthermore, the bronze razors that were being used during the later part of Phase 3 indicate that some body hair was being shaved, and additional proof comes from a remarkable find of what had initially been thought to be eyebrow hairs from an Early Bronze Age grave at Winterslow, but are now regarded as being from elsewhere on the face (Kavanagh 1991, 85–6), probably shaved off as an act of mourning.

For Phase 1, finds of jewellery and dress accessories are relatively rare (although we must bear in mind that there could have been organic versions that have not survived). Five large elliptical beads of Kimmeridge shale or similar material have been found in and around Wessex, at the causewayed enclosures at Windmill Hill and Maiden Castle, in two Severn-Cotswold megalithic tombs (at Notgrove and Eyford, Gloucestershire) and as a stray find on Brentry Hill, Gloucestershire; they are likely to date to between the 37th and 34th century BC (see Whittle *et al* (2011, 91–3) on the dating of Windmill Hill and Bayliss and Whittle (2007) on the dating of Cotswold-Severn chamber tombs). A further bead of this type is known from Eton Rowing Lake. Tubular bone beads, abandoned in the process of manufacture, were recovered from Windmill Hill (Smith 1965, fig 54, B16); and from the same site come bone pins of various lengths which could have been used to fasten garments and/or to pin hair.

Belt sliders, mostly of jet and imported from Whitby, are a feature of Middle Neolithic high status male graves, and one is known from Wiltshire, while several are known from the Thames Valley. Overall, 29 are known from Britain (Sheridan 2012).

Phase 2 Late Neolithic finds of jewellery and dress accessories are similarly sparse in Wessex, unlike in Orkney, where beads, pendants and pins are abundant. The burnt 'skewer pins' found with cremated bones at Stonehenge, Dorchester-on-Thames and several other sites in Britain are likely to have been fasteners for funerary garments worn on the pyre, while the Orkney-style bulbed bone pin from Windmill Hill has already been mentioned. To the east of Wessex, in the Thames Valley, a cannel coal bead is known from a Grooved Ware pit at Yarnton. The impression given by the evidence is that jewellery and dress accessories were not the main way to display identity and status at this time; these were instead communicated through the monuments and ceremonies, and through the use of maces as symbols of power.

This contrasts with the Chalcolithic part of Phase 2, where male status and identity was explicitly signalled through these artefacts, as the Amesbury Archer grave exemplifies (see **Chapter 6 – People**; Fitzpatrick 2011). Continental-style artefacts (and insular variants thereof) were used, with an emphasis on fancy archery gear and jewellery to adorn the head and neck, along with dagger-like knives of copper and flint. The archery gear includes belt rings (with the Amesbury Archer example being of Kimmeridge shale, and others of bone), arrows with fine barbed-and-tanged arrowheads, and fine stone wristguards which, as Fokkens *et al* (2008) have recently pointed out, are more likely to have been ornamental mounts than functioning bracers (see also Woodward *et al* 2011). The sheet gold basket-shaped hair ornaments found with the Amesbury Archer and in the adjacent grave (Fig 10.5a) represent an insular variant on a Continental style of jewellery. Other Chalcolithic gold jewellery found in Wessex (and more generally in Britain) comprises the so-called 'sun discs', which had probably covered functioning or ornamental buttons (Fig

Fig 10.5 a) Hair ornaments from the grave of the Amesbury Archer. © Wessex Archaeology b) Gold 'sun disc' from Mere, Wiltshire © Wiltshire Museum, Devizes

10.5b), and a tubular sheet gold bead, forming part of a composite necklace along with tiny Kimmeridge shale disc beads, found at Chilbolton, Hampshire (Russel 1990; see also a similar necklace with tubular sheet copper beads from Devil's Dyke, Sussex (Clarke 1970, fig 167)). A copper neck ring from Yarnton is likely to be of Chalcolithic date, as are a set of copper rings found in a child's grave at Radley, Oxfordshire. Research by Needham (2012a) and Woodward and others (Woodward *et al* forthcoming) has clarified the Continental origins of many of these objects, and also of the pins that are found in a few Chalcolithic graves (Fig 10.9).

The phenomenon of indicating power and status through jewellery and dress accessories reached its apogee in Phase 3, and particularly from the 20th century BC onwards, with the famous rich 'Wessex' series of graves (Fig 10.6). Our understanding of this phenomenon is being enhanced by Woodward *et al*'s current research into the materials used, manufacturing methods, and use-wear traces of these famous artefacts; and by Stuart Needham's exploration of the ideological background to their use (eg Needham *et al* 2010; Needham forthcoming). The key characteristics have already been alluded to above; essentially, at its beginning, we are seeing a process of competitive conspicuous consumption in the funerary arena, in which bigger and better versions of traditional artefact types were used alongside novel objects and materials, in gender-differentiated assemblages. For example, the V-perforated buttons of jet and similar materials that had been popular from the 22nd century BC were now made from amber, or from Kimmeridge shale coated with sheet gold and made so large that they could not have functioned as normal fasteners (Shepherd 2009).

Fig 10.6 Assemblage from Upton Lovell G2e barrow, Wiltshire. Collection: Wiltshire Heritage Museum, Devizes. © National Museums Scotland

Similarly, the jet spacer plate necklaces that had been popular in northern and eastern Britain during the 22nd and 21st centuries BC (Sheridan and Davis 2002), themselves copying gold lunulae, were 'trumped' by versions made from large amounts of amber imported from Denmark. Old and worn elements from such necklaces travelled as far as Orkney and Mycenae. The choice of materials was significant: not only were they mostly rare and precious, but they may well have been believed to have magical powers (eg to protect their owner); jet and amber are both stones that float, can be burnt, and are electrostatic, for instance. Faience – a glass-like substance, the know-how for whose manufacture was adopted from central Europe around the 20th century BC (Sheridan and Shortland 2004) – involved a magical transformation of raw materials, and its amuletic efficacy was enhanced by the addition of tin. Natural geological freaks that would probably have been associated with an 'Otherworld' such as fossil crinoids and a stalactite were also used, as were ancient, 'heirloom' objects, believed to be imbued with ancestral powers. All these materials could have been used as amulets – a form of '"supernatural power dressing" (Sheridan and Shortland 2003) – and probably also had symbolic significance: amber and gold could have referenced and symbolised the sun. In other words, members of the elite seem to have been sent on their journey into the afterlife to communicate with the gods and ancestors and to safeguard the well-being of the living, adorned with auspicious and magical symbols of power.

The jewellery is dominated by various forms of necklace – primarily a female accoutrement – with several kinds in contemporary use, and exhibiting change over time. Pendant forms include gold-bound amber discs, a miniature halberd and a miniature double-headed axehead. Composite necklaces had existed from as early as Phase 2, but from around the 18th century BC, examples featuring several materials and various bead and pendant shapes became popular. In a similar manner to charm bracelets today, components were probably handed down through the generations and exchanged between individuals; the combination of diverse elements may have strengthened their amuletic properties (Fig 10.7). Other jewellery included studs, probably for earlobes, and labrets; the recent find of two pairs of studs of differing sizes at Whitehorse Hill, Devon, suggests their deployment as a 'parure' of matching ear plugs/studs and labrets. The function of some objects remains obscure, such as the 'tweezers' of bone (Fig 10.8), which might conceivably have been hair ornaments, and the rectangular sheet gold plaque found in what is assumed to be a female grave at Upton Lovell G2e (Fig 10.6). Male adornment was mainly in the form of dress accessories, which are covered below.

Fig 10.7 A composite necklace, mostly made in Wessex, found at Exloo, Netherlands. Collection: Drents Museum, Assen. © National Museums Scotland

Fig 10.8 'Tweezers' from Amesbury G11 barrow, Wiltshire. © Wiltshire Museum, Devizes

3. What kind of clothes did prehistoric people wear?

We know very little about the clothes worn by people during any of the three periods in question, since virtually no actual garments have been found in Britain. However, there are clues about the materials used to make the clothing – skins, hides, furs and textiles – and the various dress accessories and ornaments that have survived suggest the way some garments were fastened and decorated, which further helps build a picture those garments. To show just what we may be missing, this section ends with a brief consideration of the Continental evidence for clothing dating to between 4000 BC and 1500 BC.

Regarding the materials used for clothing, it is clear from the abundant tools used to scrape fat from hides (ie scrapers) and to pierce holes (ie awls, of bone and – from Phase 2 – metal), that animal skins would have been used. This is supported by occasional finds of fragments of hides, pelts and de-haired skins in funerary contexts, albeit mostly outside Wessex. One intriguing 18th century find from within Wessex, from an Early Bronze Age tree-trunk coffin under King barrow, Stoborough, Dorset, featured the remains of a body wrapped around several times in sewn skins of various thicknesses, reportedly including deerskin (Hutchins 1767). It is particularly unfortunate that the finds from this coffin no longer survive. While in this case, as in some other Early Bronze Age tree-trunk coffins (eg Gristhorpe, North Yorkshire: Melton *et al* 2010) and stone cists (Watkins 1982), the animal skins/hides had been used like shrouds to wrap or cover the body or, in some cases, to line the bottom of the grave, there is no reason to doubt that these materials had also been used for clothing. This is confirmed by the recent find of a fragment of what had probably been a piece of clothing for the upper body, in a waterlogged Early Bronze Age cist at Whitehorse Hill on Dartmoor (Jones *et al* 2012). This garment – which had been kept away from the funeral pyre, then deposited after the cremated remains of the corpse had been gathered together – was made from animal skin that had been de-haired and carefully worked to make it supple, and it featured an inset panel of woven plant fibre, edged around by triangular appliqués made from the skin. Work continues on identifying the species used in its manufacture.

The other direct evidence for the use of skins for clothing comes from a tree-trunk coffin at Loose Howe, North Yorkshire, where the fragment of a shoe with two lace-holes, along with what was described as a fragment of leg-wrapping, was found (Henshall 1950, 131; Elgee and Elgee 1949, 90). It may be that fur pelts were also used for clothing. There is evidence for their use during the Early Bronze Age to wrap or cover human remains (as at Dysgwylfa Fawr, Ceredigion (Green 1987); a pelt was also used to wrap the Whitehorse Hill cremated remains), and at Tillicoultry, Clackmannanshire, fragments of a probable stoat pelt were found under the skull in an Early Bronze Age cist, as if to cover a 'pillow' of quartz pebbles (Ryder 1964, 176 and see Sheridan *et al* in press for further examples). As for the use of animal fibres, an enigmatic object found at Sheshader on the Isle of Lewis, which may have been some kind of garment, had been made from matted cattle hair, with attached cords of twisted wool and plaited horse hair (Sheridan 1996). This has been radiocarbon-dated to 2860±85 BP (OxA- 3536, 1300–830 cal BC at 95.4% probability) and so falls outside the chronological scope of this chapter, but it reminds us that parts of animals other than their hides and sinews were probably used for clothing.

A few fragments of textiles have been found in Wessex and elsewhere in Britain, almost all from funerary contexts (see also **Chapter 11 – Technology and Domestic Objects**). The earliest surviving textile in Britain is from a non-funerary, Beaker-associated context at Etton

Woodgate, Cambridgeshire, and consists of a fragment of sprang textile made from plant fibres (Pryor *et al* 1985, plate XL). The use of linen is attested from the Early/Middle Neolithic (at the Etton causewayed enclosure, Cambridgeshire, as a piece of cord: Pryor *et al* 1985, plate XL; Taylor 1998, 157; Whittle *et al* 2011, 322-5) and from the Early Bronze Age in funerary contexts. Linen thread found in the Loose Howe tree-trunk coffin was interpreted as evidence for linen fabric used to wrap the body, shroud-like (Elgee and Elgee 1949), while fragments of woven linen cloth found at Manton, Wiltshire were interpreted in a similar manner (Cunnington 1907, 13). Fragments of linen cloth have also been found at Durrington G11 barrow, Wiltshire (Annable and Simpson 1964, 65, no. 539), where they (and possibly woollen cloth) were associated with a Collared Urn. Here, the fabric may have been used as a bag for the cremated remains, and/or as a textile cover for the urn.

There is no pre-Early Bronze Age (Phase 3) evidence for the use of wool in Britain (see also **Chapter 11 – Technology and Domestic Objects**). The Early Bronze Age evidence includes the material found in a tree-trunk coffin at Rylstone, North Yorkshire, where Canon Greenwell reported that the body had been wrapped in woollen cloth from head to toe (Greenwell 1877, 375–7 and fig 2; the identification as wool requires confirmation).

Many of the fragments or impressions of fabrics have not been identified (or are not currently identifiable) to species; this is the case for the more finely-woven of the two textiles found at Manton, and for the finds from Shrewton barrow 5k (Crowfoot 1984), Ridgeway, Bush barrow and Lambourne. Plain weaves are involved, and at Shrewton, loosely S-plied thread had been used, with a thread count of 10 x 11 and 9 x 9 per cm (Crowfoot 1984; Henshall 1950).

It is clear that not all textile finds are from clothing; in addition to the aforementioned evidence suggesting the use of linen and woollen cloth for shroud-like funerary body wraps, and for urn bags and/or covers, there is evidence from Shrewton 5k that the fabric had been laid over, or wrapped around, a small dagger (more likely a knife; Crowfoot 1984). At Manton, however, it may be that the finely-woven fabric had belonged to the clothing of the elderly female buried in the grave, while the more coarsely-woven linen fabric had been a shroud-like covering (see **Chapter 11 – Technology and Domestic Objects**).

The pins, buttons and other dress accessories that have been found in contexts dating to Phases 1–3 offer some clues about the types of garment in use, and about the means of fastening clothes. Pins are known from all three Phases, in bone (if not also antler) for the Neolithic, and in bone and metal for the Chalcolithic and Early Bronze Age, including some forms that are clearly Continental in inspiration if not origin (Fig 10.9a). Buttons appeared as a Beaker-associated novelty and apparently enjoyed a currency of several centuries (especially during Phase 3), being used by both sexes, while toggles were also used from the Early Bronze Age (Fig 10.9b). The earliest dated button is a through-perforated example in bone, found in a Beaker-associated cist at Cookston, Angus and dated to 3800±50 BP (BM-2523, 2460–2050 cal BC at 95.4% probability: Kinnes *et al* 1991), while others are V-perforated (Shepherd 2009). Most are of jet and jet-like materials, while some are of amber, a few of bone or stone, and even fewer, possibly, of wood (ibid). Several Phase 3 finds in Early Bronze Age cists from central and northern Britain, featuring sets of (usually six) V-perforated buttons, suggest their use to fasten a jacket, and where the sex has been determined, this has been male (as, for example, at Rameldry Farm, Fife: Baker *et al* 2003). The late Ian Shepherd discussed the various uses of V-perforated 'buttons' and pointed out that the largest examples may well have been for fastening a cloak-like outer garment (again, for men), while some may have been used to fasten pouches (eg containing fire-making equipment) and leggings (Shepherd 2009); when used in these ways as fasteners, he argued that they had probably not articulated with button-holes, but instead with loops, and had thus been used like the toggles on a modern duffle coat. Some V-perforated 'buttons', however, had probably been used as ornamental studs, sewn onto a garment. This is likely to have been the case with the sets featuring large numbers of 'buttons', as at Street House, Cleveland (ibid, Cat No 106). Others, in northern Britain, had clearly been used as beads or as fasteners in necklaces. The small prismatic V-perforated amber 'buttons' and hook-shaped objects found at the Knowes of Trotty in Orkney may well have been ornaments sewn onto the lower edge of a special cape (Sheridan *et al* 2003 and see below); similar objects have been found at Winterslow, Wiltshire (Beck and Shennan 1991, fig 11.20.1). As noted above, quite how the oversized, gold-covered V-perforated ornaments found in the richest Phase 3 graves in Wessex (eg Fig 10.6) had been deployed is uncertain, although they are likely to have adorned very special garments, as discussed further below.

Toggles of bone and antler (Piggott 1958) are also likely to have been used to fasten clothing. Most, if not all, have been found in funerary contexts, with arguably the earliest example coming from a Beaker-associated grave containing an unburnt body at Sewell, Bedfordshire (Kinnes 1985, no. 9.4). Most date from Phase 3 and are associated with cremated bone. These toggles found in funerary contexts may well have served a special funerary use: most are calcined, implying that – like many bone and antler pins – they may have fastened a shroud-like wrapping for the corpse on the pyre. Even the Sewell toggle may have been used to fasten an outer, shroud-like garment, as the additional presence of a Continental-style metal pin in the grave implies that a second garment had been present. A further use for a bone toggle is suggested by the unburnt bone toggle, thought to have been found with cremated bones at Bishop's Cannings G11 or 12 (Fig 10.9b): this could have been used to secure a bag containing the bones.

Fig 10.9 a) Continental style pin. Collection: Wiltshire Heritage Museum, Devizes. © National Museums Scotland b) Bone toggle from Bishops Cannings G11 or 12, Wiltshire. © Wiltshire Museum, Devizes

The use of belted garments, during all three periods of interest, is implied by the presence of belt accessories – Middle Neolithic sliders (Fig 10.10a; Sheridan 2012), Chalcolithic and Early Bronze Age belt rings (eg Fig 10.10b) and Early Bronze Age belt hooks (Fig 10.11; Sheridan 2007). Virtually all have been found in relatively well-equipped or otherwise exceptional graves, and many are of rare or unusual materials: jet and jet-like materials, sperm whale tooth or walrus ivory (at Brackmont Farm, Fife: Waterston 1941) and, at Bush barrow, sheet gold covering an organic base (Fig 10.11). Where the associated human remains have been sexed, they have been male. This implies that fancy belts were one way of displaying the special status of certain men. As for the manner in which the belt accessories were deployed, there is some uncertainty regarding the Middle Neolithic 'sliders', since the use-wear traces tend not to support the idea that they had slid along, retaining the loose end of a belt, although if they had had one end attached to a belt, this would have reduced their visual impact (Sheridan 2012, 193–4). Their association with belts is not, however, in question. As for the various forms of Chalcolithic and Early Bronze Age belt ring, the arrangement suggested by David L. Clarke (1970, fig 144) seems plausible, although one cannot rule out the possibility that some bone rings may alternatively have been attachments for quiver straps (eg at Culduthel, Highland: D V Clarke *et al* 1985, fig 4.16). As for the garments that would have required the use of a belt, one assumes that these had been tunic, shirt, shift or smock-like garments, extending below the waist. The use of a belt would have been important for keeping the garment out of the way when the wearer was using a bow – as can be seen in the reconstruction illustration of the 'Amesbury Archer', with his Kimmeridge shale belt ring (Fitzpatrick 2003 Fig 10.12a; Sheridan and Davis 2011). The possibility that some Phase 2 and/or 3 belts had had pouches attached to them, perhaps containing fire-making equipment, has been suggested plausibly by Ian Shepherd (Shepherd 2009).

Fig 10.10 a) Belt sliders from Skye and Beacharra, Scotland. Collections: National Museum Scotland and Public Library & Museum, Campbelltown © National Museums Scotland b) shale belt ring from Wimborne St Giles G9. © Wiltshire Museum, Devizes

While there is no direct evidence for the use of headwear (other than jewellery), the central European affinities of some of the objects from the Migdale Hoard, Highland, suggest that the sheet bronze tubular beads, cones and spacer cover may have adorned some kind of cap (Fig 10.12b). This hoard has been radiocarbon-dated (from willow backing in one of the tubular beads) to 3655±75 BP (OxA, 4659, 2290–1770 cal BC at 95.4% probability; Sheridan 2002). Holes in the sheet bronze ornaments suggest that they had been sewn onto something, and since similar ornaments have been found in the head area of unburnt bodies in Straubing contexts in Bavaria, it is not impossible that they had

Fig 10.11 Gold pectoral lozenge and belt hook, Bush barrow. Collection: Wiltshire Heritage Museum, Devizes. © National Museums Scotland

been deployed in this way in Scotland; there are other indications of an awareness of central European fashions in the Migdale hoard.

Fig 10.12 a) Reconstruction of the Amesbury Archer by Jane Brayne: note the belted garment. From http://www.wessexarch.co.uk/projects/amesbury/archer.html © Wessex Archaeology

b) Reconstruction of the Migdale Hoard headgear © Victor Ambrus

In terms of the kinds of garment that will have been worn in Britain at various times between Phases 1 and 3, then, we have mentioned possible headwear, belted tunics (or similar garments), jackets, outer cloaks, leggings and shoes. There may well have been a gender difference in dress, with the evidence from V-perforated 'buttons' suggesting that women may not have worn five- or six-buttoned jackets, or outer cloaks fastened by large buttons (Shepherd 2009). There is also evidence suggesting status differentiation from at least as early as the Middle Neolithic. From Phase 3, however – and particularly during the first quarter of the second millennium – there is evidence for the inclusion of very special, very ostentatious garments in certain graves, particularly in Wessex but by no means restricted to that region (cf. Needham and Woodward 2008; Needham *et al* 2010). In most cases these evoke comparisons with contemporary regal attire, although in one grave – Upton Lovell G2a, Wiltshire – the finds have been interpreted as attachments for a shaman's robe. Here, Hoare records the discovery of 'over three dozen' perforated bone points and two dozen 'arrowheads' of bone; of these, 41 of the former and two of the latter survive (Annable and Simpson 1964, 49). If attached to a garment, these would have made a rattling noise as the wearer moved.

As for the other special garments, the most impressive by far is the sheet gold 'cape' found at Mold, Clwyd (Needham 2012b; Powell 1953) and convincingly attributed a Phase 3 date by Stuart Needham. The perforations along the lower edge of this object indicate that this had actually been the upper part of a robe, whose lower part had consisted of some organic material that had perished; when worn, this garment would have restricted the movement of the wearer's arms, and so its use only on ceremonial occasions is implied. Needham has argued persuasively that the size of the 'cape' is more appropriate to a female than to a man (as had been portrayed in Brian Hope-Taylor's famous reconstruction drawing, which also inaccurately showed the 'cape' as being more flexible than it is: Powell 1953), and this is consistent with the discovery of perhaps as many as 300 amber beads, which may well have come from a Wessex-style amber spacer plate necklace. If Needham's assessment is correct, then this constitutes the most striking example of a high-status female and marks the apogee of a process of marking female high status that had already begun during the 22nd century BC.

The other evidence for very special garments during Phase 3 includes the assemblage of amber and gold foil ornaments from the Knowes of Trotty, Orkney, which may have adorned a cape-like garment and which have been radiocarbon-dated to 3575±35 BP (GrA-34776, 2030–1770 cal BC at 95.4% probability: Sheridan *et al* 2003 Fig 10.13; Sheridan and Bradley 2007). The gold foil would have covered four low-domed (and probably V-perforated) objects made of organic material, and the V-perforated prismatic items and the hook-shaped objects of amber may well have been sewn along the bottom of the garment as an ornamental fringe. This garment, like the fragments of an old, worn, Wessex-style amber spacer plate necklace that were also found in the cist, had been kept apart from the body as it was cremated. While the cremated remains could not be sexed, it seems likely, from the necklace fragments, that they had been female.

Other ostentatious female garments may well be represented among the very rich Wessex grave assemblages as described above, although the absence of human remains makes it hard to determine which of the assemblages had been associated with females, and which with males. However, a convincing argument has been put forth for the Bush barrow and Clandon assemblages as having been associated with men (Needham *et al* 2010; Needham and Woodward 2008), and the rich assemblage from Little Cressingham, Norfolk, was reportedly associated with a senior adult man (D V Clarke *et al* 1985, 276). These all contain sheet-gold ornaments – lozenge-shaped in the case of the Bush barrow and Clandon items (Fig 10.11), and rectangular in the case of Little Cressingham – which may have been worn as pectoral ornaments, attached to a garment or strap. The original description of the discovery of the Bush barrow object stated that it had been found on the man's chest (Needham *et al* 2010). It may be that the rectangular sheet-gold object from Upton Lovell barrow G2e (Fig 10.6) had also been worn in a similar way. There are two recently-discovered skeuomorphs of the Wiltshire rectangular gold objects: one, in jet, found at Carlton Colville, Suffolk (Pitts 2007), and another, fragmentary, in amber, found during the Heathrow Terminal 5 excavations (Sheridan 2010b).

Fig 10.13 Reconstruction drawing (by Marion O'Neil) showing how the amber and gold foil ornaments from the Knowes of Trotty, Orkney may have been worn (from Sheridan *et al* 2003)

3.1 Comparative evidence for clothing from Continental Europe

Evidence for clothing is more abundant from mainland Europe, as illustrated for example in Gleba and Mannering's recent review (2012a), and this is useful in showing what materials and techniques were in use there at what times – and perhaps highlighting what we are missing in Britain, with our restricted dataset.

The earliest remains of actual clothing (not just fragments of textile) are those recovered from Neolithic lake-edge settlements in Switzerland and Germany, dating from *c* 4300 BC. The burial conditions at these sites are alkaline, so proteinaceous material such as animal skins and sinew are not preserved, with only textiles made from plant fibres being recovered. Both woven and twined textiles are present, with woven fabrics invariably made from linen, and twined textiles from tree bast, principally lime. No whole garments have been found but there are woven textile fragments that include pockets and buttonholes, along with evidence for striped decoration using different types of thread (Rast-Eicher 2012, 380; Médard 2012, 367; Möller-Wiering 2012, 126). As discussed in **Chapter 11 – Technology and Domestic Objects**, the earliest evidence for the use of woollen textile in Europe dates to the third millennium BC and is associated with Corded Ware contexts; its appearance is related to the spread in the breeding of woolly sheep (Bender Jørgensen 2003, 55; Gleba and Mannering 2012b, 6; Ryder 1983, 45-7; see **Chapter 5 - Animal Resources**; and also Möller-Wiering 2012, 126 on the use of wool combined with other hair or with plant fibres).

Arguably the most famous Continental clothing is that which was associated with Ötzi (the Iceman) found in the high Alps, and radiocarbon-dated to 3350–3100 cal BC (Spindler 1995, 81). His costume comprised a bearskin cap, goatskin and fur cape, goatskin and deer hide leggings, a goatskin loincloth, calf hide belt with pouch, bearskin and grass-cord shoes with deerskin 'galoshes' and a grass cloak (http://www.iceman.it [accessed July 2012]; Spindler 1995; Bazzanella 2012, 205; Groenman-van Waateringe 2001, 380-1; note that there is some debate as to whether the grass 'cloak' may instead have been a blanket or matting). However, this find, along with the hide leggings, cape and shoes recovered from a melting ice field in Schindejoch pass and dated to 2950–2500 cal BC (Grosjean *et al* 2007; Rast-Eicher 2012, 380), is unlikely to be typical of what was worn in Britain, even in winter, as these individuals were clearly dressed to survive in the freezing conditions of the High Alps.

Of much greater potential relevance to Britain are the Chalcolithic Beaker period (Phase 2) representations of male and female clothing on monumental stelae at the 'Petit-Chasseur' cemetery at Sion, Switzerland (Courboud and Curdy 2009). One in particular – stele 25 (Fig10.14; ibid, 68–71) – may shed light on what the 'Amesbury Archer' could have worn, since it appears to depict high-status male costume as worn by a Beaker warrior/archer during the second half of the third millennium BC. While the possible origin for the Amesbury Archer in Switzerland or a neighbouring region (Fitzpatrick 2011) may be the subject for debate, nevertheless this stele reminds us that high status Beaker clothing on the Continent may well have been elaborate and patterned, and so the earliest Beaker users in Britain may well have stood out sartorially, as well as in many other ways. The individual on stele 25 appears to be wearing a hooded and belted tunic plus a disc-bead necklace, with his bow and an arrow shown slung across his chest diagonally. The fabric represented in the tunic has a lozenge pattern above the belt and along its bottom, and a pattern featuring closely-set triangles below the belt; the belt has a different pattern featuring opposing semi-circles. Some of the Petit-Chasseur stelae (but not 25) also show representations of pouches suspended from belts by fabric loops.(Harrison and Heyd 2007, 154–6.) This is of interest given the evidence for pouches from Britain (see above).

That the material of the tunic depicted on stele 25 is likely to have been woven cloth, rather than decorated skin, is arguably suggested by the presence of the belt, which suggests suppleness to the fabric (Rast-Eichner pers comm; this is not to deny that some skin garments could have been supple, however). Additional support for this suggestion that the tunic had been of woven textile comes from the survival, in the lake settlement of Molina di Ledro, northern Italy, of a strip of woven fabric – probably a girdle-end – featuring a sophisticated design of nested lozenges that corresponds exactly to the design shown on the 'female' side of stele 20 from the Petit-Chasseur cemetery (Rast 1995; Courboud and Curdy 2009, 60, 63, 66–7; Bazzanella 2012, 206 and fig 8.3). This design will have been achieved "through a cross between two alternating weaves, tabby and twill. The experimental reconstruction of the decorative motifs indicates the use of a loom to weave this textile" (ibid).The Molina di Ledro fabric is from the Early Bronze Age levels (c 2300 – 1700 BC) and may be slightly later than the supposed date of the Petit-Chasseur, but it clearly demonstrates a continuity of design.

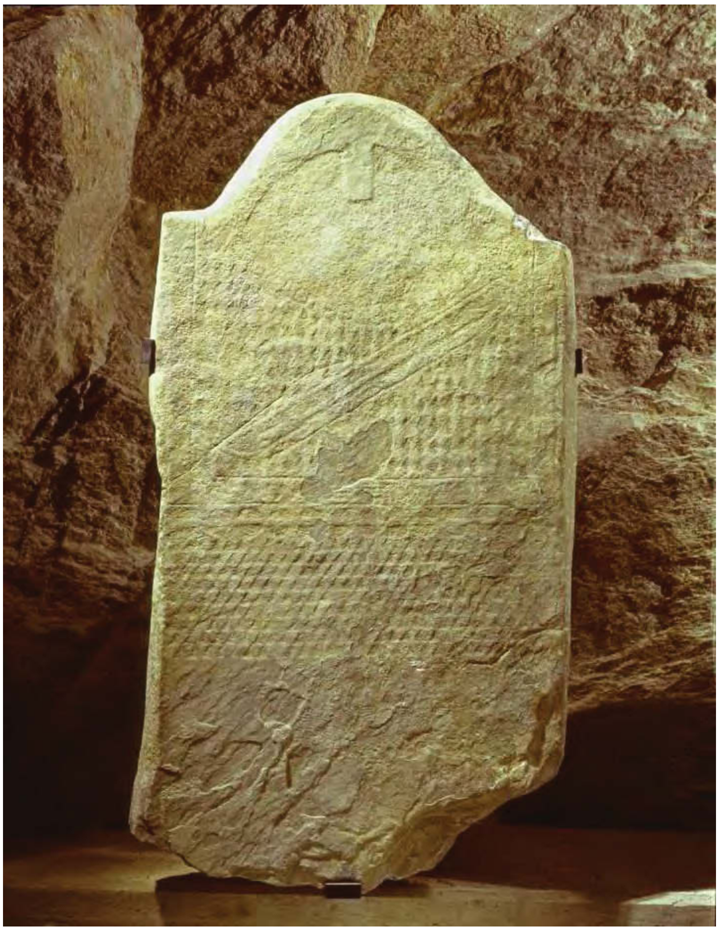


Fig 10.14 Anthropomorphic stele no 25, Sion, Petit-Chasseur necropolis. Photograph from Département Préhistoire et Antiquité du Musée d'Histoire du Valais. Licensed under Creative Commons. © Musées Cantonaux du Valais, H. Preisig

While it is unclear whether the Molina di Ledro textiles had been coloured, there is evidence from elsewhere in Europe for the use of dyes from at least as early as our Phase 3. Part of a woman's headdress made from a striped linen textile made using olive green and dark brown yarns was recovered from within one of the graves at Franzhausen, Austria, and dated to 2200–1600 cal BC (Grömer 2012, 30). Plentiful further evidence for the use of dyes, at a later date, comes from the salt mines at Hallstatt in Austria, where indigotin (blue) and luteolin and apigenin (yellow) have been isolated from one textile fragment, while a red dye, possibly derived from wild madder, was observed in another fabric; both date to *c* 1500 BC (Grömer 2012, 30; Hofmann-de Keijzer *et al* 2012).

Other elaborations attested from the Continent include the use of festoon embroidery and of appliqué (using plant seeds) in the Early Bronze Age layers at Molina di Ledro (Bazzanella 2012, 206); and from Irgendhausen, Switzerland comes a tabby linen fabric bearing zigzag linen-thread embroidery, dated to between 1685-1493 cal BC (Rast-Eicher 2012, 381).

In terms of the range of garments worn on the Continent, in addition to the aforementioned costumes from the Alpine glacier finds and from the Petit-Chasseur representations, there are occasional examples such as two linen tunics with long-fringed lower hems, as well as a cape with a V-necked front, found in a grave at Cueva Sagrada, Murcia, Spain and radiocarbon-dated to around 2200 cal BC (Alfaro 2012, 339).

Lying outside our period of interest, but included here because of the insights they provide into prehistoric clothing, are the complete sets of clothes recovered from oak tree-trunk coffins in Scandinavia (especially south Jutland, Denmark), dating to 1400–1200 cal BC. This corpus of material includes gender-specific garments such as skirts and hairnets for women, as well as piled hats and kidney–shaped cloaks with shawl collars for men, though the majority of the finds are of rectangular textiles that were wrapped around the body in a variety of ways (Mannering *et al* 2012 97-102). Probably the most famous of these sets of costumes is that of a young girl discovered at Egtved. She wore a wool tabby fitted blouse with three-quarter length sleeves, a string wool skirt with tasselled ends and a gathered hem, and a woven belt ending in large tassels (Mannering *et al* 2012, fig 3.5). Recent re-examination of the male costume found at Nybøl has concluded, among other things, that this individual was wearing a kilt-like garment and was dressed in seven different cloths with varying textures (Bergerbrant *et al* 2013).

3.1.1 Shoes

As well as the hide shoes found on Ötzi and from the Schindejoch pass, shoes made from woven lime bast are known from sites around Lake Constance (Coles and Coles 1989, 112). A recent example was recovered in 2008 from the lake site at Sipplingen, Germany and is dated by association to 2900-2860 cal BC (Phase 2). Part of the toe is missing, but it appears to consist of a simple oval 'sole' turned up at the edge with reinforcement at the heel and the remains of a possible lace, also made from lime bast, attached close to the heel (Wiesner and Beirowski 2012).

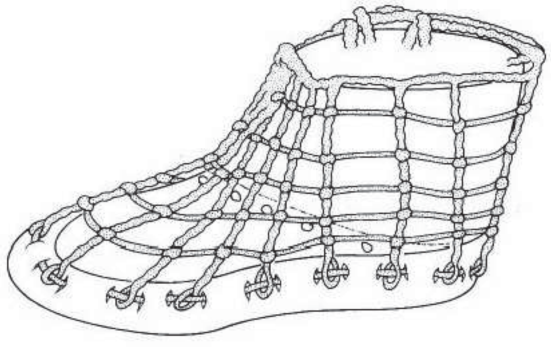


Fig 10.15 Reconstruction of Ötzi's shoes from Groenman-van Waateringe (2001)

Single piece leather shoes are also known from the oak log coffin burials in Denmark and from peat bogs including many undated examples from Ireland (Groenman-van Waateringe 2001).The earliest and simplest form, like that worn by Ötzi, consists of a single oval piece of skin with slits around the edge. A thong or lace is then threaded through securing the shoe to the wearer's foot (Groenman-van Waateringe 2001, 384; Fig 10.15). This design does not fit the human foot particularly well as it results in surplus material around the toe, heel and sides of the shoe; by around 1000 cal BC, heel seams were introduced resulting in a squarer heel-end with a better overall fit. These squared ended shoes were made by cutting off the back end of the oval 'sole' and folding it over with the seams sewn together usually with a coarse leather thread (Groenman-van Waateringe 2001, 384).

Chapter 11. Technology and Domestic Objects

Richard Brunning, Jonathan Last, Hugo Anderson-Whymark, Gill Campbell, Alison Sheridan, David Dungworth, Glyn Davies and Angela Middleton

Wooden materials

Wood was the most significant raw material for early prehistoric communities, essential for fuel, the majority of structures and a component of most artefacts. Unfortunately its importance is mirrored by its rarity in the archaeological record in the UK (eg Murphy 2001; Smith 2002). Unless it has been charred, wood only survives where waterlogging of the burial environment has prevented the normal process of decay, or where it is bonded to the decay products of bronze and iron objects. A total of 23 Neolithic and Early Bronze Age sites have produced evidence of wooden remains in Wiltshire, but the majority of these are isolated finds of single artefacts or log coffins in barrows, many of them only known from 19th or early 20th century records. Fortunately the neighbouring county of Somerset has produced the greatest concentration of early prehistoric wooden structures in the country and the Severn Estuary zone as a whole has produced more waterlogged prehistoric sites than the rest of the UK combined. Wooden artefacts are so rare that for the purposes of this chapter all the available evidence from southern Britain has been used. These rare survivals demonstrate how the raw material was selected and processed and how artefacts were created.

Species selection

The choice of different species reflects their suitability for specific tasks, but is influenced by their physical and social availability. It is likely that different species were perceived to have their own spiritual meaning that could influence how they were used. The consistent choice of oak for the log coffins used in some Early Bronze Age barrows (Brunning 2007), for example, may have been motivated by religious associations with the species, in addition to its practical qualities.

The Neolithic and Early Bronze Age structures from the Severn Estuary used 22 species as smaller roundwood with hazel, birch and alder dominant and ash and willow also significant (Brunning 2007,71, tables 4.1-4.4). For larger structural timbers oak, ash, alder, lime, elm and field maple were all used, with oak by far the most dominant and ash and alder also quite common (Brunning 2007, 71-2, tables 4.1-4.2). For large split timbers oak was by far the most frequently used species, more than twice as dominant as ash, with field maple, elm, alder and lime being the four other notable species (Brunning 2007, 71-2, tables 4.1-4.2). The strength and load bearing capacity of oak made it the most suitable timber for structures such as buildings and bridges. Where roundwood oak piles were required oak was also predominantly used, with alder, which preserves well in water, used less often. For woven wattle structures hazel was the preferred species with willow and alder also occasionally being used (Brunning 2007, tables 4.3-4.4).

Green's (1978) survey of known bronze spear shafts demonstrated the predominance of ash and this has been confirmed by subsequent finds such as the four examples from Flag Fen (Taylor 2001, 226). Ash was also often used for axe handles, the selection of the species reflecting its inherent strength, hardness, flexibility and shock-absorbing qualities (Green 1978; Coles *et al* 1978, table 2). A wide range of other species was also used for axe handles and spear shafts, including oak, hazel, beech, willow, field maple, bird Cherry, crab Apple and birch. This illustrates that early prehistoric woodworkers were prepared to use a wide range of species for a particular task.

Oak heartwood is very strong and long lasting and was used in a huge range of objects from tool handles, troughs and tubs to paddles, spatulas, spades and wheels (Coles *et al* 1978, table 2). Alder was favoured for carved tubs and buckets because it is easy to carve (Coles *et al* 1978, table 2; Ashbee *et al* 1989, 51-67).

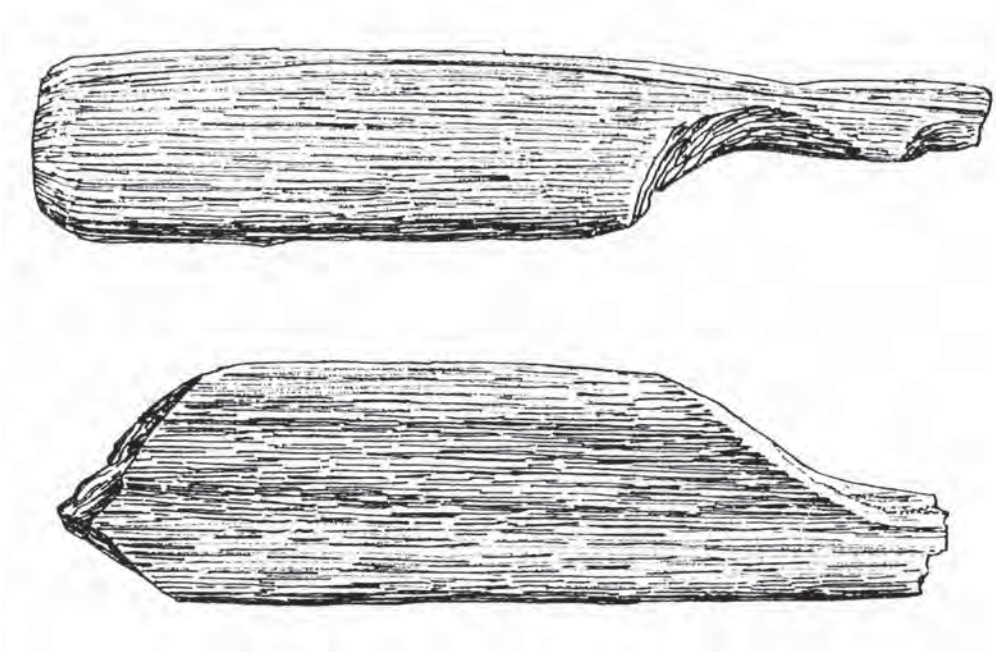


Fig 11.1 a) Neolithic paddles from the Sweet Track (Coles *et al* 1978, fig 11) © The Prehistoric Society b) Canewdon paddle (Late Bronze Age) from the Crouch estuary © T Wilkinson

Woodworking techniques

The evidence for sophisticated woodworking techniques in British prehistory is limited to a very small number of sites. It is therefore very likely that the existing data does not provide a realistic portrayal of the abilities of the prehistoric woodworkers. The Iron Age Glastonbury Lake Village contains evidence for woodworking joints and types of wooden artefact that are otherwise unknown from British prehistory (Bulleid and Gray 1911). It remains unproven whether that range of craft techniques and level of skill can projected back into the Bronze Age or earlier. Because of these limitations, woodworking evidence for the Neolithic and Bronze Ages are considered together.

Felling

Definite evidence for tree felling is rare because of secondary working of felled material. One exception is the complete yew stump found in the substructure of the Tinney's tracks in Somerset. This showed evidence of bronze axes cutting into the stump from all sides at the same level leaving a small central piece that broke as the tree fell (Coles and Orme 1980 figs 55-6, p. 65). The felling of the small birch trees (up to 102mm diameter) used in the Honeygore Track in Somerset was typically accomplished by cutting from two opposing sides with the central part of the stem severed by breaking (Coles *et al* 1985, 53). This modern practice of cutting from two sides to fell trees has also been seen on Bronze Age trunks from the River Trent (Darrah 2004, 121). Some of the larger timber from the Bronze Age site at Caldicot in Gwent retained evidence of cut ends that may represent felling. These were wedge shaped with the majority of the cuts on one side and much fewer needed on the opposite side before the trees fell towards the wider cut or 'kerf' (Brunning and O'Sullivan 1997, 179).

Several of the Sweet Track planks were burnt at one end (Orme and Coles 1983, 21), suggesting that fire may have been used as part of the felling process in the Early Neolithic when massive trees had to be felled as part of the clearance of the primary woodland. Felling trees in dense woodland is not easy because the tree could catch on the branches of other trees on the way down. For this reason Darrah (2004) has suggested that the builders of the Bronze Age Dover boat probably climbed the trees and cut off the crown and main branches before felling. This would have the added advantage of decreasing the possibility of damage by flexing when it hit the ground.

Felling is an activity that has traditionally been carried out in winter when it is easier to work in woodland because there is less undergrowth (Edlin 1974). The winter period is also when there is more spare time in the farming calendar. In addition trees are easier to fell before the sap begins to run in spring and winter felled timbers and objects such as shingles are thought to be more resistant to decay because they do not contain sap. There are difficulties with establishing the season of felling in archaeological wood but the major felling episode for the Sweet Track definitely took place over the winter of 3,807/6BC (Hillam *et al* 1990).

Heading, bucking, and snedding

When a large timber-producing tree is felled the branches have to be removed ('snedding') and the crown (or 'topwood') separated from the main trunk ('heading'). The trunk could then be used whole or reduced by splitting and/or cutting into smaller lengths or 'bucking'.

Branch wood and crownwood are obviously smaller, knottier and more curved than the main trunk and contain a greater proportion of sapwood. They are therefore less suitable for use in structures and are more likely to be used as fuel or as short logs in simpler structures.

Smaller branches and twigs were often used on mass as foundations for other structures, such as the Baker, Jones's, Honeycat, Foster's Walton, Blackwater 3 and 18 and Tinney's tracks (Coles *et al* 1980; Coles and Orme 1982; Orme *et al* 1982; Godwin 1960; Coles and Hibbert 1968; Coles *et al* 1985; Coles *et al* 1988a; Wilkinson and Murphy 1995; Coles and Orme 1978b; Coles and Orme 1980). Larger branches of birch were used in walkways such as the Honeygore (Godwin 1960; Coles and Hibbert 1968; Coles *et al* 1985) and Chilton Tracks in Somerset (Coles *et al* 1970) and branch material is a likely source for many of the other non-hazel brushwood trackways such as Crouch 29 (Context 67) in Essex (Wilkinson and Murphy 1995), and for some smaller roundwood in corduroy walkways such as the Abbot's Way in Somerset (Dymond 1880; Coles and Hibbert 1968; Coles and Orme 1976a; Coles 1980). Branches were also used as vertical stakes in pit revetments (eg Allen 2006), and in perhaps the majority of the small stakes and pegs that were extremely common in brushwood and hurdle trackways and platforms.

Fig 11.2 Neolithic Walton Heath hurdle track, Somerset. © Somerset Levels Project

Definite examples of the structural use of larger crownwood from timber-producing trees are more rarely identified. The brushwood and brash used in Garvin's track in Somerset was derived from the topwood of trees (Rackham 1977).

Conversion into timbers

Prehistoric structural wood of all sizes was often left in the round with the bark on. The smaller tree species such as hazel, willow, hawthorn, poplar and blackthorn were almost always used in the round or at most split in half.

Simple half, or quarter splits of the smaller timber tree species such as alder, birch and ash were quite common, maximising the usefulness of the logs for such structures as the corduroy Abbot's Way trackway in Somerset (Coles and Hibbert 1968; Coles and Orme 1976a; Coles 1980). Tangential splitting to produce planks is also evident in alder, ash and oak logs that would not be big enough to produce such timbers from radial conversion (eg Orme and Coles 1983).

Where very wide planks with integral raised cleats were required for Bronze Age sewn boats, large oak trees were split in half and then the wood was reduced on all sides with axes and adzes to form the required shape (eg Wright 1990; Nayling and Caseldine 1997; Darrah 2004). This process was not only very wasteful of the raw material and quite laborious but it also retained an inherent weakness in the planks along the rays, especially towards the centre of the tree, where splits could easily develop. If radially split planks were used the raised cleat itself would be more likely to break off along the rays, which might prove even more fatal to the vessel. The use of such timbers in sewn boat construction is therefore evidence of the limited joinery options available at that time.

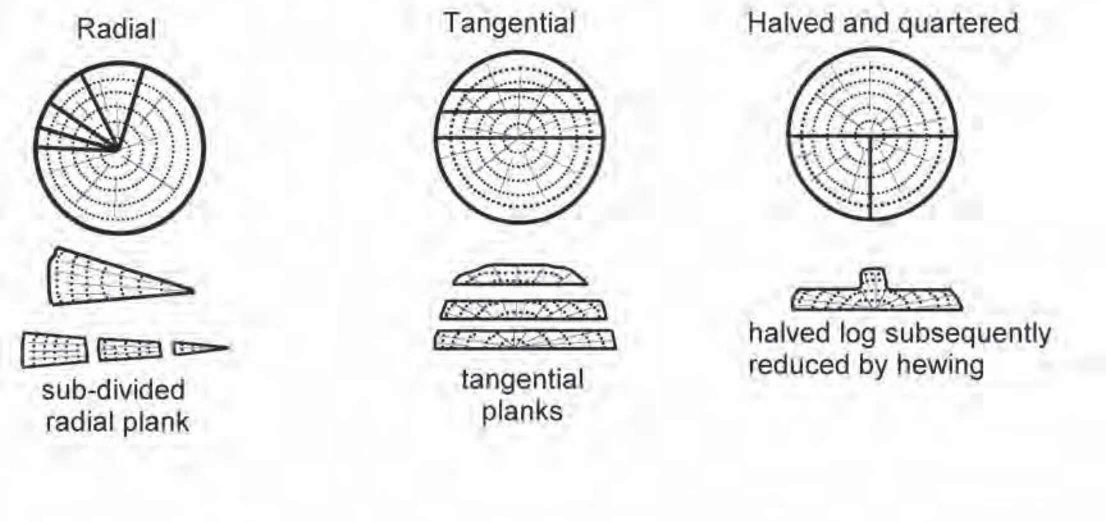


Fig 11.3 Conversion of roundwood into timbers. © R. Brunning

The main tree species used in the prehistoric period to make planks were oak, ash, alder, lime, elm and field maple. All of these are relatively easy to split radially, especially oak, alder and ash that have strong radial rays. Radial planks made from these trees are also inherently stronger that other types of conversion because they follow the plane of weakness rather than going across it. Smaller planks were made from just 1/8th or 1/16th radial splits but mature oak trees could be radially divided even more into 1/32nd or 1/64th splits. The radial planks derived from the larger oak trees were often then subdivided tangentially, as was often the case with the material for the Neolithic Sweet Track and the Bronze Age Meare Heath Track (Orme and Coles 1983).

Moving and insertion

Moving heavy green logs is hard work. To get heavy timbers out of a wood to the point of use, a track of parallel bearers like a railway line might have been used with rollers, on the top on which the timbers were moved (Darrah 2004). Non-functional holes are known from a wide variety of prehistoric structures such as some vertically set planks in the Neolithic Sweet Track in Somerset, a pile in the bridge at the Bronze Age Caldicot in Gwent and several large logs from the Bronze Age site at Ashton-upon-Trent in Derbyshire (Coles and Orme 1976b; 1979; 1981; 1984; Brunning and O'Sullivan 1997; Garton *et al* 2001). These may have been used to help tow the planks, but only across dry land as green oak sinks in water.

More formally constructed 'towing bars' have been recorded on large logs at the Bronze Age site of Holme-next-the–Sea in Norfolk. They consist of two small holes cut into the trunk towards each other until they meet leaving the outer wood of the trunk to form the 'tow bar' (Brennand and Taylor 2003).

When inserting a stake or pile a choice has to be made whether to place it the same way as it was growing in life or 'upside down'. In soft sediments the presence of side branch stubs on an upside down post can be useful to help prevent sinkage. This is especially important for load bearing timbers such as bridge piles or house walls. Inserting green timbers upside down would also prevent the sap rising up the length of the trunk and would prolong the useful life of the upright (Audouze and Büchsenschütz 1992, 52; Mann 1903, 379).

Joinery and fine finishing

There is no recorded evidence of Mesolithic joinery from England and Wales. From the Neolithic the only structural joinery consists of notches and holes in planks through which roundwood stakes were driven (eg Coles and Orme 1976b; 1979; 1981; 1984). There is some more evidence of joinery from the Bronze Age but it is of a very restricted nature. In contrast, the Late Iron Age provides a wealth of joinery evidence. This chronological development is completely contrary to the findings of a review of woodworking in north-western Europe which concluded that;

"The Bronze Age witnessed few changes in jointing techniques in wood, and the Iron Age practically none. The main period of innovations appeared from the Middle Neolithic period, in the fourth millenium BC." (Audouze and Büchsenschütz 1992, 50).

This dramatic difference can be put down to the fact that numerous waterlogged Neolithic settlements have been investigated on the Continent but none in England or Wales. In contrast, the Late Iron Age site of Glastonbury Lake Village has produced some of the most abundant and sophisticated woodworking evidence from prehistoric Europe. There is therefore clearly a significant bias in the UK archaeological record that probably leads to an underestimate of the range and complexity of early prehistoric woodworking.

One of the simplest ways of joining two pieces of wood together is by tying them. Twisted hazel and willow ties have been recorded on Neolithic trackways (eg Coles and Orme 1977) and on the Bronze Age site at Caldicot (Brunning and O'Sullivan 1997, 185). At the

Minnis Bay Bronze Age site the withy ties had been so tight that in some cases they had cut into the bark and greenwood (Worsfold 1943, 34). Withies of unknown species were used as a bag for a pot in one of the Bronze Age wells at Swalecliffe (Masefield *et al* 2003, 99). Twisted yew withy was used as stitching in the Bronze Age Ferriby and Dover boats (Wright 1990, 130-3 and Clark 2004, 183-7). Yew was chosen for these functions because of its flexibility and great tensile strength.

The most common way of joining two pieces of wood together, as evidenced in the archaeological record, was to cut a hole in one timber and then drive a stake though it. This type of fastening is first seen in the Sweet Track (3806 BC) in Somerset where the walkway planks sometimes had holes through which were driven roundwood stakes (eg, Coles and Orme 1976b; 1979; 1981; 1984). It is also evident in several of the more substantial trackways of the Middle to Late Bronze Age including the Meare Heath Track in Somerset (Bulleid 1933; Godwin 1960; Coles and Orme 1976c; Coles and Orme 1978a; Coles *et al* 1988b), the Shinewater Park Track in East Sussex (Greatorex 1995; 1998), Caldicot in Gwent (Brunning and O'Sullivan 1997, 182-4), Kate's Pad in Lancashire (Anon 1851; Edwards 1978; Middleton *et al* 1995, 60-5) and the Brigg trackway in Lincolnshire (Wylie 1884).

Notches in the sides and ends of planks are known from numerous structures including the Sweet Track, the Bronze Age Meare Heath and Withy Bed Copse tracks and the Bronze Age sites at Caldicot and Flag Fen (Orme and Coles 1983; Brunning and O'Sullivan 1997, 182 and figs105-6; Taylor 2001). None of these were definitely used as joints and many of the end notches may merely be where planks broke across a hole. The Bronze Age causeway at Lingley Fen near Haslingfield in Cambridgeshire (Pullinger *et al* 1982) had 2m long timbers with notches in their ends into which were driven roundwood stakes to prevent lateral movement.

A crude lap joint is recorded from the Middle Bronze Age Meare Heath trackway where the transverse planks were cut flat to receive the longitudinal planks (Coles *et al* 1988b, 16). The Middle Bronze Age Ferriby 1 boat displayed evidence of a sewn lap joint that joined the two side strakes together (Wright 1990). Several possible lap joints were recorded from the Late Bronze Age site of Flag Fen mostly in a fairly crude form on roundwood logs with no evidence of any method of securing the joint apart from gravity (Taylor 2001, 209-10). One small piece of roundwood, suggested as a possible flail component, had a holed rebate for a lap joint that could have been secured by a peg (Taylor 2001, 218-9, fig 7.54). None of the potential lap joints were actually used as such in the monument. One of the examples is quite neatly made with a rectangular slot cut in the side of the plank. This resembles some examples of joint used in the blockbau or log cabin building technique known from the Middle Bronze Age on the continent (eg Zippelius 1954, 32, fig 9).

More sophisticated joinery is evident on the Bronze Age sewn plank boat finds including sewn joints caulked with moss and raised cleats through which split timbers were driven to brace the timbers. The well preserved boats from Ferriby and Dover, and the Brigg raft show the best examples of this type of joint in operation (Wright 1990; Goodburn 2004; McGrail 1981).

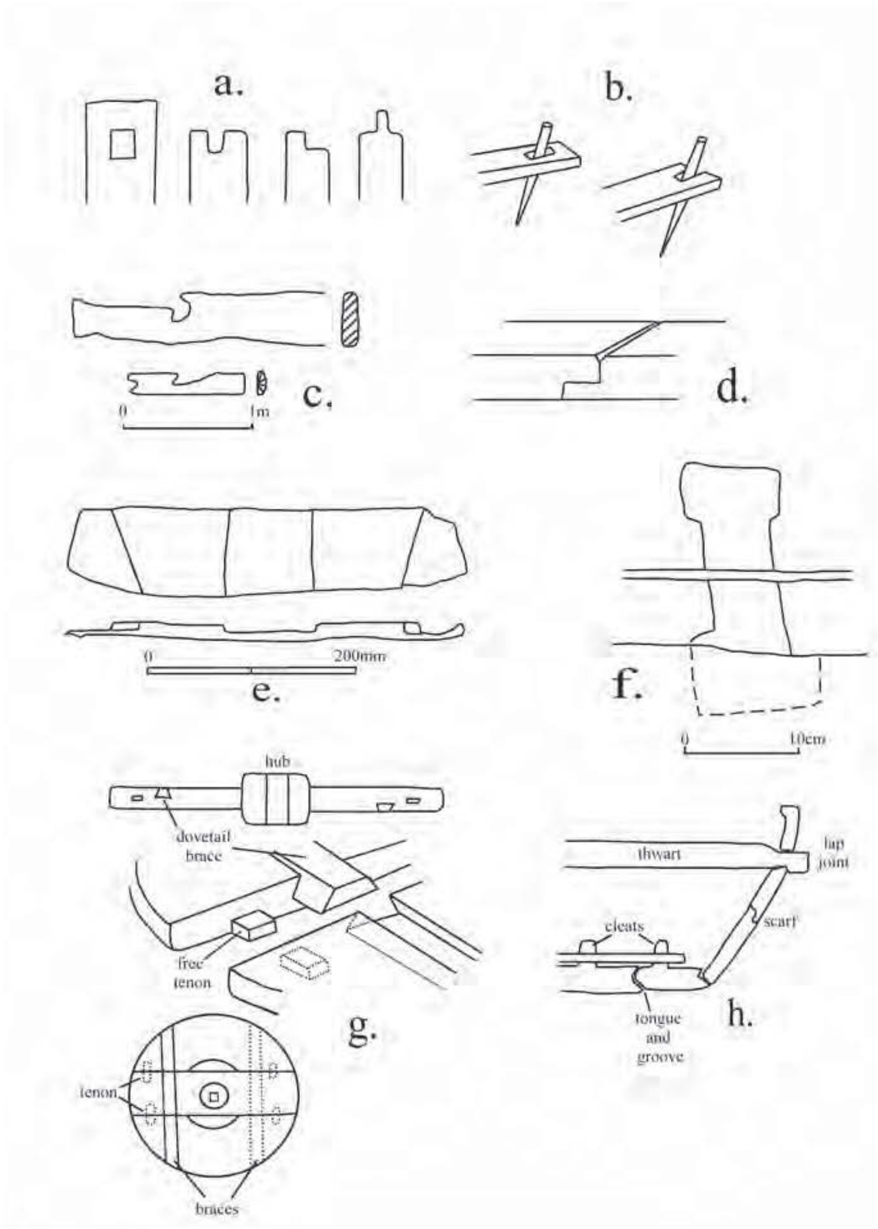


Fig 11.4 Prehistoric joinery. © R. Brunning

a. ends of prehistoric planks that had potential for use in joints – hole, double and single prong and 'locating pin'
b. methods of securing planks used in prehistoric trackways in the UK
c. 'housing joints' from Flag Fen (after Taylor 2001)
d. box scarf joint from the Ferriby 1 keel (after Wright 1990)
e. finely worked lath from the Dover boat designed to lap against several other timbers (after Clark 2004)
f. dumbbell clamp used on the Appleby logboat (after Christensen 1996)
g. mortice and tenon and dovetail joints on the Flag Fen wheel (after Taylor 2001)
h. section through the Ferriby 1 boat showing the variety of jointing used (after Wright 1990)

The earliest scarf joint is from the Bronze Age Ferriby 1 sewn plank boat, which had two keel planks that were joined with an edge halved scarf joint with square vertical butt ends (Wright 1990, 62). The scarf was not pegged or sewn in place but was retained by the stitching that joined the keel planks to the outer bottom planks on either side.

Plank and groove joints are present on the Bronze Age Ferriby boats where rebates on the edges of the keel planks have corresponding triangular projections on the planks of the adjoining bottom planks (Wright 1990). The planks were held together by sewing. On a more basic level the use of grooves in joints can be seen in the attachment of the bases to stave built tubs (Earwood 1993, 67-75) and in the numerous examples of logboats that have separate transom boards (McGrail 1978). The latter are usually fitted into a groove in the logboat with the joint caulked with moss and sometimes held in place with wedges or bracing rods. From Continental Europe the earliest example of tongue and groove structures are from the Early Bronze Age wooden mortuary enclosure at Leubingen in Saxony (Zippelius 1954) and the Early to Mid Bronze Age cistern at Padnal, in Grisons (Audouze and Büchsenschütz 1992, 144).

A crude pseudo mortise and tenon joint is recorded from the 12th to 11th century BC site at Swalecliffe in Kent, where a wooden step timber in one of the wells on the site had a single hole that accommodated the prong on the top of a radially split oak stake (Masefield *et al* 2003, 66). Taylor (2001) has coined the term 'locating pin' to describe the projections that can be seen on three examples of three timbers from the Late Bronze Age site of Flag Fen (Taylor 2001, 203-4). Similar single prongs have been recorded on the ends of timbers from the Neolithic Sweet Track and Bronze Age Meare Heath Track in Somerset (Orme and Coles 1983, 32). The earliest mortise and tenon joints known from the Continent are from the Early Neolithic settlement at Aichbűhl in Germany (Zippelius 1954, 14-15 and fig 2). These are true joints unlike the locating pins and prongs mentioned above. A reused plank with a blind-mortise was discovered the post rows at Flag Fen (Pryor and Bamforth 2010, 19).The tripartite alder wheel from the Late Bronze Age Flag Fen site had two ash free tenons joining the centre plank and an outer plank together, located in blind mortises (Taylor 2001, 213-5). Dovetail joints were used to secure oak laths on opposing faces of the wheel plank (Taylor 2001, 213-5). This method of forming solid wheels from planks is of great antiquity in Continental Europe. The earliest example is possibly the two-piece wheel from Stare Gmajne in Slovenia that is dated to the second half of the fourth millenium BC (Velušček 2004, 78 and fig 5.3). Dovetail mortises are also known from the Middle Neolithic door at Egolswill and Late Neolithic cartwheels from Zűrich Pressehaus (Audouze and Büchsenschütz 1992, 51).

A joint similar to a double dovetail is evident from an attempted repair to the Late Bronze Age Appleby logboat from Lincolnshire (Christensen 1996, 26-7). A recess in the bottom of the boat was carved out across a split. This was evidently designed to hold a dumbbell shaped clamp to help hold the crack together. A 'T' shaped indentation on the bottom of the Bronze Age log boat coffin and its boat-shaped cover from Loose Howe in Yorkshire suggests the use of a similar dumbbell shaped clamp (Elgee and Elgee 1949).

Two 'housing joints' are recorded from planks used at Flag Fen. These consist of a notch cut into the side of a timber with a slight lip on the outer edge (Taylor 2001, 210). Such a joint could be used vertically to hold a horizontal rod in place by gravity.

Woodworking tools

Archaeological evidence for woodworking tools comes in two forms; the physical remains of the tools themselves and the actual evidence for their use. The main woodworking tools of the Neolithic and Bronze Age were axes of varying materials, shapes and designs. Their development is beyond the scope of this paper but it should be noted that many of them could have been hafted for use as either axes or adzes. Definite evidence for the use of adzes is very limited but experimental work suggests that distinctive longitudinal fluting on planks from the Dover Boat and the Brigg raft were created by the use of palstaves hafted as adzes (Goodburn 2004, 129).

Fig 11.5 Neolithic stone axe from Ehenside tarn excavations. British Museum; image from J Miall, Wikimedia Commons

Wooden mauls or beetles (heavy wooden clubs) would have been used alongside seasoned wooden wedges to split logs and to help drive in stakes and piles. They could either be formed of one piece of wood or with separate head and handles joined together. The Post and Sweet Tracks in Somerset provide the earliest indisputable evidence of the use of mauls or beetles and seasoned wedges to split timbers (Morgan 1979; 1984). Some of the split timbers preserve the burring made by the wedges as they were driven into the wood (Orme and Coles 1983, 25 and fig 18). The earliest maul is a one piece Neolithic example of yew found on Meare Heath (Coles and Hibbert 1972). A wooden hammer of unknown species was found at Flag Fen (Taylor 2001, 222, fig 7.58). Both these examples used side branches for the handles and the main trunk for the striking component.

Fig 11.6 A wooden hammer from Flag Fen (Taylor 2001, 222, fig 7.58). © English Heritage

Numerous wooden wedges have probably gone unrecognised on waterlogged sites, but two Bronze Age examples are known from the Atlas Wharf site in London (Goodburn and Minkin 1998). They were both made from dense fairly fast grown radially split oak heartwood with the bruised butt ends neatly bevelled to strengthen them and help prevent splitting during repeated use (Goodburn and Minkin 1998, 38).

Both chisels and gouges were used to create the stitch holes of the Bronze Age Dover Boat (Goodburn 2004, 133). Their use has been taken as evidence that no drills, augers or corers were available in the Middle Bronze Age (Goodburn 2004, 133). No Neolithic or Bronze Age sites have shown any evidence of such tools with the sole exception of a timber from the Late Bronze Age Skinner's Wood trackways in Somerset that had a small hole of *c* 5mm filled with a slender treenail.

The sewn joints of the numerous Bronze Age boats from England and Wales would probably have required a specialist tool to help pull the withies tight during construction. Such a tool has been found at North Ferriby (Wright 1990, 155-6). It consisted of an 'L' shaped piece of wood with a small round hole, 13mm in diameter, near the end of the longer arm. The shorter arm was curved and rounded as though to fit the hand and a replica was found to be very effective at maintaining a tight weave and keeping the twist in the withy (ibid, 155). Such tools could obviously also have been used in other wooden structures to help achieve tightly tied withy bonds.

Neolithic wooden artefacts

The number of Neolithic wooden artefacts known from England is very limited. The two sites of Ehenside Tarn in Cumbria and the Sweet Track in Somerset have produced the greatest range of objects (Darbishire 1874; Coles and Coles 1986, 57-62). A bowl fragment was found at the former site and a complete rectangular carved oak trough at the latter, of the right size to have functioned as a container for a stone axe. Ehenside produced a small spatula, decorated on one side with cross-hatching and a wooden stirrer was found beside a complete pot at the Sweet Track. Another bowl fragment was recovered from Storrs Moss, Lancashire (Powell *et al* 1971, fig 5).

The excavations at Runnymede Bridge produced a more complex object, the base for a bentwood bark box, with neatly made holes for the stitching that would have bound it together (Needham 1985, 131). More complete bentwood birch bark boxes have been discovered in the pit of a ring ditch at Manor Farm, Lower Horton, Berkshire. The boxes were shallow, 350-400mm in diameter, and were sewn together with lime bast (Preston 2003). By the mid third millenium BC, larger vessels were created by carving a tree trunk into a hollow cylinder and fitting a separate base, stitched to the sides through small holes in both pieces.

Fig 11.7 Rectangular carved oak trough from the Sweet Track excavations. © Somerset Levels Project

The Sweet Track has produced evidence for Neolithic arrow production. Two of the arrowheads from the site were still attached to fragments of their hazel shafts, one of which had been bound to the shaft with nettle fibre thread. A third retained a lump of the pitch that attached it to the shaft (Coles and Coles 1986, 57). The remains of four possible hazel bows have been found beside the track, all broken and one of them, about 1m long, that may have been a child's weapon. Two more substantial Neolithic yew bows have been found in the same valley on Ashcott and Meare Heaths, the latter being bound with strips of rawhide (Clark 1963). A reconstruction of this bow has shown that it was more powerful and quieter than a Medieval longbow (Prior 2000). Hafted stone axes have been found at Port Talbot and Longtown, Kirkandrews, the hafts made of birch and hawthorn or apple respectively (Green 1978).

A small wooden axe from the Sweet Track (Fig 11.8), made of two pieces of oak slotted together, may represent the earliest toy in Britain (Coles and Coles 1986, 61 and fig16). Other wooden objects from the site included slender, paddle like objects, possible digging sticks and the burnt fragments of the bowl of a spoon (Coles and Coles 1986, 62). A series of slender, carved and polished pins, 160mm to 276mm long, had been made from split yew. These would have been very strong and could have held together bags, clothing or coiled hair or used to make nets (Coles and Coles 1986, 62). A mallet, carved from a piece of yew with a handle formed from a side branch, was discovered on Meare Heath in Somerset (Coles and Hibbert 1972). A single birch bark bead was found in Neolithic peat in the Brue valley (Somerset HER 25248).

Other beech and oak objects from Ehenside Tarn included a digging stick, some crudely made clubs, a hafted stone axe (see Fig 11.5), an oak paddle and a three pronged fork, possibly a reed fork or a fish spear (Darbishire 1874; Coles *et al* 1978, fig 5; Coles and Coles 1989, fig 25). One of the clubs had an incised latticework design on it. Two incomplete oak paddles with asymmetrical blades (Fig 11.1a) are also known from the Sweet Track (Coles *et al* 1978, fig 11). Two pointed paddles, each with one concave and one convex face, were found off Lion Point, Essex and are thought to be Neolithic in date (Warren *et al* 1936), but only exist as a paper record.

Fig 11.8 Possible child's toy axe from Sweet Track excavations. © Somerset County Council Heritage Service

The earliest known human figurine from the UK is the 'God Dolly', discovered below the early 4th millenium BC Bell Track in Somerset (Coles and Hibbert 1968). It is a small limbless figure made of ash, which has head, shoulders, breasts and penis (Fig 11.9). Also from the Neolithic period is the pine figure from Dagenham (Essex) which has head, torso and legs (Coles 1990).

Fig 11.9 The 'God Dolly', found below the Bell Track in Somerset. © Somerset County Council Heritage Service

Birch bark containers stitched together with lime bast were retrieved from Neolithic deposits at Lower Horton (Cartwright 2003). A bark container dated to 1880–1620 cal BC (3415 ± 40 BP; OxA-8929) was recovered from the base of a pit on the edge of a palaeochannel at Yarnton, Oxfordshire. Evidence for stitching was recovered in the form of regular indentations in the side of the bark piece/s but the material used to hold the sides together did not survive; the type of bark from which the container was made is not recorded (Taylor forthcoming). Similarly, part of a sewn birch bark container was recovered from a Neolithic deposit at Runnymede Bridge (Heal 1991, 141, plates 17 and 18). A number of sites have also produced fragments of birch bark, possibly representing prepared material stored for later use, for example Etton and Yarnton (Taylor 1998, 156-7; Taylor forthcoming).

The only Bronze Age example of a bentwood box is the 'dish of bark stitched with sinew' that was recovered, along with a wooden spatula, from a dug-out coffin at Gristhorpe (Elgee and Elgee 1949, 105)

Bronze Age wooden artefacts

The most productive sites for wooden objects in southern Britain are mainly of Middle to Late Bronze Age date. Discussion of them has been included here because they are probably representative of the sorts of object that also existed in the Early Bronze Age.

Many Early Bronze Age objects were discovered in early barrow excavations and only survive as paper descriptions. One such example if the handled cup or bowl from Stoborough, Dorset (Elgee and Elgee 1949, 105). Several other containers are only known from paper records. The bronze weapon hoard from Cogie Hill Farm was found in 'a strong rude oaken box, with pins of the same' (Garstang 1906, 236). The Edington Burtle hoard from Somerset was contained within a maple box that disintegrated soon after exposure (Stradling 1854, 92).

By the second millenium BC tubs and buckets were being made from several separate staves, with circular bases fitting into rebates in the staves. A wide collection of whole and fragmentary staves and bases from tubs and buckets were found in the Wilsford Shaft (Ashbee *et al* 1989, 51-67). They appear to have been bound with withy hoops and one stave had a hole at the top that may have been for a withy handle. The staves were made from split alder, oak and ash and had carved grooves to hold the bases, which were also of oak and alder. A similar alder bucket, with a rebate for the base, is known from Stuntney Fen, Cambridgeshire and an ash example from Caldicot (Clark and Godwin 1940; Earwood 1997, 208, fig 127). Handled buckets could have been carried by the curved yoke with a hole at each end that was discovered at Flag Fen (Pryor *et al* 1986, fig 11).

A fragment of a bowl was recovered from the Wilsford Shaft, with a suggestion that it was turned on a lathe rather than being carved. If this is correct, it is the earliest evidence for lathe turned wooden bowls in England. The Neolithic method of carving a bowl from a half split log was still being used on Late Bronze Age sites such as Washingborough and Caldicot (Taylor 2009a, 80-1, fig 4.17; Earwood 1997, 204-5). A long alder trough was also found at Caldicot, with a possible handle at one end, carved out of a half split log (Earwood 1997, 208, fig 128).

Ladle like objects with deep bowls are known from Runnymede, Flag Fen and Caldicot (Needham and Longley 1980, 407; Taylor 2001, 226, fig 7.65; Earwood 1997, 207, fig 125). Fragments of possible wooden scoops with right angled edges and a possible handle have been found from the Wilsford shaft, where they may have been used in its excavation (Ashbee *et al* 1989, 57, figs 55 and 51/11).

Other tools include two heavy oak beaters from the Caldicot site, of a size that would make them suitable for use in the early stages of flax preparation (Earwood 1997). A large wooden needle with a triangular hole near its base, found at Flag Fen, may represent a thatchers bodkin (Taylor 2001, 228, fig 7.67). Four sword shaped pieces of oak and ash were found from the Caldicot site. They may be weaving swords but could be copies in wood of metal weapons (Earwood 1997, fig 126). They could be ritual substitutes for actual weapons, a possibility that is supported by their deposition in a water channel.

Numerous Bronze Age spears, axes, chisels and daggers have been discovered with enough wood surviving to allow determination of species (Green 1978; Coles *et al* 1978). Only a small number have almost complete survival of the wooden component however. Four oak axe hafts were found at Flag Fen, three fragmentary and one complete. One of the fragmentary examples was part of a two piece handle but the others were single piece objects, in two cases with the handles made from a side branch and foreshaft carved down from the main trunk (Taylor 2001, 219-24, figs 7.56-7.60). The other single piece haft used part of the main trunk for a handle and a side branch for the foreshaft (Taylor 2010). An unused but complete axe haft of bird Cherry from Caldicot used a side branch (with bark still on) for the handle and part of the main trunk for the foreshaft (Earwood 1997, 206-7, fig 123). As there is no sign that it was ever attached to an axe the object may actually be a hooked tool instead.

Amongst other wooden Bronze Age objects are two bows from Edington, Somerset and Cambridgeshire (Clark 1963) and the solid wheel fragment from Flag Fen (Taylor 2001, 213-8). The wheel fragment consisted of a curved alder plank that would have formed a third of the wheel. It would have attached to the adjoining plank by two ash dowels housed in rebates in its thickness and braced on opposing faces by oak slats held in dovetail grooves. An oak axle that had broken and been reused as a small stake, was also found at the site, together with a peg that could have been wedged into its fastening hole (Taylor 2001, 216-8, fig 7.52). Very similar solid wheel fragments are known from Early Iron Ages sites at Cottenham and Cat's Water in Cambridgeshire (Evans 1993; Taylor 1984, 175-6, fig 124) with finely made spoked wheels only developing later in the Iron Age (eg Bulleid and Gray 1911, 328, 336, 338-340).

The earliest evidence for wood turning is from two pairs of small wooden studs discovered in the Whitehorse Hill cist on Dartmoor. These circular studs had a very finely made groove along their edges and were turned from half split batons of spindle wood (*Euonymus* sp) around 1,900 cal BC.

Fig 11.10 Flag Fen Wheel. Photograph by Susan Greaney

Basketry, cordage and textiles

As elsewhere in Britain, evidence relating to basketry, cordage and textiles in Neolithic to Bronze Age Wessex is extremely rare, apart from the indirect evidence for cordage provided by impressions on pottery. This is, however, an artefact of adverse preservation conditions: by analogy with other areas and periods where organic material is better preserved, the prehistoric inhabitants of Wessex can be expected to have made good use of the resources available to them for producing basketry, cordage and textiles. Elsewhere in the world, the earliest evidence for all of these categories of material dates as far back as the Upper Palaeolithic, where sites in the Czech Republic have produced indirect traces (as impressions in clay) of plaiting, single- and multiple-ply cordage, knotted netting, wicker-style basketry and a variety of woven plant-fibre textiles, including simple and diagonal twined pieces and plain woven and twilled objects (Soffer *et al* 2000a, 512-13; Soffer *et al* 2000b; Gleba and Mannering 2012b, 1).

Basketry

The only example of basketry from Wessex from the period of interest is a burnt container or basket which was recovered from the base of northern ditch terminal of the henge at West Amesbury and is dated, by association, to the Chalcolithic (Phase 2) (Parker Pearson *et al* unpublished). Slightly further afield, a fine-textured bag, with a coiled base, has recently been found in a waterlogged Early Bronze Age cist on Whitehorse Hill, Dartmoor where it had been used to contain the deceased's jewellery (Jones *et al* 2012). Both of these artefacts are currently undergoing detailed study. Elsewhere in Britain and Ireland, the results of developer-funded archaeology have increased the *corpus* of basketry since Coles *et al* published their review of the use of wood in prehistoric Britain in 1978 (Coles *et al* 1978). In Ireland, for example, four Mesolithic fishing baskets (Fig 11.11a) were found beside a former lake at Clowanstown, County Meath (FitzGerald 2007), with a date range of 5300–4730 cal BC (Beta 231947-231958) (Mossop and Mossop 2009, 9). Others, dating from the Middle to Late Bronze Age and believed to have been eel traps, were found at Must Farm, Cambridgeshire (*British Archaeology* 116, Jan/Feb 2011, News; Symonds 2012; Fig 11.11b). Other fine examples of basketry include a Neolithic circular handled bag, made using the coiling technique, from Twyford, County Westmeath (Wallace and Ó Floinn 2002, 72), and another Neolithic bag, found containing a stone axehead, from Aghintemple, County Longford. Both were manufactured from young alder shoots (Raftery 1970; FitzGerald 2007). Several impressions made by basketry matting are known from the bases of Grooved Ware pots, as at Barnhouse, Orkney, Rinyo, Orkney and Forest Road, Kintore, Aberdeenshire (Sheridan and Brophy 2012, section 5.3: http://www.scottishheritagehub.com/content/532-wood-and-other-plant-material). In each case the matting had been coiled, and at Kintore and Barnhouse the centre of the pot base had lain on the centre of the mat. An impression of a wickerwork basket is present on the exterior of a Middle Neolithic saggy pot base from Glenluce in south-west Scotland, and five Grooved Ware pots from Balfarg Riding School, Fife, have rows of faint impressions of 'twine' on their exterior (ibid). In each case, this has been taken to be evidence for the use of basketry containers as supports for pots during their manufacture, although this needs to be tested experimentally.

The materials used for basketry and related constructions (eg wattlework hurdling) in prehistoric Europe in general include hazel, alder, birch, wayfaring tree (*Viburnum lantana*), dogwood (*Cornus sanguinea*) and Rosaceae species, while bast fibres of lime, willow, oak or birch, and the stems of grasses, sedges or rushes, were used for fine baskets, bags, matting and other textiles. Patterns can be produced not only by varying the type of weave but also by the use of different coloured materials.

Three main techniques are used in basketry: coiling, twining and plaiting or interlacing. Coiling involves rolling the fibres (or fibre bundles) in a spiral which is held together by cross-wrapping the adjacent coils to each other in a variety of ways. The adjacent coils can also be sewn together (Hodges 1981, 130–2). This was the method used to manufacture the Whitehorse Hill, Twyford and Aghintemple bags and the Neolithic matting in Scotland. Twining involves the production of a fixed framework (the warp) around which horizontal elements (wefts) are then twined. The edge can either be finished by simply cutting off the warp ends or by bending the warps over and weaving them into the existing structure (Hodges 1981, 146–7), as is the case with the fishing baskets mentioned above (FitzGerald 2007). The Clowanstown baskets were made using 1 or 2 year old alder, birch and Rosaceae withies measuring 2mm-8mm in diameter (FitzGerald 2007). Twining is the method by which larger structural elements, such as wattle fencing, is created. Whether the plaiting/interlacing method had been used to make the flexible upper part of the Whitehorse Hill bag remains to be determined.

Fig 11.11 a) Late Mesolithic fish trap found at Clowanston, County Meath © Archaeological Consultancy Ltd. b) Late Bronze Age fish trap from Must Farm, Cambridge. Photograph by Martin Curtis

Cordage

To the authors' knowledge, there is no direct evidence for cordage in any of its forms – as thread, string or rope – in Neolithic to Bronze Age Wessex, although as mentioned above there is plentiful indirect evidence in the form of cord impressions in pottery in this region. This ranges chronologically from the Early to Middle Neolithic impressions of twisted and whipped cord on Peterborough ware pots from West Kennet, Wilsford G51 and Windmill Hill, for example (Annable and Simpson 1964, nos. 9 and 11 and Zienkiewicz 1999), to the Chalcolithic twisted cord impressions on early Beaker pottery, including that from the 'Boscombe Bowmen' and 'Amesbury Archer' graves (Barclay 2011b, Cleal 2011), and the twisted cord impressions seen on many Early Bronze Age cinerary urns and on some accessory vessels (eg Annable and Simpson 1964, nos. 484, 502, 552, 442 and 474. Note that the (rare) use of whipped cord is attested on accessory vessel no. 444). The Beaker assemblage from the 'Boscombe Bowmen' and 'Amesbury Archer' graves is significant for including examples of both true and pseudo-plaited cord impressions, a rare feature on Beaker pottery both here and on the Continent (Barclay 2011b, Cleal 2011 – and note Cleal's discussion of whether the plaiting on two of the Amesbury Archer's Beakers might in fact have resulted from crocheting (ibid,146). Research needs to be undertaken on the fibres used to make the cords, not least to test Andrew Sherratt's bold and engaging (yet arguably incorrect) assertion that the cord used to decorate Beakers may have been of hemp, associated with the prehistoric use of cannabis (Sherratt 1995, 31). Recent analysis of absorbed lipids has demonstrated the presence of milk fats in several Beakers, and of 'unknown plant oil or degraded human lipids' in the case of the Boscombe Bowmen's Beakers, but no cannabinoid resins (Šoberl and Evershed 2011, Šoberl pers comm). Furthermore, there are no macroscopic finds or pollen evidence for *Cannabis* of this date from Britain.

The prehistoric inhabitants of Wessex will undoubtedly have used cordage for a variety of purposes including, importantly, the manufacture of bowstrings. It remains to be seen whether flax fibre, the preferred fibre in more recent times, had been used to make them, as opposed to tree bast, sinew or another material. It had been speculated that a bowstring might have been used to make the impressions of plaited cord seen on the aforementioned Beakers in the Amesbury Archer's grave (Cleal 2011, 146) but prehistoric archery expert Dr Jürgen Junckmanns has confirmed (pers comm) that bowstrings are unlikely to have been plaited, since this would make them too stretchy. The possible bowstring found with Ötzi in the Alps was a two-ply tree bast cord, 1.9–2.1m long (Spindler 1995, 134). As for the cordage used to secure arrowheads in position, the use of nettle fibre is attested from the Sweet Track, Somerset, where it was used to bind an Early Neolithic leaf-shaped arrowhead to its hazel shaft (Coles and Coles 1986, 57). The other uses of cordage attested from prehistoric sites outside Wessex include netting, string, rope and textiles.

Nets can be regarded as a form of open textile. They can either be knotted or formed by linking or lopping (Gleba and Mannering 2012b, fig 0.14, 10). Nets have been recovered from the Early Mesolithic site of Friesack, East Germany (Coles and Coles 1989, 94-5) while Ötzi's equipment included a knotted net with a mesh size of roughly 50mm. It was made from two-ply grass string (Spindler 1995, 121-2). Nets may not only have been used to catch fish, but also to snare birds and other animals.

String made of plaited plant fibres (probably willow bast or nettle) has been recovered from Late Mesolithic contexts at Tybrind Vig, Denmark (Coles and Coles 1989, 67), while fragments of twisted plant fibre have also been retrieved from the Late Mesolithic site of Bouldnor Cliff (Fig 11.12) from a layer dated to 6220–5980 cal BC (OxA-15722, 15723; Momber *et al* 2011, 81; Momber and Gillespie 2011). Many examples of Neolithic and later string are also known from the lake villages in and around the Alps (eg lac de Chalain, Jura, France: Monnier *et al* 1991, 12).

As for rope, within Britain a Late Neolithic example made from the twisted stems of crowberry (*Vacinnium oxycoccos*) – a tough, resilient fibre much used in the historical past in Orkney – is known from Skara Brae, Orkney (Clarke 1976, fig 12; http://theorkneybookofwildflowers.blogspot.co.uk/2011_09_01_archive.html; species identified by Linda Hurcombe).

Ropes made from small diameter roundwood twisted together have been recovered from Phase 3 onwards in Britain. A three-ply rope was found attached to the upturned central tree stump at Holme-next-the-Sea. It consisted of 3 separate roundwood stems of honeysuckle, 15 – 22mm in diameter, twisted together. The individual stems were twisted clockwise (Z twist) and then plied together in the opposite direction (S twist) to form a three-ply rope. Honeysuckle climbs in an anticlockwise direction so this method of rope manufacture would serve to make best use of the plant's natural properties (Taylor 2003; Brennand and Taylor 2003). A similar rope has recently been recovered attached to an oak bucket from Pode Hole Quarry, Peterborough and dated to 1380-1050 cal BC (SUERC-12890, 2980 ± 40 BP) (Taylor 2009b), and further Bronze Age rope has been found not far away, at Must Farm.

Rope fragments consisting of split roundwood yew withies twisted in an anti-clockwise direction were found associated with an Early Bronze Age plank-built boat at Caldicot, Gwent. They are similar to the two-stranded yew rope used in the construction of the North Ferriby boat (Earwood 1997; McGrail 1981, 101, 234).

Fig 11.12 The Bouldnor string. Photograph by Gill Campbell

Textiles

A few scraps and impressions of woven cloth have been found in Early Bronze Age graves in Wessex including Manton, Shrewton, Durrington, Ridgeway, Bush barrow and Lambourne (Crowfoot 1984; Henshall 1950). These demonstrate that the practice of weaving was certainly underway in this region by Phase 3 (around 1800 BC), if not earlier (see also **Chapter 10 - Design, Clothing and Personal Adornment**). Plain weaves are involved, and at Shrewton, loosely S-plied thread had been used, with a thread count of 10 x 11 and 9 x 9 per cm. While in most cases the type of fibre used is unknown, evidence for the use of linen was found at Manton, where the unburnt body of an elderly woman had been buried amid a rich assemblage of grave goods (Cunnington 1907, 13). Here, evidence for the use of two textiles was found, with the linen being the coarser-woven of the two. Flax is known to have been grown in Britain from the Early Neolithic (see **Chapter 4 – Plant Resources**), and the earliest evidence for its use here comes from the causewayed enclosure at Etton, Cambridgeshire, where a piece of S-twisted linen twine of Early/Middle Neolithic date was found (Pryor *et al* 1985, plate XL; Taylor 1998, 157; Whittle *et al* 2011, 322-5). Linen thread is also attested in the Early Bronze Age tree-trunk coffin at Loose Howe, North Yorkshire, where it was suggested that the body may have been wrapped in linen cloth (Elgee and Elgee 1949). The finely-woven textile recently found as a rectangular insert into a skin garment from Whitehorse Hill, Devon (Jones *et al* 2012) is of vegetable fibre. (This identification may be refined as further investigation by Caroline Cartwright is in progress).

As for the use of woollen textiles, there is currently no evidence for their use prior to the Early Bronze Age in Britain, and in Continental Europe the earliest surviving woollen textile – a scrap of wool and vegetable fibre fabric found between a flint dagger blade and its wooden hilt at Wiepenkathen on the Elbe river, in a Corded Ware context – dates no earlier than 2400 BC (Bender Jørgensen 2003, 55). The breeding of sheep to produce fine, woolly coats may have begun as early as 5000 BC in the Near East (Barber 1991, 24) but the practice may not have been adopted in Continental Europe until the third millennium BC (Gleba and Mannering 2012b, 6; Ryder 1983, 45-7; **Chapter 5 - Animal Resources**). That it was adopted at this time is indicated not only by the aforementioned fabric, but also by osteological and other evidence from Corded Ware villages in Switzerland where the number, mean size and age at death of sheep were all greater than in pre-Corded Ware contexts (Schibler 2004, 153). In theory, the use of woollen fabrics could have been introduced to Britain as part of the range of Beaker-related novelties from the Continent, but this remains to be demonstrated (see also **Chapter 10 - Design, Clothing and Personal Adornment**).

As for earlier textiles in Britain, in the light of the evidence from the Continent, these are most likely to be of plant fibres – not just linen, but tree bast and other fibres. The earliest evidence for any textile in Britain is an impression left on a Middle Neolithic Impressed Ware sherd from Flint Howe in the Glenluce Sands in south-west Scotland (Henshall 1968). According to Henshall "The textile was a plain weave cloth, with one system of threads much closer together than the other system; the latter would have been hardly visible and they have not registered in the impression. There were about 32 threads per inch in the close-set system, and about 10 threads per inch in the wide-set system. The direction of spin of the former was S (Z on the impression). The Luce Sands textile seems to have been almost a repp'" [a fabric with prominent rounded crosswise ribs]. Research needs to be undertaken to identify the fibres used for this textile.

The use of plant fibres to create woven textiles is well attested on the Continent, where for example the Neolithic Swiss lake settlements have produced evidence for the use of bast fibres from lime, oak and willow, as well as flax (Médard 2012, 368).

While the Flint Howe textile impression may constitute the earliest evidence for textile use in Britain, the earliest piece of fabric dates to the period when Beaker pottery was in use and comes from Etton Woodgate (Pryor *et al* 1985, plate XL). It is thought to be a sprang textile – that is, a textile formed by twisting adjacent parallel threads -and is made of vegetable fibre (Pryor *et al* 1985, 303; Gleba and Mannering 2012b, 11, fig 0.15).

As for tools associated with the manufacture of textiles, no evidence for any Neolithic to Bronze Age loom has been found in Britain and the earliest candidate for a spindle whorl is a find from Silchester: this object, although found in a Roman/Iron Age site, has decoration akin to that seen on Beaker pottery and may be of late third/early second millennium date, along with some other objects found at this site (Elise Fraser pers comm). Another possible candidate is a decorated stone disc from Park Quarry, Durris, Aberdeenshire, from a cist with a Beaker and seven barbed and tanged flint arrowheads (Shepherd and Greig 1989) – although the possibility that this had been a pendant cannot be ruled out. Whether or not these objects had been spindle whorls, it is clear, from the Neolithic cordage referred to above, that some method had already been in existence to create twisted thread.

Fig 11.13 Bronze Age cloth impressions formed by deposited calcium carbonate, from Manton barrow, Preshute, Wiltshire. © Wiltshire Museum, Devizes

Hide and skins

Before the introduction of weaving, animal hides and skins provided flexible, large sheets that could be made into a variety of items, including clothing. However, there are very few finds of prehistoric leather. Skin products only survive under special circumstances, eg in wet and waterlogged conditions, in permafrost, in arid situations or in contact with salt. Even though wet and waterlogged deposits present the ideal environment for the preservation of many organic materials, it is surprising how little prehistoric leather survives from such environments.

A few leather clothing remains have been found, such as those from the Ice Man (Spindler 1993), from bog bodies (Coles and Coles 1989) or from salt mines (Harris 2006). Finds of textile tools or pictorial evidence, such as cave paintings, can give additional insight into prehistoric clothing; further clues about skin processing can be gained from studying indigenous people. However, in the absence of artefactual evidence, a lot has to remain speculation.

The raw material

Animal hides or skins[4] would have been retrieved as a by-product of hunting, so it can be expected that a wide variety of animal skins were used for clothing (see **Chapter 5 - Animal Resources**). Without any modification, animal skins will rot away, so to make skins last, they had to be made resistant to decay. Tanning (ie vegetable or oil tanning) is an irreversible process (Hodges 1989, 150). The tannins used form stabilising chemical bonds with the collagen fibres within the skin structure, which produces leather that can withstand repeated wetting and drying. Other processes (eg curing) are reversible, especially when the product is exposed to water; skins treated in this way are not real leather and will easily decay in the ground.

The making of leather

The bonds produced by tanning are resistant to biochemical attack (Cronyn 1990, 265). Although the skin of any vertebrate animal can be made into leather, it is more common for mammalian skin to be used (Haines 2006, 12).

The skin of vertebrate animals is composed of three layers (Hodges 1989, 148; Waterer 1968, 18):

- The thin outer layer consisting of the epidermis, together with the hair and associated hair roots.
- The middle layer incorporating the grain, in which are embedded muscles, sweat glands, blood vessels, etc. and the corium. This middle layer contains the fibres of collagen which are converted to leather.
- The underlying flesh which mainly consists of fat cells and the membrane connecting the corium to the underlying tissue.

After the removal of the skin from the carcass, the first step in the preparation of skins is the removal of fatty tissue from the flesh side. The commonly found flint scrapers (see **Flint** section in this chapter) seem to be ideally suited for this task (Hodges 1989, 148).

Skins can be temporarily preserved by slow drying or the application of salt. This is called *curing*. These skins are rather stiff and without the addition of further substances (such as

[4] Hide is the term used for skins from larger animals such as cattle. Skin is the term used for skins from smaller animals such as sheep, goat or pig (Waterer 1968, 17). For ease the term *skins* will be used throughout this report.

oils and fats) will probably be unsuitable for clothes. If such skins become wet, rot will set in again or if they dry completely, they will become hard and brittle (Covington 2006, 31).

To soften skins, a variety of techniques could have been used. Continued beating or staking, where skins are pulled over a blunt edge, would have softened the leather (Waterer 1968, 35). Chewing or the application of oils or fats will also make skins more supple. If drying took place over a fire, the wood smoke will have had a mild tanning effect on the leather (Thomson 2006, 66) and made it more durable. Wood smoke contains small amounts of tanning agents such as phenolic and formaldehyde derivatives (Püntener and Moss 2010, 316).

Fatty materials, such as tallow, make skins waterproof and prevent decay. This is still not properly tanned leather, but is called *pseudo-leather*. When reactive oils such as from animal brains or fish oils are worked into the skins, real *oil-tanned* leather is produced. These unsaturated oily substances oxidise to create aldehyde derivatives, which create the tanning bonds (Püntener and Moss 2010, 317).

Later, from the Roman period onwards, vegetable tanning becomes more common. This involved soaking the leather in extracts of bark and roots, producing long-lasting leather. The skins have to be continuously turned in the tanning solution, and more bark has to be added or the skins transferred to new vats. This process can take up to a year or even longer.

From the few examples we know (see below), it is unclear whether the hair was removed or not. It can be assumed that for certain clothes, hair would have been left in place for comfort or insulation. Use and wear of garments can cause the hair to be rubbed away. Any remaining hair easily comes away from the skin due to decay, as was shown on the clothes remains of the Ice Man (Spindler 1993, 135), where tufts of hair came off as the body was recovered. Most of his clothes were in fact fur (skin processed with the hair retained), but appear like leather today since the majority of the hair has fallen out and is only partly preserved in protected areas such as folds. The same phenomenon was observed by Groenman-van Waateringe (2001) in prehistoric footwear. If hair was to be removed, it could have been done by treatment with a solution of wood ash, urine or simply by scraping it off (Hodges 1989, 148; Groenman-van Waateringe 1993, 122).

Preservation issues and some examples

In common with other organic materials, leather is preserved in anaerobic environments, such as waterlogged deposits. However, only leather that has been properly tanned (vegetable or oil tanned) will survive burial. Cured or pseudo-tanned leathers will easily decay in such environments and only survive if a secondary tanning process took place. This can occur in salt mines (*curing*), in the acidic milieu of a bog, or an oak coffin where processes similar to vegetable tanning occur. Artefacts that have been exposed to a secondary tanning process cannot be analysed to establish the original curing or tanning process, as this is masked by the salt or natural tannins.

Of the few prehistoric leather items that do exist, the influence of secondary tanning means that it is not fully possible to analyse the original skin-treatment. Salt curing is unlikely to have been a mainstream technique, as huge quantities of salt would have been necessary

(Groenman-van Waateringe 2001, 379) and access to these amounts of salt is unlikely in the Neolithic period. Also vegetable tanning seems unlikely, as the process can take up to 18 months and a more settled life style seems to be required.

The discovery of the Ice Man (3200 BC; Stonehenge Phase 1) provided an ideal opportunity to investigate Neolithic clothing that had not been influenced by a secondary tanning process but simply survived due to being frozen. Analysis of pollen remains in the fur of his clothes indicates that the skins were probably processed by smoke-drying and the application of fat (Groenman-van Waateringe *et al* 1999).

Groenman-van Waateringe (2001) gives a very good overview of prehistoric footwear across Northern Europe (see also **Chapter 10 - Design, Clothing and Personal Adornment**). Most finds come from bogs and the original curing/tanning process can therefore not be established. The finds do however allow some other conclusions to be made, mainly on typological developments of shoes and working of skins in terms of sewing.

In the absence of any skin or leather finds from the prehistoric Stonehenge landscape, particular attention must be paid to bone or stone tools and clothes fasteners, which can give an indication of skin working techniques.

Flint

Flint was an essential component of prehistoric toolkits. Throughout prehistory it would have been used regularly, if not on a daily basis, in many aspects of life. As a result, hundreds of thousands of flint artefacts have been recovered from the Stonehenge landscape (eg Richards 1990; Chan 2010). The earliest flints in this area date from the Mesolithic (*c* 9500-4000 BC) and the latest date from the Late Bronze Age (c.1500-700 BC), but the greater part of this total are broadly contemporary with Stonehenge.

Procuring flint

Flint occurs in bands and irregularly-shaped nodules within the chalk. The Wessex chalk land is therefore littered with flint nodules that can be easily procured and turned into tools. River worn pebbles are also readily obtained from the bed of the Avon. The flint obtained from the ground surface is, however, not of the best quality as it has been subjected to frost and other forms of weathering; far superior raw materials can be obtained by digging into the chalk. The construction of many Neolithic monuments yielded a large number of good quality flint nodules, and clusters of knapping debris from working these nodules have been found in the ditches of the Stonehenge Cursus and the Amesbury 42 long barrow (Julian Thomas pers comm; Richards 1990). In the Neolithic, flint was also obtained by excavating mines, for example at Durrington and Easton Down, Winterslow (Barber *et al* 1999).

Working flint

Flint is a hard but brittle form of silica, much like glass, that can be worked by 'knapping'. Knapping exploits the flints conchoidal – literally shell-like – pattern of fracture that, with skill, can be controlled and directed. By striking the edge of a flint nodule with a hammer made of deer antler or a stone pebble, a flake can be detached of a desired form. A punch may also have been used. This flake can be further modified into a formal tool type by retouching, which is the removal of small flakes to create a desired shape. Retouching can be achieved by direct percussion or pressure flaking. The former involves striking an antler or pebble against the flake edge, while the latter requires a point, such as the tip of an antler tine, to be placed on the edge of the flake and pressure applied until a small retouch chip is detached. The finest artefacts, such as arrowheads, were manufactured by pressure flaking.

Flint toolkits

Mesolithic

Comparatively little Mesolithic flintwork is known close to Stonehenge, although recent excavations on the Stonehenge Palisades yielded a small number of artefacts (Author's data, Stonehenge Riverside Project Site PAL'08). Large flint assemblages have been recovered from the close to the river, eg Vespasian's Camp (Barry Bishop pers comm) and Bluestonehenge (Ben Chan pers comm). Mesolithic flintwork is based upon the production of narrow, parallel-sided blades. The blades were used in this form, or modified into retouched tools. The most common Mesolithic tool is the microlith: a blade that has been truncated or backed by retouch. Various forms of microlith were manufactured (eg obliquely-blunted points, rods, and scalene triangles) and many can be broadly dated to either the Early or Late Mesolithic (eg Clark 1934; Jacobi 1978b). Microliths are thought to have been used in composite tools and are likely to have been set within a wooden haft using mastic. For example, an arrow would have consisted of several microliths embedded in the sides of the shaft as barbs and one microlith mounted as the tip. If one of these flints was broken during use, it was removed and replaced with a microlith of the same form. Graving tools (burins) for working antler, piercers and scrapers are also commonly found.

Neolithic to Early Bronze Age

Flint-working techniques dramatically changed at the beginning of the Neolithic: microliths disappear and new tools replace them, such as single-piece arrowheads and polished axes. The production of fine narrow blades also declines in favour of broader flakes. Arrowheads are a key feature of these periods and their forms change over time in broad correlation with ceramic styles. Leaf-shaped arrowheads are found in the Early Neolithic with Plain Bowl pottery; chisel/transverse arrowheads are found in the Middle Neolithic with Peterborough Ware; oblique arrowheads characterise the Late Neolithic and are found with Grooved Ware; while, barbed and tanged arrowheads date from the Early Bronze Age and are associated with Beaker pottery. This pattern indicates these arrowheads are not just functional, but are being used alongside other artefacts to make statements of cultural identity.

Fig 11.14 Polished Neolithic stone axehead with re-worked butt end from the Stonehenge Riverside Project excavations on the Stonehenge Palisades (PAL'08). Maximum length 81mm. Photograph by Hugo Anderson-Whymark, reproduced by permission of Stonehenge Riverside Project

At Durrington Walls hundreds of oblique arrowheads have been recovered and the tips of arrowheads have also been found embedded in pig and cattle bone (Albarella and Serjeantson 2002; Chan 2010). This could indicate that domesticated or semi-domesticated animals were being 'hunted' as part of the activities at this site. Arrows were also used as weapons, as is attested by the tip of a flint arrowhead embedded in the skeleton of man buried in the Early Bronze Age in the ditch surrounding Stonehenge (O'Connor 1984: See also **Chapter 6 - People**).

Other common tools in the Neolithic and Early Bronze Age include polished axes, scrapers, piercers, knives, serrated flakes and strike-a-lights. Polished flint and stone axes were time-consuming objects to manufacture, potentially take up to 40 hours of grinding to produce a finished surface, but they made effective tools for clearing woodland and many appear to have been traded or exchanged over long distances to create or maintain social relations between communities (Bradley and Edmonds 1993). In contrast, the other tools are likely to have been manufactured locally for specific tasks. Scrapers are commonly considered to have been used for cleaning hides, but some may have been employed in woodworking. While, serrated flakes, sometimes called micro-denticulates on account of their fine serrated teeth, were used to work silica-rich plants, such as nettles, into fibres for textiles or cordage (Hurcombe 2007), and strike-a-lights were struck against iron pyrites to create sparks and fire.

Overall, the standard of flintwork declined from the beginning of the Neolithic to the Early Bronze Age and at the end of this period everyday flint-working was relatively basic. However, in the later Neolithic and Early Bronze Age a small number of high quality prestige artefacts were being manufactured by skilled craftsmen. In the Late Neolithic exceptionally fine ripple-flaked oblique arrowheads were deposited in the postholes of the Southern Circle at Durrington Walls (Wainwright and Longworth 1971), while flint daggers, plano-convex knives and thumbnail scrapers were manufactured in the Early Bronze Age. These latter tools were undoubtedly status items and many were included as grave goods in the barrows encircling Stonehenge (see **Chapter 10 - Design, Clothing and Personal Adornment**), for example a fine flint dagger was recovered from barrow G54 (Annable and Simpson 1964, 92).

Middle to Late Bronze Age

The use of flint tools declined in the Middle to Late Bronze Age as metal tools became more common, but flint was still employed for some tasks albeit perhaps infrequently. In the Middle to Late Bronze Age, broad and thick flakes were produced with little care or skill. The flakes were most likely used as expedient cutting tools and the only commonly produced retouched tools were scrapers and piercers. These tools indicate that flint artefacts were still used for hide processing.

Fig 11.15 Middle Neolithic chisel arrowhead from the Stonehenge Riverside Project excavations on the Stonehenge Palisades (PAL'08). Maximum length 32mm. Photograph by Hugo Anderson-Whymark, reproduced by permission of Stonehenge Riverside Project

Fig 11.16 Later Neolithic oblique arrowhead from the Stonehenge Riverside Project excavations on the Stonehenge Palisades (PAL'08). Maximum length 33mm. Photograph by Hugo Anderson-Whymark, reproduced by permission of Stonehenge Riverside Project

Bone Tools

Animals provided a range of resources to prehistoric societies - food, skins and traction (see **Chapter 5 – Animal Resources**). They also provided skeletal materials, bone, antler, teeth and horn that were used for the production of tools. Bone tools (a term sometimes used to cover objects made from all of these materials) were made and used throughout prehistory, and have been recovered from Stonehenge and other sites in the surrounding landscape. Most bone tool forms are chronologically unspecific, and can continue relatively unchanged for thousands of years. On prehistoric archaeological sites, bone tools are not as common as flint ones, probably due to bone's greater susceptibility to degradation. The varied properties of skeletal materials mean they could be used to produce a range of tools and objects that other materials were unsuited for.

Raw materials

The skeletal materials that were used in the production of tools included bone, tooth, antler and horn. These different materials combined with the variable forms of skeletal elements results in a range of properties (MacGregor 1985) which prehistoric people exploited in making bone tools. The skeletal elements most commonly used in tool production were bone and antler followed by teeth; the use of horn is little understood as it rarely survives on archaeological sites.

Bone and antler are natural composite materials, consisting of crystalline hydroxyapatite that provides strength as well as rigidity; and a flexible fibrous protein, collagen, which makes the structure more flexible and provides resistance to breakage. The properties of skeletal elements vary. Long bones are particularly strong in compression, having evolved for load bearing. Antlers, used by deer for display and fighting during the rut, are resistant to damage from impacts. Tooth enamel is particularly hard and resistant to abrasion.

Skeletal materials used in tool production came from both domestic and wild species. The sourcing of bone would rarely have been a problem in the past as it was a ubiquitous waste product easily available. Antler would only be available from wild deer and could have come from hunted animals or shed antlers discarded by stags after the rut. Teeth would have been as ubiquitous as bones. Where specific teeth or species were desired (such as a large carnivore) these may have been more difficult to source.

The choice of which skeletal element to use in tool production was determined by a number of factors - the physical properties of skeletal materials, the suitability of a skeletal element's size and shape for producing the desired object, and the availability of the desired skeletal element.

Working techniques

The techniques used in the manufacture of bone tools were relatively simple. Most production comprises two stages - rough out and final shaping. The techniques used in bone working include groove and splinter, groove and snap, chopping or smashing, chipping, scraping, whittling, grinding and drilling. The extent of work associated with tool production will depend on the original skeletal element used and the desired final form. Some bones require relatively limited alteration to become a useful tool while others require extensive modification.

Rough out production Rough out production involves the removal of large quantities of material to produce a rough outline of the desired tool. This can be done with relatively crude techniques such as smashing or chopping to produce splinters or remove extraneous parts. More refined techniques include groove and splinter or groove and snap. In these, a groove is cut along or around a bone with a flint and the piece is then split or snapped along the pre-made grooves. This gives much greater control in producing the rough out.

Final shaping In final shaping the tool rough out is cleaned up, refined and smoothed to produce the desired object. The main techniques used in shaping were grinding and scraping. These two techniques produced distinctive scratches and marks on the surface of the bone that can be distinguished to identify the technique used. Grinding involved the shaping and smoothing of rough outs by rubbing them against a rough stone such as sandstone. Scraping or whittling with a flint was also used to shape and smooth a rough out. Drilling was used to perforate objects. Drilling usually involved a flint, working from both sides of the desired hole resulting in a distinctive hourglass shape. Deliberate smoothing or polishing may have finished the tool. Caution should be used in interpreting polish as it can also arise from use.

Use

Many bone tools show evidence of their use in the wear that can be seen on them. This wear tends to concentrate in two areas, on the working end of the tool and where it was held. Various types of wear are identifiable and these are indicative of the action and material the tool has been used on.

Polish – this is seen on the object's working end and where held. It is generally indicative of rubbing movements on smooth or fine grained materials and may result from weaving, sewing, leatherworking and burnishing pottery. Specific types of wear and polish such as beading can be produced on the teeth of combs used on hair or for processing fibres.

Scratches – wear can result in fine or coarse scratches. Where scratches from wear are numerous and unidirectional, they identify the direction of movement and therefore how the tool was used. Numerous coarse scratches can be found on the working ends of digging tools.

Chips – chips both small and large can be detached from the working ends of tools. Small individual chips are often accidental and not associated with the tool's use whereas large multiple chips are indicative of use and are inevitable on digging tools. Antler picks are often worn down to small stubs through repeated use with the end chipped and battered.

While the use of some bone tools such as antler picks or pins appears fairly clear there are many tools for which this is not the case. Many tools, particularly general points and spatula-like tools, could be multifunctional and consequently have a mix of wear from different uses.

Tool types

Excavations at Stonehenge have recovered around 174 bone tools (Cleal *et al* 1995). The assemblage reflects the activities undertaken on the site during its construction and use. The Stonehenge bone tool assemblage is similar to those seen on some of the other large henges in the area such as Durrington Walls (Wainwright and Longworth 1971) and is different to those seen on many prehistoric settlement sites.

Large digging tools The large digging tools commonly associated with Neolithic and Bronze Age monuments are antler picks, rakes and scapula shovels. At Stonehenge 130 digging tools were recovered, tools probably used in the excavation of the ditch, stone holes and pits. The manufacture of antler picks from red deer antler usually involved the removal of all bar one tine (see **Chapter 5 – Animal Resources**), but at Stonehenge the antler picks were unusual as often more than one time was left in place (Serjeantson and Gardiner 1995). Antler picks were used to dig into the chalk making, or exploiting, cracks in the rock and then levering out blocks. Antler rakes utilising several tines were probably used to gather up the loose rubble from excavation. The use of scapula shovels at Stonehenge is less clear, as only 11 ox scapulas were recovered from the site and only one appears to have been used as a shovel. Scapula shovels are similarly rare at Durrington Walls and it has been suggested that scapula shovels are not suitable for use on chalk (Serjeantson and Gardiner 1995) although the presence of scapula in flint mines suggests they must have been of some value in excavation in chalk (Russell 2000). The deposition of antler picks at large Neolithic monuments has prompted much discussion over the deliberate structured deposition of antler picks. The small assemblage from Stonehenge limits potential analysis there, but the recent excavations at Durrington Walls (Parker Pearson *et al* forthcoming) has enabled a reassessment of the large assemblage from this site (Wainwright and Longworth 1971) supporting the idea that antler picks were subject to structured deposition (see **Chapter 9 - Depositional Practice**).

Fig 11.17 Antler pick from Durrington Walls showing stumps of removed tines and the chipping and scratches on the brow tine used as the pick. Photograph Glyn Davies (Courtesy Durrington Walls Excavations)

Decorative objects Ten bone pins have been recovered from Stonehenge. Many were burnt and recovered from cremation deposits (Montague 1995). Such pieces, usually made from a splinter of long bone, were probably used to fasten clothing or hair. The association with burials at Stonehenge suggests these pieces were pyre goods possibly worn by the deceased. The other group of decorative objects commonly made from animal skeletal material in the Neolithic or Bronze Age are beads, made from bone or tooth. None have been recovered from Stonehenge, although they are known from other monuments in the area such as Durrington.

Fig 11.18 Bone pins from Durrington Walls made from long bone splinters; one pin has a perforated head. Photograph Glyn Davies (Courtesy Durrington Walls Excavations)

Everyday tools There are a number of bone tools such as points, awls, spatulas and scrapers that are very common on Neolithic or Bronze Age sites in general but are relatively rare at Stonehenge. These everyday objects, that would have had numerous functions, are represented by only seven tools from Stonehenge and are similarly rare at Durrington Walls. They are generally common on settlement sites of this period across Britain and Europe and their absence demonstrates that the activities they are associated with (leather working, weaving, basketry and pottery production), were not commonly undertaken at Stonehenge and the other monuments in the surrounding landscape.

Fig 11.19 A short bone point from Durrington Walls, the point is manufactured on a longitudinally split metapodial with the proximal end forming the handle. Photograph Glyn Davies (Courtesy Durrington Walls Excavations)

Weapons/hunting equipment Weapons and hunting equipment, eg bone arrowheads and fishhooks are rare in the archaeological record but do occur. None have been recovered from Stonehenge or Durrington Walls. Due to the rarity of these objects in the archaeological record generally, one should avoid over interpreting the absence of data, as other material such as flint could have been used for arrowheads.

Metals

The construction of Stonehenge started during the Late Neolithic before metals of any kind were used in the British Isles. The earliest phases were built in the later third millennium and overlap with the first appearance of metals (copper and gold) in Britain. The use of metal artefacts increased during the subsequent Early Bronze Age period when the stones were rearranged. The evidence for metal manufacture during these periods is very limited—this is true not just for the immediate vicinity of Stonehenge but applies to the British Isles as a whole. There is, however, abundant evidence for the use of metals as prestige items, especially from rich burials of the period.

The evidence from metal artefacts

The use of metals in the Chalcolithic and the Early Bronze Age in the Stonehenge area is known almost exclusively from burials. Among the earliest finds are the copper knives and gold ornaments from the Amesbury Archer burial, dated to the third quarter of the third millennium BC (Fitzpatrick 2011). Broadly contemporary Beaker burials, occasionally containing copper daggers and gold ornaments, are known in the region (Annable and Simpson 1964). Early Bronze Age gold artefacts are known from many parts of the British Isles, especially Ireland, although many are stray finds (Eogan 1994; Taylor 1980). A large part of what we know about the Early Bronze Age comes from the rich and varied 'Wessex' burials (Needham *et al* 2010) (see **Chapter 10 - Design, Clothing and Personal Adornment**). The importance of metal axes and daggers to the people who used Stonehenge is also highlighted by the presence of carvings of these objects on various Sarsens (Fig 11.21).

Fig 11.20 a) Bronze daggers from Wilsford G23 bowl barrow. Collection: Wiltshire Heritage Museum, Devizes. © National Museums Scotland b) Bronze axehead from Mount Pleasant, Dorchester. Collection: Dorset County Museum, Dorchester. © National Museums Scotland

The evidence from metal composition

The scientific examination of a selection of copper artefacts of this period (Allen *et al* 1970; Case 1966; Coghlan and Case 1957) has shown that the earliest artefacts (especially the thick-butted axes) were made of an impure copper (it should be noted that the vast majority of the early axes analysed have Irish provenances). The copper usually contains a suite of minor and trace elements which points to the use of a metal obtained from ores—there is no evidence for the use of naturally-occurring (native) copper in the British Isles (Coghlan and Case 1957). Arsenic is often the most prominent of the minor elements present and it would have had a slight effect on the properties of the metal (eg to make it somewhat harder than pure copper), but easier to cast. There also appears to have been some selection of different grades of metal for different artefacts. The rivets used to fix organic handles to tools and weapons are frequently of a more pure (and so softer) copper.

Needham *et al* (1989) have shown that the change from copper (or arsenical copper) to tin bronze occurs in the last quarter of the third millennium BC and is associated with the change from thick-butted to thin-butted flat axes. The tin content of British bronze in the Early Bronze Age is consistently and relatively high (8–15 % by weight); this suggests the deliberate alloying of copper with metallic tin (McKerrell 1978; Needham *et al* 1989). There are several possible advantages of tin bronze over copper, in particular the metal will melt at a lower temperature and once solid, the metal will usually be harder (Allen *et al* 1970). Nevertheless, it is widely accepted that arsenical and other impure coppers of the Chalcolithic would "give service for cutting implements not much inferior to that of the average tin-bronze" (Coghlan and Case 1957). The addition of tin may have been undertaken for non-technical reasons. Tin bronzes are a different colour to copper; the exact colour of the alloy depends on the proportion of tin but most bronzes have more golden colour than pure or impure copper. It is striking that the metal artefacts from Bush barrow include examples made from both arsenical copper and tin bronze. Although the existence of tin bronzes clearly must imply the exploitation of tin ores, there is very little direct evidence for how this was achieved. Tin objects are rarely found in the archaeological record, but have recently been identified among the beads from the Early Bronze Age burial at Whitehorse Hill (Jones *et al* 2012).

The range of minor and trace elements present in prehistoric copper and copper alloys has frequently been used to propose a particular origin for the copper ore (eg Coghlan and Case 1957; Needham *et al* 1989; Northover 1980; Wilson and Pollard 2001). Coghlan and Case (1957) suggested that the minor and trace elements present in the early copper axes they analysed indicated that the metal was smelted from Irish ores (O'Brien 2004). In particular, the *fahlerz*-type ores are seen as suitable because they contain the range of minor and trace elements seen in early copper artefacts: arsenic, antimony and silver.

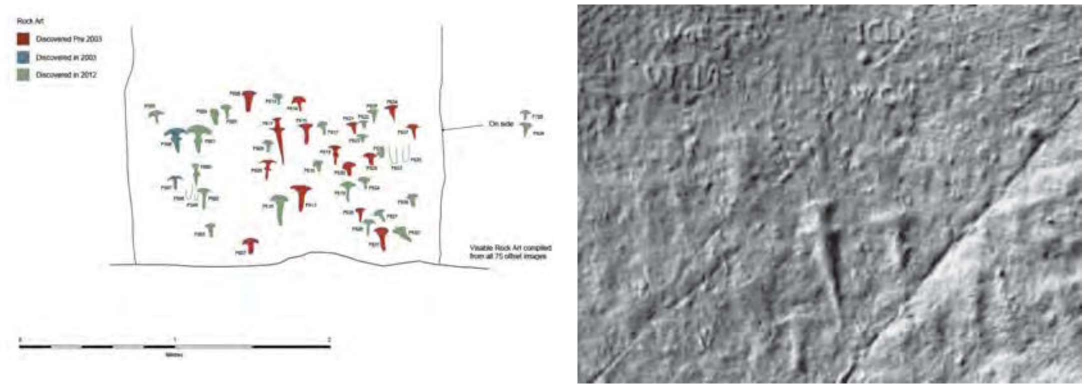


Fig 11.21a) Carvings of daggers from Stone 53 (Abbott and Anderson-Whymark 2012) © English Heritage b) Laser scan image showing detail of the same carvings. (Reproduced courtesy of Archaeoptics Ltd). © Wessex Archaeology and Archaeoptics Ltd

Early copper smelting

There is very little evidence for the actual production (smelting) of early copper, however, this is a situation which is common to much of Europe and the Middle East. While evidence from later periods often includes furnace remains and large slag heaps (eg Rothenberg 1990) the earliest smelting activities are poorly known. The limited direct evidence for metallurgical activity in the Early Bronze Age suggests that the smelting of copper ores did not lead to the formation of significant quantities of slag (Craddock and Craddock 1997; Bourgarit 2007). Modern and historic copper smelting always involves the formation of a slag which allows the effective separation of metal and unwanted elements from the ore.

The almost total absence of early slags has led to the proposal that early copper smelting may have taken place at a low temperature which would have reduced the copper ore to metallic copper but which would not have melted the other elements or allowed the formation of a conventional free-flowing slag (Bourgarit 2007; Budd *et al* 1997; Craddock and Meeks 1987; Hauptmann 2003). According to this model the copper would be present as small prills within a sintered mass of partially melted/slagged ore which would be broken up to recover the copper. This model appears to agree with archaeological evidence from several Chalcolithic sites in Europe (Bourgarit 2007) which have yielded large shallow hearths, shallow crucibles, copper ore and droplets of metallic copper (often containing arsenic).

Early copper mining

Until recently virtually nothing was known about the early mining of copper ores in the British Isles (Tylecote 1986). It was widely assumed that the intensive exploitation of copper ores in the recent past would have destroyed all traces of early mining. Nevertheless recent field survey, underground exploration and archaeological excavation have identified at least twenty sites where copper ores were mined in prehistory (Crew and Crew 1990; O'Brien 2004; Timberlake 2003a; 2003b; Timberlake and Prag 2005). Very few of these sites have been proved to be contemporary with the earliest use of metals in the British Isles (Ross Island in Ireland is a notable exception). More unsettling is the fact that the ores that would have been obtained from most of these mines would contain rather modest proportions of those minor and trace elements that characterise the copper used for Chalcolithic and Early Bronze Age artefacts. It is striking that virtually no evidence has yet been recovered for prehistoric mining or smelting of copper in Cornwall and Devon, despite the fact that this area could provide secondary copper ores that would have been relatively easy to smelt and would have yielded copper within the right range of impurities (Budd *et al* 1997; Ixer and Budd 1998). The intensive exploitation of copper ores in this region may account for the lack of evidence for any earlier exploitation.

Early gold working

Chapman *et al* (2006) have analysed examples of Early Bronze Age Irish gold artefacts, as well as samples of gold from alluvial deposits. They suggest that early Irish gold artefacts were made from Irish alluvial gold and that this was not alloyed with other metals. Ixer (1999) cautions that the complex variation in the composition of alluvial gold (even from a single placer deposit) may make such provenancing uncertain.

Pottery

All Neolithic and Bronze Age pottery was handmade and most vessels would have been built up from coils or rings of clay (Gibson and Woods 1997, 37-40) mixed with inclusions such as crushed flint, pottery (grog), sand and shell. In many cases these were deliberately added tempers but sometimes they were inherent in the clay (eg fossil shell), which may have been chosen for this reason. The choice of clay sources and tempers would have had both functional/technical and cultural/symbolic significance (Hamilton 2002, 39–40).

A variety of simple tools for preparing materials, forming pots and finishing surfaces may have been used in these periods, probably very similar to the Late Bronze Age and Iron Age examples illustrated by Hamilton (ibid, 42–3). Most prehistoric pottery was fired in open bonfires or simple pits (Gibson and Woods 1997, 49-53); because air flow is hard to control in those conditions, vessels often have mottled surface colours showing a range of oxidation states (though sometimes colours may have been controlled: see for example Darvill 2011, 165).

Pots were often carefully looked after by their users, as shown by the evidence for mendholes (drilled either side of a crack and tied together) in many of the styles discussed here (though Beakers in particular rarely seem to have been repaired: Hamilton 2002, 45).

Though the basic technology changed little, many styles of pottery were used between 4000 and 1600 cal BC in southern Britain, several of them overlapping in their currency (see **Chapter 10 - Design, Clothing and Personal Adornment**; also Gibson and Woods 1997; Gibson 2002). The Carinated Bowls of the earliest Neolithic (*c* 4000–3650 BC) are the oldest known, with as-yet poorly understood Continental affinities (see **Chapter 10 - Design, Clothing and Personal Adornment**; see also Whittle 1977). Typical are plain, sometimes burnished, round-bottomed hemispherical bowls with everted rims and sharp carinations often low on the body (Fig 11.22), but they are accompanied by other forms such as simple bowls, cups and jars (Cleal 2004); lugs and suspension holes are sometimes found. As Cleal (ibid, 177) notes, in a limited repertoire slight differences may have been highly important. The significant assemblage from the Coneybury Anomaly (Fig 11.22) demonstrates how broken pots were incorporated into middens and pit deposits which held great symbolic significance.

Overlapping with later Carinated Bowl assemblages are a number of regional styles of Plain and Decorated Bowls (*c* 3800–3300 BC) which are more or less contemporary with the appearance of causewayed enclosures around 3700 BC. These tend to have baggier shapes with weak shoulders and rolled or thickened rims; perforated and solid lugs are also found (Fig 11.23). The decorated vessels have simple incised or impressed motifs on their rims and upper parts. There is much regional variation, though many of the traditionally defined Bowl styles, such as 'Windmill Hill ware', now appear to grade into one another (Whittle *et al* 2011, 762). One exception is 'Hembury ware' (see **Chapter 10 - Design, Clothing and Personal Adornment**), part of a broader South-Western style that has a strong presence in Wessex, accounting for about 5% of Early Neolithic vessels at some sites, such as Maiden Castle (Cleal 1991). Bowl fabrics in Wessex are mainly flint-tempered, with a large minority containing shell (Cleal 1995).

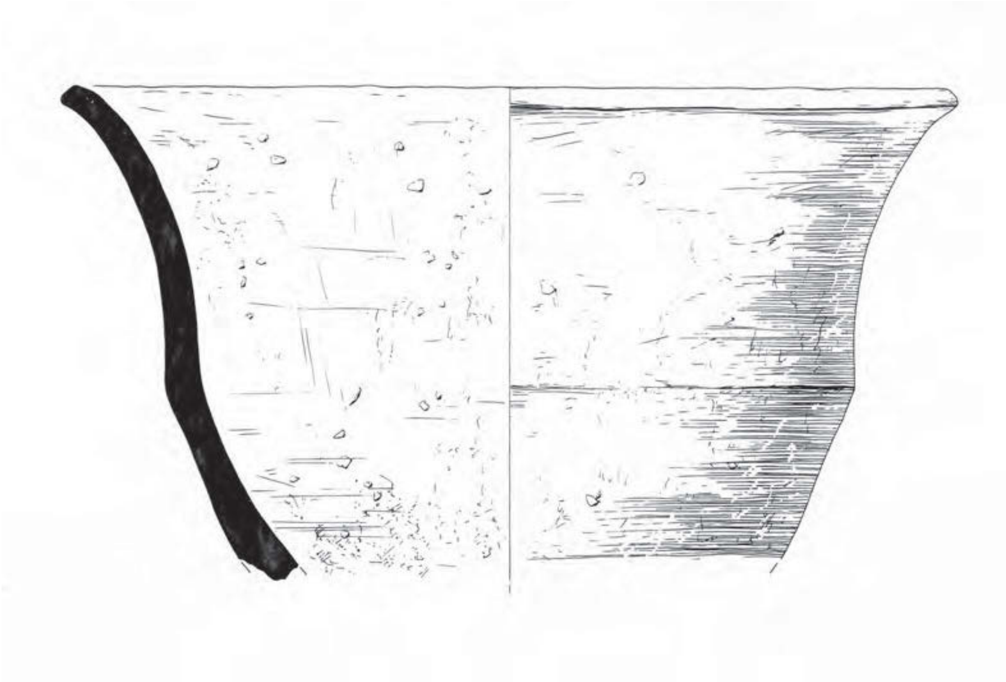


Fig 11.22 Carinated vessel from the Coneybury Anomaly near Stonehenge (Richards 1990, fig 28) © English Heritage

Fig 11.23 Windmill Hill pottery from Devizes Museum (EH photo library: J870387). © English Heritage

In the Middle Neolithic (*c* 3400–2800 BC) there is less regionality and the three main styles of Peterborough Ware (Ebbsfleet, Mortlake and Fengate) are widely distributed. These are insular developments which represent increasing elaboration of form and decoration within the bowl tradition. Heavy rims and profuse cord (often in the form of whipped cord 'maggots'), bone and finger impressions are typical, especially in the Mortlake style (Fig 11.24). Jars, dishes and cups occur in small numbers alongside the standard bowl form. Fengate-style vessels are distinguished by novel elements including collars and small, flat bases which resemble those on later Collared Urns (see below), though there is clearly a chronological gap (see Gibson and Kinnes 1997). Fabrics are similar to the earlier wares (Cleal 1995). Around Stonehenge, Peterborough sherds occur in surface scatters and buried soils under later round barrows.

Fig 11.24 Mortlake style vessel with impressed decoration from West Kennet long barrow, Avebury. © Wiltshire Museum, Devizes

Significant changes occur with the Grooved Ware of the Late Neolithic (*c* 2900–2200 BC; see **Chapter 10 - Design, Clothing and Personal Adornment**): it has a very different repertoire of flat-based tub- and bucket-shaped vessels with new styles of decoration including raised cordons and incised or grooved geometric motifs (Figs 11.25 – 11.26). Grooved Ware represents a clear break with the Bowl tradition after a millennium of gradual development. Whereas the predominantly round-bottomed Bowls were probably suspended or placed in pits or hollows, Grooved Ware pots could have stood on floors or furniture. Large assemblages have come from Durrington Walls and Woodhenge and broken vessels were often deposited in highly structured ways (Pollard 2002, 26). Fabrics also differ from what went before: shell is the main inclusion type regionally but grog was predominant at Durrington Walls (Cleal 1995, 190). This may reflect a distinction between the Durrington Walls style, with grog temper, bucket shapes and vertical cordons and panels, and the Clacton/Woodlands style, with shell temper, tub-shaped pots and horizontally ordered decoration (Barclay and Bradley 2011, 459).

Fig 11.25 Tub-shaped Grooved Ware vessel from Durrington Walls. © Salisbury and South Wiltshire Museum

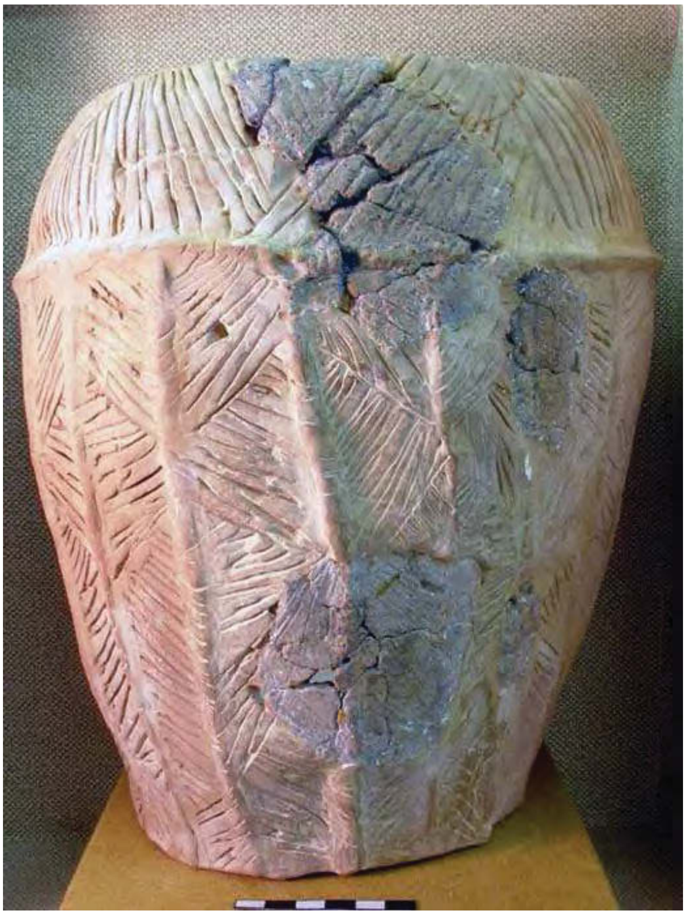


Fig 11.26 Bucket-shaped Grooved Ware vessel with vertical cordons from Marden henge. © Wiltshire Museum, Devizes

In the Early Bronze Age, settlement pits and other contexts are still found but the majority of finds are from graves; however, there is little evidence of typological differences between pots accompanying burials and those used in settlements. The Beaker pottery of the final Neolithic/Copper Age/Early Bronze Age (*c* 2500–1700 BC) is typified initially by bell-shaped vessels of Continental derivation. More effort has been spent on attempting to unravel the subsequent development of Beaker pottery than any other style, with no single scheme capturing all the variation, though both shape and decoration are important (Figs 11.27-11.28). Most recently, Needham (2005) has proposed a development from low-carinated Beakers before *c* 2250 cal BC to a variety of carinated, long-necked, short-necked and S-profile forms, only some of which persist beyond *c* 1900 cal BC. Decoration, often finely executed, is usually incised, cord-impressed or, most characteristically, comb-impressed. 'Rusticated' decoration with fingernail and fingertip impressions is more common on settlement sites though domestic Beaker assemblages have seen relatively little study since the work of Gibson (1982) and Bamford (1982). In Wessex inclusions vary, with grog, sand and flint all used, although not the shelly fabrics typical of Grooved Ware (Cleal 1995).

Fig 11.27 Tall mid-carinated Beaker from bowl barrow Wilsford G2b. © Wiltshire Museum, Devizes

Fig 11.28 Long-necked Beaker from barrow Amesbury G54. © Wiltshire Museum, Devizes

The late 3rd millennium sees the appearance of Food Vessels (*c* 2200–1700 BC), which may represent a resurgence or continuation of the Impressed Ware and Grooved Ware traditions. They are usually flat-based bowls with elaborate rims and often complex decoration; taller examples are known as Food Vessel Urns. Although more common in northern Britain and Ireland, Food Vessel bowls and urns have been found with burials in the Stonehenge region (Fig 11.29). In the early 2nd millennium they are supplemented by Collared Urns (Longworth 1984) and Biconical Urns (*c* 2000–1500 BC), both primarily found with cremation burials. Collared Urns (Fig 11.30) are tall jars with decoration, often in the form of cord impressions, mainly restricted to the rim and collar; they may represent a fusion of Beaker and indigenous Neolithic traditions. Biconical Urns, with shoulders but no collars, seem to have more Continental affinities; examples from Wessex often have horseshoe-shaped handles (Fig 11.31). Grog is favoured in pottery fabrics of the Urn tradition. Food Vessel and Urn cremations are sometimes accompanied by small Accessory (or Pigmy) Vessels, which are often elaborately decorated (Fig 11.32) and may have unusual features like perforated walls ('incense cups') or knobbly surfaces ('grape cups').

Fig 11.29 Food Vessel found with a secondary cremation in bowl barrow Winterbourne Stoke G13. © Wiltshire Museum, Devizes

Fig 11.30 Fine Collared Urn from bowl barrow Wilsford G7. © Wiltshire Museum, Devizes

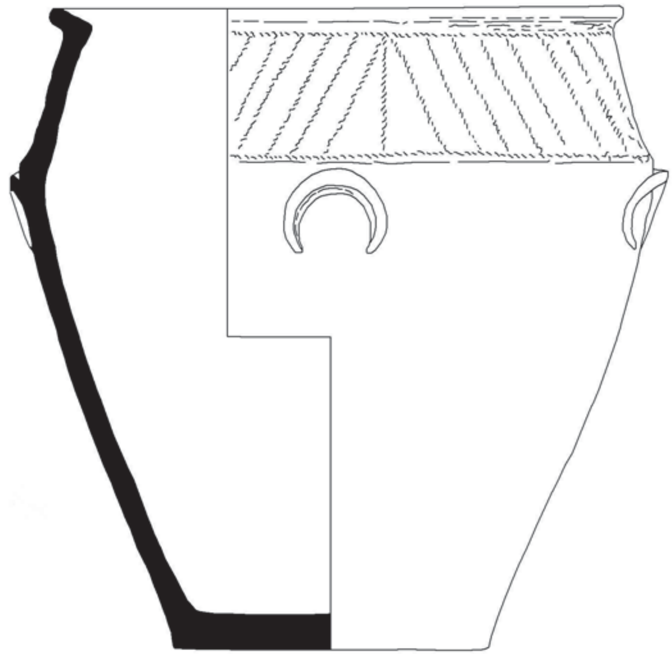


Fig 11.31 Drawing of a Wessex Biconical Urn with applied horseshoes from round barrow Bulford 47 (from Darvill 2005, ill. 83). © English Heritage

Fig 11.32 Accessory cup with perforations for suspension found with primary cremation in bowl barrow Wimborne St. Giles G10, Dorset. © Wiltshire Museum, Devizes

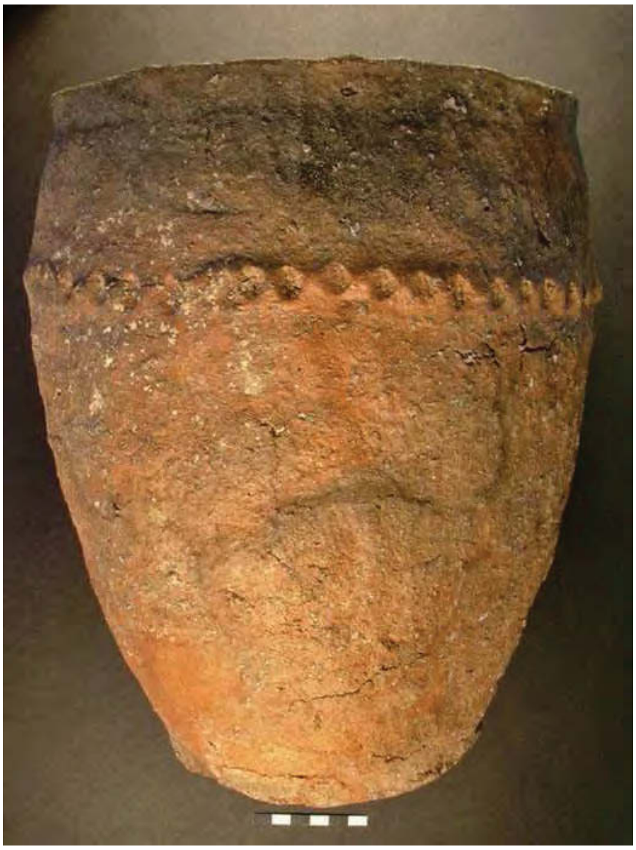


Fig 11.33 Bucket urn with a finger-impressed cordon found with a secondary cremation in bowl barrow Collingbourne Ducis G9, Snail Down. © Wiltshire Museum, Devizes

At the end of our period of interest, the Deverel-Rimbury style of the Middle Bronze Age (*c* 1600–1100 BC) continued the Urn tradition, though forms are largely restricted to simple bucket and barrel shapes with applied and finger-impressed decoration (Fig 11.33); flint once again became the main inclusion type in Wessex (Cleal 1995). However, smaller and finer globular urns may have been made by specialists and distributed over greater distances than coarse pots. Urns still occur in burial contexts but more domestic assemblages are known and for the first time pottery can be divided into different functional categories of fine, everyday and heavy-duty wares (Woodward 1995). Near Stonehenge, Deverel-Rimbury pottery is well-represented among the finds from the Wilsford shaft.

Chapter 12. Social Organisation and Gender

Jonathan Last

Theoretical approaches to status and identity

The main divisions in any small-scale human society relate to gender, age and status, though there may also be supra-familial affiliations, either based on kin groups, such as lineages, or cross-cutting them, such as moieties and clans (these need not be mutually exclusive). In theory it may be possible to identify some rules of kinship and marriage archaeologically, insofar as they relate to patterns of residence, either from the burial record (if isotope data suggest women were incomers to a settlement, for example) or from spatial distributions of particular stylistic attributes (eg ceramic motifs associated with different households). While such interpretations have been attempted for the Linearbandkeramik of west-central Europe (eg van de Velde 1979), the nature of settlement and burial evidence in the British Neolithic and Early Bronze Age has not yet facilitated similar kinds of analysis.

Alongside kinship structures in most communities some individuals would have had higher social status and authority that was either acquired during their lifetime ('big men', elders or lineage heads) or inherited and in turn passed on (chiefs); this may also mark a distinction between rank that was contested and uncontested (Mann 1986, 37). The presence of large monuments, like Stonehenge, and/or wealthy burials are sometimes seen as marking the appearance of chiefdoms. Accordingly in the 1970s and 1980s British prehistorians developed a number of complementary or competing social models that interpreted aspects of the prehistoric record in terms of, for example, a shift from clan to lineage organisation during the Neolithic, the emergence of territorial chiefdoms in Wessex, or the appearance of 'big men' in the context of prestige goods economies.

General social theory has tended to see more complex social forms, such as chiefdoms and states, evolving from simpler ones. However, early models of social evolution that were dependent on external causes like population pressure were critiqued by structural Marxists, who outlined how internal structural conditions in one stage could lead to the next (Friedman and Rowlands 1978). Michael Mann's influential volume on The Sources of Social Power eschewed social evolution, however: prehistory offered many examples, including Stonehenge, where relatively centralised authority did not "consolidate into a coercive state" (Mann 1986, 64) because élites have rarely been unitary and people have always been able to move away (ibid, 66). Nevertheless, for Mann the Neolithic was characterised by "a drift toward greater fixity of settlement and organization … Fixed settlement traps people into living with each other, co-operating, and devising more complex forms of social organization" (ibid, 42). "Locality or kin – or a combination of both – could offer organizational frameworks for denser, role-specialized social networks" (ibid, 44). The distribution of many phenomena in the period under consideration, such as henges or Beaker pots, "points to a common culture over an area much bigger than that of authoritative social organizations" (ibid, 47), in other words to the presence of "diffused power … [which] spreads in a more spontaneous, unconscious, decentered way throughout a population, resulting in similar social practices that embody power relations but are not explicitly commanded. It typically comprises … an understanding that these practices are natural or moral or result from self-evident common interest" (ibid, 8).

Despite the increasingly sophisticated discussions of the 1980s, in recent years British prehistorians have, by and large, tended to eschew broad theoretical discussions of social models, preferring to consider the nature of people's interactions with individual monuments, often through analysis of 'structured deposition' (see **Chapter 9 - Depositional Practice**) or phenomenological approaches (ie how sites may have been experienced by people with different rights of access), as well as the construction of personal identities. The focus is more on how society was maintained or transformed through ritual, exchange and routine practices, than on how a social group should be labelled. This derives in part from a distrust of general models (especially evolutionary ones) but also from a realisation that social organisation is hard to infer archaeologically. For instance, status cannot necessarily be read directly from the burial record, since after death the human body itself becomes a symbolic resource that can be deployed and treated by the living in a variety of strategic ways, as in Shanks and Tilley's (1982) suggestion that collective deposits of human remains in long barrows masked social inequalities. As John Barrett (1995, 2–7) has pointed out in a critique of general social models, if we are to write history we need to understand processes of social reproduction through the concept of agency (how subjectivities are realised in practice) rather than looking for particular individuals such as chiefs.

More recently the nature of prehistoric agency has been addressed in terms of 'personhood'. For example, Chris Fowler (2005) focusses on the creation of identity through interaction within a system composed of plural social positions, rather than looking for 'identity groups' such as 'élites' or 'women'. Seeing personhood as related to kinship, he discusses ethnographic ideas of 'permeable', 'partible' or 'fractal' persons – various forms of 'dividual', as opposed to the modern, western 'individual' – articulated through the exchange and fragmentation of objects (see **Chapter 9 - Depositional Practice**). Interpreting Neolithic and Early Bronze Age society in terms of fractal personhood in part reflects the fact that archaeologists are far better placed to investigate the networks of inter-personal connections represented by material culture assemblages, in graves or elsewhere, than to interrogate informants about their self-consciousness. The risk is that a Melanesian model of the person is imposed on British prehistory when in the end, as Fowler (2005, 123–4) acknowledges, all human cultures have aspects of both dividuality and individuality. An archaeological approach to personhood must attempt to understand the degree to which a person's agency was enmeshed with that of others through those practices that leave an archaeological trace.

However, it is worth noting that our ability to understand people's diet and lifetime movement through stable isotope analysis has opened up a new window on the prehistoric (in)dividual, one that may have a bearing on understanding status differences (though for a cautionary note, see Pollard 2011). For instance, Rick Schulting (2011) has suggested that people buried in some Welsh caves may have had diets lower in animal products than those in cairns, although other studies have not found clear evidence for links between diet and status (eg Richards 2000). Ethnographic analogy indicates that travel may have been a source of prestige, those who had moved long distances (like the 'Amesbury archer' who probably originated in the Alpine region) perhaps accruing high social status (Helms 1988). But while the archer's rich grave goods tend to support this notion (see **Chapter 10 - Design, Clothing and Personal Adornment**), other, earlier examples may have a different interpretation. Josh Pollard (2000) notes that we still know little about the dynamics of Neolithic social organisation, but residential fluidity might have been a factor given that aggregation rarely seems to have been sustained; in a society with a high degree of mobility the easiest solution to a dispute may simply have been to move: Mann's 'trap' of settlement fixity may not have applied in the British Neolithic. Perhaps the woman and juveniles of later 4th millennium BC date found at Monkton-up-Wimborne in Cranborne Chase may reflect such a change of allegiance; they seem to have come from the Mendip area, about 80km from their place of burial (Montgomery *et al* 2000).

Whatever the theoretical position adopted, any attempt to reconstruct prehistoric social organisation has to draw on multiple lines of evidence including the architecture of houses (rare in this period) and monuments, the burial record (treatment of the body, grave goods and scientific analysis), depositional practices and artefact biographies.

Monuments, territories and chiefdoms

Evidence for institutionalised status differences could include the appearance of large-scale undertakings that imply some kind of organiser or leader. However, groups may also come together of their own free will for collective projects, and the segmented nature of many Early Neolithic monuments (causewayed enclosures and bayed long barrows) could be interpreted in these terms, each family or household being responsible for one section. Relatively egalitarian models have usually been favoured for the Early Neolithic, linked to an emphasis on generalised ancestral power, as materialised in long barrows and chambered tombs, rather than wealthy or powerful individuals. There has always been a temptation to associate tombs and enclosures with territorially discrete social groups ('tribes') but they are not always evenly distributed in the landscape, while distributions of particular classes of monument may not match those of contemporary artefact types, suggesting overlapping social networks that operated at different scales. The ability to access long-distance exchange networks for the acquisition of polished stone or flint axes (see **Chapter 10 - Design, Clothing and Personal Adornment**) may have been one means of accruing prestige in the Neolithic, though we have to be wary about concepts such as 'wealth' since these objects may have been 'inalienable possessions' transferred as gifts (Weiner 1992). Rather than territory, for Barrett (1995, 140) it is the nature of tenure (access to land) that was important. The emergence of cursus monuments in the later 4th millennium BC (possibly) and the development of field systems in the earlier 2nd millennium BC (certainly) indicate significant tenurial changes and reflect new understandings or perceptions of landscape.

It is easier to see the hand of formal leadership or control in the large monuments of the Late Neolithic, such as Stonehenge and Avebury, though even these reveal signs of a collective approach, having been built episodically, subject to change or reworking and perhaps left unfinished (Tilley *et al* 2007). Colin Renfrew's (1973a) idea that the large Wessex henges represent the emergence of territorial chiefdoms, whose power could be measured by the 'man hours' of labour represented in the different monument complexes, has been extremely influential but much critiqued in recent years. For instance, Colin Richards (2009) has shown that labour needs to be understood as social practice, rather than simply quantified; while as Alasdair Whittle (1997, 147) has pointed out, it is inappropriate to take single features such as monument construction "out of context to imply the existence of a societal type for which there is no or little other supporting evidence". The problem with interpreting Stonehenge and similar sites as 'temples' is that in Mann's terms this implies a centralised institution just one step away from a state, yet there is no evidence for the fixity of settlement required for a social structure of that complexity. This mismatch between the major monuments and the rest of the archaeological record seems to be at the heart of the problem of putting a social label on Late Neolithic Wessex.

While current thinking generally still views Stonehenge and the other monument complexes as representative of social entities engaged in some kind of competition or emulation, and certainly indicative of long-distance contacts, it therefore eschews the recognition of highly ranked societies and clear territorial or cultural boundaries: for instance, Jan Harding (2000, 32) talks about "spatially fluctuating networks of continually negotiated inter-relations". However, the debate about chiefs continues, with the argument first set out by Renfrew for a centralised authority which could organise the construction of large-scale works restated by Euan MacKie (1997) in terms of theocratic élites with sophisticated astronomical knowledge, and countered by Ruggles and Barclay (2000). Recently Parker Pearson et al (2009) have revived the idea in another form by interpreting the cremation burials from Stonehenge as a dynastic succession of rulers "whose hereditary hold on power is revealed to us by their increasingly dramatic manipulations of workforces moving large stones". But although formal burials are extremely rare in the earlier 3rd millennium BC, suggesting the people interred at Stonehenge did indeed have some kind of special status, the absence of osteological evidence that they were related means a dynastic interpretation remains speculative (but see below). Nevertheless, many timber and stone circles, including Stonehenge itself, restrict access (physical or visual) to the centre of the monument, implying the existence of a small group of privileged people (social élites or ritual specialists?).

The end of the large monuments equally remains open to different explanations. It now appears that successive types of Neolithic monument (causewayed enclosures, cursuses, large henges) may have been constructed in cycles or bursts with periods of reduced activity in between. There certainly seems to be a correlation between the end of construction activity at the major Wessex henge monuments and the emergence of large round barrows, though these often still seem to be focussed on the older sites, as at Stonehenge itself. Although round barrows are often seen as individual rather than communal monuments, Paul Garwood (2007b) has suggested that Early Bronze Age barrow cemeteries may have served as arenas of equivalent importance to the older enclosures. To what extent these changes were contested is also uncertain, though violence is only occasionally attested, as discussed below.

Burials, élites and violence

Caution is certainly required in using the burial record as evidence for social organisation in prehistory, not least because the post-mortem treatment of the vast majority of people in all periods did not leave any record. It might therefore be inferred that those found in formal graves of any kind had special status in life – though that status could of course be ‘outsider’ or ‘victim’ rather than ‘élite’ or ‘leader’. However, it is also clear that the nature of the burial record changed considerably through the period in question. There has been little recent work on Early Neolithic human remains from the Stonehenge area but elsewhere the longstanding idea that long barrows were the repository of disarticulated ancestral bones has been modified somewhat; reanalysis often shows them to contain a smaller number of more complete skeletons (eg some 21 people were interred at Ascott-under-Wychwood in Oxfordshire, rather than the initial estimate of over 40), suggesting that disarticulation resulted from bodies being moved as new ones were inserted – though there is still evidence of remains being interred in a defleshed state, as in the first phase at Fussell's Lodge, Wiltshire. In addition the primary mortuary phases at many long barrows are now seen to be shorter than was once assumed, usually lasting less than a century (Bayliss and Whittle 2007). While people of both sexes and all ages are represented, there is often a preponderance of adult males, but we do not presently understand how people were selected for burial in long mounds, nor why some chambers have more remains than others (Whittle et al 2007). The same goes for the growing number of Early and Middle Neolithic flat graves that are known, such as the possible adult female (the sexing was not conclusive) from Blackwall in London (Coles et al 2008); in the Stonehenge landscape, Thurnam excavated several complete skeletons from long barrows which are mostly male – such as the primary burial from Winterbourne Stoke (Darvill 2005, 43) – but not exclusively so (see **Chapter 6 - People**).

The variety in numbers and disposition of human skeletal remains beneath earthen long barrows in Wiltshire and beyond is summarised by Field (2006b 132–40). Though barrows were clearly places where community identities were worked out and reproduced, the successive deposits of human remains, with "each occasion perhaps the opportunity for overt display" (Whittle *et al* 2011), may have been more significant than generalised notions of ancestral power. Evidence from stable isotopes suggests burials in long barrows derived from more local groups than human remains at causewayed enclosures (Richards 2000).

In the Late Neolithic, burials are extremely rare (which is why the Stonehenge cremations appear so exceptional) and new traditions of circular monuments without an overt funerary role take centre stage. It is only with the appearance of Beakers after *c* 2500 BC that significant numbers of graves are found once again. Usually characterised as part of a broader European single grave tradition, suggesting the emergence or enhancement of inherited status, Beaker mortuary practice is actually rather varied and includes nearly as much evidence for disarticulation and secondary burial as in the earlier Neolithic (Gibson 2007), suggesting that a clear ideological distinction between clans with a generalised body of ancestors in the earlier period and lineages with specific lines of descent in the later one is an oversimplification. However, the best-known and richest Beaker graves, such as those from Amesbury or Barnack, are whole bodies (usually male) buried with the accoutrements of an ideology that connotes archery (Fokkens et al 2008), metalworking (Fitzpatrick 2009) and possibly drinking alcohol (Sherratt 1987). The Amesbury archer was not only of exotic origin himself (isotope evidence suggests he was from the Alps) but also had access to Continental metal and non-local stone. While the archer's persona in Beaker graves may have been more of a fashion than an occupation (many of the stone wristguards and finely made arrowheads were more for display than use - see **Chapter 10 - Design, Clothing and Personal Adornment**) the possible special status of smiths and metalworkers has been much discussed ever since Childe (1930, 4–5) conceived bronzesmiths as "perhaps the first independent craftsmen" who "would easily gain credit for supernatural powers among barbarians to whom all stones looked much alike." Whether Beaker burials mark people who had acquired status or inherited authority therefore remains moot.

The Beaker graves are precursors of developments in the Early Bronze Age proper, especially after *c* 1950 BC, although the richest ('Wessex culture') graves show a diverse array of goods and mortuary practices that contrast with the more restricted, or even cliched, Beaker repertoire, suggesting limits to the way the dead were individuated in the earlier period. This diversity may be the key to making sense of the Wessex culture:

Needham and Woodward (2008) suggest that bringing different materials together can be seen as a record of the individual's (or kin group's) prowess in travel or procurement of exotic objects, both prestigious activities. Although the extent to which burial assemblages directly reflect someone's status in life has been questioned by those arguing for a relational construction of identity, access through long-distance exchange or trade to new types of 'wealth' (if that is the right way to define their value: see Fowler 2005, 128) in the form of copper/bronze, gold, jet and amber could well have played a role in defining an emerging social élite.

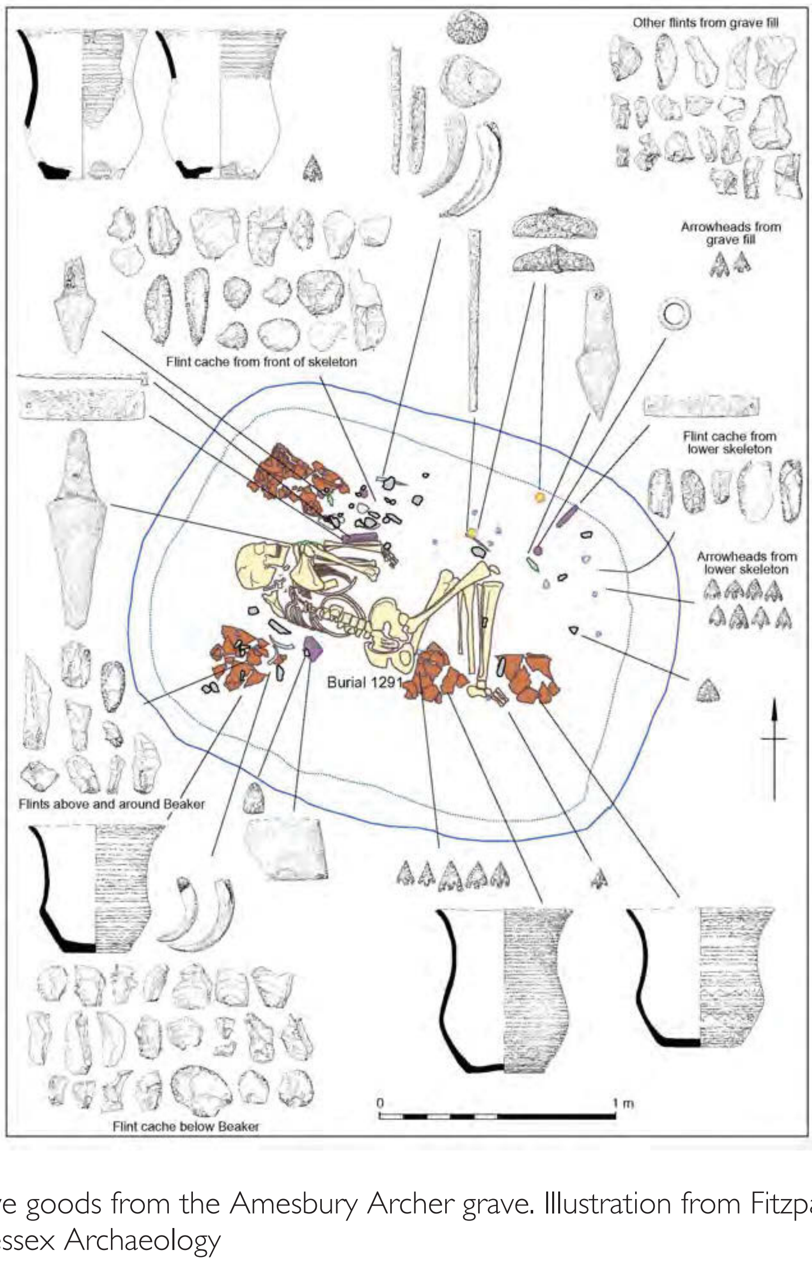


Fig 12.1 Grave goods from the Amesbury Archer grave. Illustration from Fitzpatrick 2011, fig 28. © Wessex Archaeology

Some of the artefacts do indeed seem to represent symbols of power: for example, the Bush barrow 'sceptre' (Needham et al 2010). The emergence of individual burials that refer to the (real or idealised) status of the deceased and the development of barrow cemeteries that seem to reflect genealogical succession suggest that heredity and hierarchy had become more important. The linear barrow cemeteries prominently positioned around

Stonehenge, like that on the Normanton Down ridge, may well have been fitting places for the burial of "certain notable people over a restricted period" (ibid, 31), in other words a dynasty. In other cases, rather than a series of burials under individual mounds, secondary interments were inserted into existing mounds, as at Wilsford G1. Diversity of practice among these élites may therefore argue against any institutionalised authority – a variety of strategies for acquiring status seem to have operated.

Fig 12.2 Bush barrow macehead with bronze and copper objects found in the same grave. Collection: Wiltshire Heritage Museum, Devizes. © National Museums Scotland

Recovery and scientific analysis of some of the human remains from these barrows, which were mostly reburied by Cunnington and Colt Hoare, may allow light to be shed on the origins and relationships of the Early Bronze Age élite from Stonehenge, but would not answer many other questions, for example about the uneven distribution of wealthy graves in Wessex (why are there so few around Avebury in comparison with Stonehenge?) or, once again, the nature of larger-scale social structures in a period for which we have almost no settlement evidence. Compared to the Late Neolithic, Renfrew (1973b) saw a shift from 'group-orientated' to 'individualising' chiefdoms in the Wessex culture, based on new forms of wealth (bronze) and weapons (daggers) but 'chiefs' have fallen out of fashion in more recent interpretations that stress the relational creation of identity, in death as well as in life. However, it is worth noting the arguments of Kristiansen (2007) in support of a chiefdom model for the Early Bronze Age of southern Scandinavia. He refers to "a networked, decentralised chiefdom", arguing that more egalitarian interpretations "underestimate the rules" governing barrow-building and other activities, which he characterises as "a network of exchanges and obligations linked to metal and prestige goods". Perhaps renewed interest in the rich graves and large barrow groups of the Wessex culture will revive the debate about social structures in Britain too.

However they are interpreted, the wealthy were always in a small minority; only about 5% of graves in this period can be characterised as rich. Later that number declines even further, as Urn cremations with few if any grave goods replaced inhumations. By the start of the Middle Bronze Age, burial rites were generally restricted to simple cremations (the spectacle was in the funeral, not the grave), though the appearance of field systems and metalwork hoards suggest the continuing development of social hierarchies linked to the control of land or other resources. In other words the loss of high-status burials may mean that, far from disappearing, inherited power became more institutionalised and less contested; offerings were made to the gods by the living (for example in rivers) rather than deposited in graves with the dead. While clearly a sea-change in the social order, the chronology of this process remains a little imprecise: Darvill (2005, 61) suggests that the first land divisions around Stonehenge were constructed around 2000 BC, but in general the origins of field systems are hard to date because they often contain little material, and what is present is frequently residual (cf. the Grooved Ware wrongly used to date the Bronze Age field systems at Fengate, Peterborough). In fact there is little compelling evidence for fields in southern Britain before the end of Wessex I, around 1750 BC. Investment in field systems seems to connote greater settlement fixity, but structured roundhouse settlements generally seem to be later in date so interpretations of fields in terms of increasing sedentism or intensification may be misleading (Wickstead and Johnston 2009).

Given the suggestion above that conflict resolution could have been simply a matter of one party moving away, we might not expect to find much evidence for actual violence (as opposed to warrior symbolism) in graves. For the Early Neolithic Schulting and Wysocki (2005) round up the skeletal evidence, showing that cranial injuries are found on individuals of both sexes but perhaps in rather low numbers compared to archaeological and ethnographic studies elsewhere (see **Chapter 6 – People**). Meanwhile Whittle et al (2011, 716–9) discuss the signs of collective violence at a number of causewayed enclosure sites in southern England, notably Crickley Hill and Hambledon Hill, affairs which imply inter- rather than intra-group conflict, and some level of social organisation above close kin.

In the later period weapons and warrior personae are more in evidence, but not necessarily conflict and violence. Braithwaite's (1984) model of competition between users of Grooved Ware and Beakers has been superseded more recently by a stress on inter-marriage and acculturation (Brodie 1997; Needham 2005). There is limited evidence for conflict at this time: parts of the timber palisade at the Mount Pleasant henge were burnt (Wainwright 1979), for example, but fewer Beaker skeletons have signs of physical injuries likely to have been caused by inter-personal violence compared to the Early Neolithic (one exception is the so-called 'Stonehenge archer' (see **Chapter 6 – People**); another is the man from Barrow Hills who was apparently killed by an arrow: Barclay and Bradley 2011, 446). The potential for violence was clearly present throughout the period but may have been largely ritualised, perhaps in order to prevent warfare, or because co-residential groups were generally small and more widespread conflict would therefore put their survival at risk.

Gender

Although today it tends to be subsumed in broader discussions of agency, identity or personhood, as outlined above, gender is another aspect of social organisation that can be addressed through the burial record, both in simplistic ways ('finding women') and more subtle ones (recognising the means by which gender structured social life). In terms of the former, the predominance of adult males in long barrows has been mentioned above, but this statement hides more complex patterning and variations between sites (eg West Kennet has roughly equal numbers of men and women, with the exception of the western chamber). Men of various ages seem to predominate among the Grooved Ware cremations from Stonehenge, which are suggested to represent patrilineal dynastic lineages, though females are also present (Parker Pearson with Willis 2010). Early Beaker graves, and rich ones throughout the period, seem to be overwhelmingly male, with more females apparent in the Early Bronze Age proper, but also considerable regional variation (see **Chapter 6 – People**).

Paul Garwood (2011, 406–8) has made a detailed study of Beaker and Early Bronze Age graves from the Thames Valley. He notes that early Beaker burials of women are "far rarer and less consistent in layout" than those of men, and they have fewer grave goods selected from "an extremely limited range of categories (Beaker, flint scraper, copper alloy awl)". Female graves also tend to be simpler and in secondary position to those of men; the only rule of orientation being a 'not-male' direction. Among later Beaker burials gendered distinctions do not seem to have been consistently maintained, though there are some cemetery-specific differences between males and females (ibid, 415–6). In the earlier 2nd millennium, once again female burials are less common than males but they have more vivid display in the form of colourful necklaces (ibid, 429–32; see **Chapter 10 - Design, Clothing and Personal Adornment**, Fig 10.7). However, in all periods the distinction between those who were buried at all and the rest seems more significant than between males and females within the buried group. The fact that there are women represented argues against any ideology of purely male status or descent, though the primacy of adult males is evident, especially in the early Beaker phase.

Jo Brück (2009) has also looked at the different treatment of men and women in Early Bronze Age burial rites, suggesting that the bodies of women were more frequently cremated and more often subject to fragmentation and dispersal after death. These practices are equated with women having a more 'fractured' sense of personal identity consistent with virilocal residence patterns. Male bodies, in contrast, may have been kept whole in order to reassert "the symbolic boundaries of the kin group", rather than expressing an ideology of individualism. Again, the distinction between traces of people's real lives and the personae they were given in death may be hard to define. Garwood (2008) has suggested there were differences not only in male and female artefact sets in Early Bronze Age cremations but also in funerary practice, male burials being associated with more overt display (eg in situ pyre sites) while female ones suggesting an aesthetic of 'modesty' (eg artefacts hidden within cremation deposits). Gendered identities are seen as depicting idealised versions of dichotomous male and female virtues.

Gender differences may also be discernible in other ways throughout this period, particularly from craft activities, though the common assumption that men knapped flint and women made pots is based more on ethnographic analogy than direct evidence from prehistoric Britain. Nevertheless if potting is interpreted as female practice, there are obvious implications for seeing the adoption of new ceramic styles such as Beakers in terms of virilocal residence: 'foreign' women marrying in to indigenous communities (Brodie 1997; cf. Needham 2005, 208).

Conclusions

Because the evidence for specific anthropological social formations, such as chiefdoms, is often ambiguous, recent work on the social organisation of prehistoric Britain has focussed more on how (in)dividual identity was constructed within a fluid social system whereby local communities or kin groups gained differential access to exchange networks of various type and scale through co-operation and competition. The traditional opposition between an Early Neolithic where the dead were incorporated into a generalised community of ancestors and a Late Neolithic/Early Bronze Age where 'élite' descent and lineages were marked out through single graves therefore needs to be tempered. Fowler (2005) notes the ambiguity of all the evidence that has been interpreted in kinship or clan terms. Constructing identity in a context of 'diffused power' was a strategic process, with shared concepts but no set rules (though see Kristiansen's (2007) Scandinavian model); hence while there are patterns in the ways monuments were used or people buried, there is also complexity and variability. In this scenario, discussion of whether we should call people 'chiefs' or 'big men', and whether we can distinguish male and female gender roles, is less relevant than investigating how conceptual understandings of social and cosmological order were materialised in monumental architecture and depositional practice, and how (in)dividual biographies can be read from burial rites and material objects. This seems to be the lesson of the recent trend away from applying general social labels to discussing personhood and identity. But the extent to which we can do this through the period in question varies according to the degree that these strategies had material correlates visible in the archaeological record (see **Chapter 9 - Depositional Practice**).

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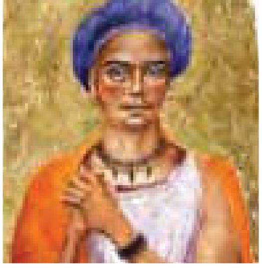



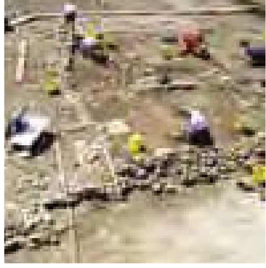

ENGLISH HERITAGE RESEARCH AND THE HISTORIC ENVIRONMENT

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* Intervention and Analysis (including Archaeology Projects, Archives, Environmental Studies, Archaeological Conservation and Technology, and Scientific Dating)
* Assessment (including Archaeological and Architectural Investigation, the Blue Plaques Team and the Survey of London)
* Imaging and Visualisation (including Technical Survey, Graphics and Photography)
* Remote Sensing (including Mapping, Photogrammetry and Geophysics)

The Heritage Protection Department undertakes a wide range of investigative and analytical projects, and provides quality assurance and management support for externally-commissioned research. We aim for innovative work of the highest quality which will set agendas and standards for the historic environment sector. In support of this, and to build capacity and promote best practice in the sector, we also publish guidance and provide advice and training. We support community engagement and build this in to our projects and programmes wherever possible.

We make the results of our work available through the Research Report Series, and through journal publications and monographs. Our newsletter *Research News*, which appears twice a year, aims to keep our partners within and outside English Heritage up-to-date with our projects and activities.

A full list of Research Reports, with abstracts and information on how to obtain copies, may be found on www.english-heritage.org.uk/researchreports

For further information visit www.english-heritage.org.uk

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