# *Making ones way in the world: the footprints and trackways of prehistoric people*

Book

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# Making One's Way in the World:
## The footprints and trackways of prehistoric people

**By Martin Bell**

**2019**

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Martin Bell

# Chapter 1: Steps towards understanding:

# routeways in practice, theory and life

## Background

I arrived at this study along an experiential path. As a child I explored the sunken and mysterious hollow ways of the chalk downland where I grew up and which have exercised my curiosity ever since. Near the beginning of my archaeological activities my first excavation revealed the ghost of a trackway which survived only as an alignment of entrances and features. As an environmental archaeologist and geoarchaeologist I studied traces of people and animals in the landscape, and went on to excavate wooden trackways. More recently my interests in traces of human movement have been crystallised by the magical experience of discovering 8000 year old human footprints in intertidal silts (Figure 1.1). Eventually these seemingly unconnected topics coalesced unexpectedly during walks in the temperate rainforest of the American North West coast. That led to a conviction that we need to develop an approach to environmental and landscape archaeology which has a greater emphasis on connectivity than the current preoccupation with sites. This approach would illuminate the most ubiquitous, and probably the earliest, way in which people structure and comprehend landscape, through the movement of their bodies.

## Introduction

The objective is to demonstrate that the study of prehistoric patterns of movement is important, achievable and relevant in all areas and periods. For some sections of the book, particularly regarding hunter-gatherers, vegetation changes and footprints examples are drawn globally. For other sections concerned with burial monuments, fields and trackways, where the evidence base is vast, but is seldom considered in detail, the focus is mainly on examples drawn from the area the writer knows best: Britain and north-west Europe, although many of the approaches adopted are much more widely applicable. The book aims to demonstrate that, notwithstanding the pessimism of many previous scholars, there is an ever-increasing range of ways in which we can investigate patterns of movement in the past. The intention is to encourage archaeologists, and others who share a fascination with landscape, to raise their sights from the individual dots on the map that we call sites, to the ways in which those foci were networked together by patterns of habitual movement constituting living landscapes. The approach is necessarily multi-scalar, from the information contained in the individual footstep or walk to issues of longer distance communication.

One reason prehistoric routeways have often seemed intractable is that they have been approached from the perspective of one source of evidence, be it landscape analysis, historical sources, phenomenological inference and so on. Archaeologists have long learnt to adopt a multi-disciplinary approach to the study of settlements, burials, ritual sites etc. Routeways are of such significance they are also deserving of a full battery of techniques applied in an integrated way, using  archaeological features, artefact distributions, environmental archaeology, footprint studies, geochemistry, sediments, social theory and the application of a range of dating techniques. The approach also needs to be multi-site so that we can think beyond the boundaries of our site, focusing not so much about how landscapes were, but about how they worked and interacted with others through axes of movement.

A multi-period approach is necessary since some tracks once established are perpetuated over millennia and thus significantly influence the encounters which successive generations have with that landscape and the perspective and angle from which their perception occurs. Here the focus is mainly on prehistory. The justification is that until recently there has been much less emphasis on routeways in prehistory as compared to those of historic periods. Consequently the case that prehistoric routes are capable of investigation needs to be articulated and appropriate techniques identified. When it comes to detailed investigation of routeways in specific areas, however, our research can seldom be confined to prehistory. One of the key approaches, certainly in areas where there has been a long history of settlement and activity, is retrogressive analysis, beginning with the present landscape, using air photographs and maps and diverse other sources to work progressively back in time from historic to prehistoric periods. Thus we can effectively peel away successive layers of landscape revealing the underlying structure of earlier prehistoric landscapes. For this reason we will necessarily stray in places onto the routeways of historic periods, when considering, for instance, the ethnohistorical records of people's movement in the American North West in Chapter 2 or British droveways in Chapter 10.

**False paths**

One factor which helps to explain a puzzling neglect of trackways for some 80 years, at least in Britain, is a book published by Alfred Watkins (1925) *The Old Straight Track.* He was an amateur archaeologist and his book was grounded in the Herefordshire countryside in which he grew up and reflects his empathy for that landscape. It is illustrated by some fine photography, a medium in which Watkins was a notable pioneer. He nonetheless drew totally erroneous conclusions from the landscape, observing that some historic places could be joined by dead straight lines. His argument was fatally undermined by the very varied character and date of the sites involved and the special and unsubstantiated pleading which permeates the work. The monuments include Neolithic and Bronze Age barrows, prehistoric settlements, boundary and waymark stones, Christian churches, medieval moated sites, avenues of trees, even isolated pines, and many others. The dead straight lines joining these places he called ley lines, which he regarded as ancient communication or trading routes. They went up hill and down dale with no reference to topographic barriers. He rationalised the inclusion of sites of wildly different dates by arguing that, for instance, Christian churches were put on previously significant sites. However, why this should apply to moated sites and many others was not explained. Suffice to say there is no convincing evidence for the ancient ley routes which Watkins claimed.

Robert Macfarlane, whose significant literary contribution to the study of paths will be noted below (p00), has recently provided an introduction to a new edition of Watkin's book. Macfarlane (2014) sees his work, naturally enough, from the perspective of the leading English scholar of landscape writing. He says 'Watkins re-enchanted the English landscape, investing it with fresh depth and detail and prompting new ways of looking and new reasons to walk'. Watkins was certainly a lyrical and persuasive writer on a landscape he clearly loved, and that must have contributed to the popularity of his writing. Macfarlane sees Watkins as somebody who opened up the countryside to the popular imagination, whilst he acknowledges the highly dubious nature of Watkins' interpretations. Watkins' message was that anybody could be a landscape historian; all they needed was a map. Macfarlane describes Watkins' ideas as going 'viral'; they provoked widespread interest and to this day are elaborated in a whole host of New Age theories. One can only speculate as to whether, if archaeologists in the 1920s had engaged more actively in critique of Watkins, his ideas would have proved so persistent. The pioneering field archaeologist O.G.S. Crawford, Archaeology Officer of the Ordnance Survey, dismissed Watkins' ideas (Hauser 2008) but refused to review *The Old Straight Track* in the journal *Antiquity* which he edited, or to debate with Watkins. A half sentence dismissal of Watkins' ideas was included in the Ordnance Survey (1973, 157) *Field Archaeology in Britain* which Crawford originally wrote. The first really substantive critique of Watkins' ideas was published 58 years after his first edition by Williamson and Bellamy (1983) and that provides a systematic demolition of ley lines and the subsequent new age paraphernalia which has been built upon them.

Whilst Watkins could be argued to have encouraged thought about long term structures in the landscape, his ideas about them were so significantly in error that they have proved a Upas Tree which poisoned the ground for research on past communication routes for three generations. Two pieces of evidence demonstrate the extent to which this occurred. Before 1925 the study of prehistoric routeways had been quite an active field with very good empirically-based field surveys by pioneering archaeologists: Curwen and Curwen (1923); Williams-Freeman (1915); Crawford (1922); and Fox (1923). After publication of Watkins' book this promising area of research virtually died. Instead, archaeologists like the Curwens focused on settlements, fields and burials; they noted the existence of tracks but after 1925 seldom made very much of them in terms of wider patterns of communication. It is interesting to compare Watkins to the very measured approach of the great archaeologist Curwen (1929, 119) who, in considering prehistoric routes in Sussex, was at pains to separate out evidence which he regards as conclusive from circumstantial inconclusive evidence, and thereby showed a pioneering appreciation of both the problems of dating early routes and how those problems may be addressed.

A second piece of evidence for the Upas tree effect of Watkins' book is provided by comparison with continental Europe. Here the pioneering studies of Sophius Müller (1904) were followed by a steady stream of archaeological writing on past routeways, of which the work of J.A. Bakker (1976) is especially notable, and draws on evidence for alignments of barrows and other monuments reviewed in Chapter 7. Perhaps the main lesson from Watkins is that a feel and empathy for the landscape, whilst something of great value, is insufficient for an adequate appreciation of its origins. It comes back to the need for detailed examination of individual features, critique of ideas and interpretations and the need to develop a robust chronology and interpretative framework.

**Taking stock and steps forward**

Evidence of past trackways is extensive but often fragmentary, dispersed and difficult to interpret and still in many ways neglected. We are still well short of a toolbox of methods for the study of prehistoric routes and this book attempts tentative first steps in that direction. The Dutch scholar Bakker (1991, 518) observes, in Britain the phenomenon of roads marked by monuments is 'regarded with scepticism and its study seems somewhat neglected'. Illustrative of scepticism in the

British literature is Coles' (1984, 1) observation that discussion of roads allows 'the prehistorian to indulge in conjecture unencumbered by the need to pay attention to observable evidence'. Fowler (1998, 25) describes tracks as 'the haunt of the romantic, the irrational and the obsessional'. Bradley (1997, 81) says: 'the recognition of ancient roads or trackways is notoriously subjective and all too often turns out to be based on circular argument'. As Fleming (2012) notes, archaeologists have never felt completely comfortable handling old roads and the subject has been left to amateurs. One of the most notable British studies is Christopher Taylor's (1979) *Roads and tracks of Britain*. He begins, somewhat disarmingly, by saying that 'most popular books on ancient trackways are nonsense'. Taylor was the greatest British landscape archaeologist of his generation; the main strengths and most detailed treatment in his book concerns Roman and later roads and it repeatedly concludes that 'all but a few [prehistoric tracks] are quite impossible to date' (Taylor 1979, 1). Similar views are echoed by other British syntheses which have a Roman and later emphasis with just a few pages on prehistory, eg Hindle (1993; 2001) and Morriss (2005). A topic, which partly accounts for the scepticism of previous British writers, is the ridgeways, which have long been supposed to represent ancient routes along the ridge crests. Of these the best-known example is the Wiltshire Ridgeway, and its continuation the Icknield Way in eastern England. These will be more fully discussed in Chapter 8, but suffice it to say there is remarkably little supporting evidence for the early origins of some claimed ridgeways. These rather pessimistic views actually reflect the position 20 or 30 years ago.

Today archaeologists are starting to use a new and imaginative range of concepts and techniques to investigate past mobility as shown by several edited surveys of diverse geographical areas and periods  including site and area specific case studies from British prehistory (Cummings and Johnston 2007; Leary 2014; Leary and Kador 2016; Preston and Schorle 2013). Alcock *et al* (2012) provide diverse case studies from many parts of the world mainly from historic periods. Sellet *et al* (2006) and Snead *et al* (2009) consider mobility from the combined perspectives of field archaeology and anthropology,  the latter with a focus mainly on middle and north America. Leary (forthcoming) provides an accessible account of the role of mobility in human affairs generally. Written from an archaeological viewpoint, it has multidisciplinary relevance and will help introduce a wider audience to the necessity for detailed examination of multiple sources of evidence and case studies attempted in the present book. Field archaeology is also providing a wealth of evidence particularly from extensive landscape scale excavations, and there is also the increasing deployment of a range of scientific and dating techniques. Consequently there is within our sights an understanding of prehistoric movement in the landscape that seemed out of reach a generation ago.

**Environmental and geoarchaeology**

Environmental archaeology has an ecological emphasis and draws on an ever-increasing range of biological evidence to address archaeological questions (Dincauze 2000; Evans and O'Connor 1999). Its emphasis has been on the role of people in transforming environments, for instance by clearance and agriculture, and evidence of their economy. Geoarchaeology uses earth science concepts and techniques to address archaeological questions (Allen, J. R.L. 2017). It has mainly been concerned with the sedimentary context of sites and the use of geological resources (French 2015). Both approaches have contributed to many aspects of archaeological investigation but neither has been especially focused on questions of routeways and mobility, to which it is argued in the following chapters they can make a significant contribution. Some types of biological evidence, which are particularly abundant in waterlogged contexts, have already contributed to studies of routeways and figure in later chapters. Several cases are considered in which pollen and charred plant macrofossils (eg seeds or charcoal; Figure 1.2a) contribute to the identification of more open corridors associated with possible routeways. Likewise, beetles may point to concentrations of dung on routes used by herbivores and mites may identify areas where animals congregated (Schelvis 1992). Plant macrofossils, beetles and molluscs originating in wetland environments, but found on dry ground sites, may also point to patterns of connectivity between these environments.

There are a number of other sources which, whilst not widely applied in the past, have potential in future environmental investigations of routeways. An introduction to several of these is provided by Nicosia and Stoops (2017) in the context of their presence in sediment thin sections (micromorphology). Non-pollen Palynomorphs (NPP; microscopic organic particles), such as fungal spores, include carbonicolas (carbon associated) fungi indicative of burning (Figure 1.2b) and coprophilous (dung associated) spores indicative of the presence of herbivore dung (Figure 1.2f and g). NPP and pollen are increasingly used in a complementary way to establish the role of natural disturbance and human activity in Mesolithic environmental change (Innes *et al* 2010; 2013; Ryan and Blackford 2010). Dung of herbivores has been shown to provide clues as to where animals had been grazing (Caseldine *et al* 2013) and also the seasonality of grazing (Aberet and Jacomet 1997) and could potentially provide valuable clues to the vegetation zones through which animals had recently moved on transhumant routes (van Asperen 2017). Faecal spherulites (spherical calcareous particles found in dung; Figure 1.2e) may also be present where herbivores are abundant, depending on alkaline soil conditions (Canti and Brochier 2017). The eggs of human intestinal parasites (Figure 1.3c and d) could also contribute to the identification of frequented routeways. Of these *Trichuris* occurred in pollen samples around activity areas at the Mesolithic site of Goldcliff, Wales (Dark 2004; 2007) and provided insights to defecation behaviour, an aspect of the human use of space seldom considered in prehistory outside the arid zone contexts where coprolite evidence is well preserved (Sobolik 1996). Micromorphological thin sections also provide evidence of layered and trampled dung and the effects of  animal presence and traffic which can assist in the identification of routeways (Goldberg and Macphail 2006; Rentzel *et al* 2017). A range of analytical techniques, including biomolecular studies, gas chromatography and mass spectroscopy, can be applied to the identification of faecal and bile acid biomarkers (Shillito 2017). Sedimentary DNA has been used to identify the presence of grazing animals in agricultural contexts in the French Alps (Giguet-Covex *et al* 2014) and could be used more widely to identify areas of concentrated animal movement and transhumant routes. Where it is possible to employ a combination of the foregoing techniques as part of a multi-proxy investigation the interpretations will be most persuasive.

In foregrounding scientific approaches it is important to avoid an overly deterministic position which assumes that societies or sites can necessarily be explained by their environmental context. Although routeways are clearly functional, they are not solely so, and cannot simply be explained by concepts of least effort and the distribution of resources. Where we have the benefit of ethnohistorical sources, as in the case of

Middle-American routes discussed in Snead *et al* (2009), it is evident that many were far from utilitarian and had social, symbolic and ceremonial roles. The same is self-evidently the case with pilgrimage routes wherever they occur (Maddrell *et al* 2015) and the Buddist concept of pathways to enlightenment (Neelis 2012). Investigations need to take account of cognitive and social aspects including perception, cosmology, religion and ideology (Flannery and Marcus 1993) as well as issues such as habitual usage and taboo areas (Jordan 2003a; Seitsonen *et al* 2014).

**Landscape Archaeology**

Landscape can be defined as environments understood and modified by human agency, in terms of effects on vegetation, the creation of fields, paths, monuments, etc. The extent to which agency is implicated is highlighted by the root of the term landscape in Old Frisian meaning coastal land drained and protected from the sea (Stilgoe 2015). That author describes landscape studies as interdisciplinary and strongly linked to the experience of walking and fieldwork.  Landscape archaeology is one of the ways in which archaeologists have succeeded in moving beyond the straight-jacket of individual site-based studies. It draws on a map-based approach and historical documents to complement the results of air photography and field survey which reveal traces of settlements, fields, trackways, ancient woodland, old pasture and other living biological communities that tell us about past landscape (Aston and Rowley 1974; Aston 1985).  A pioneering study was W.G. Hoskins (1955) *The making of the English Landscape*, the cover of my much thumbed  1974 paperback edition (Figure 1.3) exemplifies the retrogressive landscape approach, demonstrating how early topography and vegetation patterns affect the subsequent patterns of tracks, fields and woods, features which become in part fossilised in the subsequent urban plan. The approach is exemplified by a trilogy of books by Christopher Taylor: on fields (Taylor 1975), settlements (1983) and tracks (Taylor 1979). In the latter Taylor argued that much of the pattern of roads in Britain is essentially the same as 900 years ago. In a comment that can be seen as three to four decades ahead of its time, foreshadowing a key theme of this book, Taylor (1979, 153) made the observation that ‘roads are not just changed by the demands of external pressures and events, they change their own environment and the social organisation of their users.’ Oliver Rackham has also made a major contribution to the study of landscape history, initially on botanical aspects, such as ancient and managed woodland (Rackham 1980), later exploring a diversity of landscape features including many perceptive observations on the early origins of some roads and tracks (Rackham 1986). Landscape archaeology can achieve particularly detailed reconstructions in medieval and later periods for which documentary sources are also available. In the following chapters we will review several cases where large landscape-scale archaeological projects have enabled dated and excavated features to be spatially related to surviving routeways and field banks demonstrating that existing boundaries and tracks are in some cases of prehistoric origin.

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Andrew Fleming (1988) has pioneered prehistoric landscape archaeology on Dartmoor and elsewhere and has recently developed a particular research focus on the trackways of early historic periods which can also contribute to an understanding of prehistoric routes (Fleming 2012). He argues that we should focus, not just at the very local scale, but search for coherence and integrity of neglected long-distance networks which have, for the last two millennia, been associated with what he calls horse elites (Fleming 2010). In a Devon case study he makes the important observation that these routes often seem to bypass villages and farms that lie on spurs off the route. Fleming also observes that many open fields, which were established around the tenth century AD, respect existing roads. He further observes that early inscribed stones of pre-Saxon date (ie in Devon pre *c* 700 AD) are on long distance routes, including those he associates with elites, and also those associated with long distance transhumance routes which Fox (2012) has shown go back to before the Norman conquest.

**Theoretical perspectives**

Johnson (2007) has criticized what he describes as the atheoretical and romantic approach of the landscape archaeology of Hoskins and his successors and has advocated an emphasis on practice and agency, in which he explicitly mentions routes and hollow ways. One of the contentions of this book is that in order to overcome the problems of investigating past routeways we need to draw on the perspectives provided by social theory, anthropology and science. At times these approaches have seemed to be in opposition. The proponents of scientific method were dubbed processualists, and those who advocated the primacy of social factors, post-processualists (Johnson 2002). Processualists were mainly concerned with very detailed investigations of specific sites as a basis for generalisation, the post-processualists with philosophical approaches and particular classes of prehistoric monument which illuminated the role of social factors. Neither initially was particularly interested in mobility and the connections between sites. However, this later became an increasingly significant strand of thought from those with a social emphasis (eg Tilley 1994), less so within the scientific strand. Increasingly in the last

20 years, theory and science have come together, a key work being Hodder (1999) *The Archaeological Process* which outlined the complementary perspectives which they can provide, as illustrated by the philosophical framework for excavations at Çatal Höyük, Turkey. Increasingly, scientific techniques are being employed to answer, not just questions about the environment and dating, but social questions.

It is appropriate to begin by considering some of the theoretical discussions of recent decades which have brought the study of mobility to the forefront of archaeological thought. A key influence on much theoretical writing has been Heidegger's (1962) *Being and Time,* which focuses on dwelling in the world, the context-specific situatedness of the human condition in terms of the relationship between people, place and time. This challenged the tendency of processual archaeologists to look for universally applicable patterns and for environmental archaeologists, consciously or unconsciously, to slip into deterministic reasoning. However, as Ingold (2011, 12) observes, dwelling should be less about a situated place and more to do with movement along paths constituting a way of life. Gosden's (1994) *Social Being and Time,* which built closely on Heidegger's work, highlighted the role which monuments and artefacts play in creating patterns of recursiveness by which the past is used to create present and future action. Gosden (1994, 17) argues that 'thought arises from within the flow of life helping us to cope with problems encountered by habitual action', a point which clearly highlights the significant role of walking and thus the marks made on the landscape by habitual patterns of movement. Also strongly influenced by Heidegger was Thomas (1996, 89) who argued: ' in creating paths in the forest they also created links between both places and people'. Myths were then told and the place became historical.

Perceptions of place relate not just to observation with the eyes but to the bodily experience derived from all five senses; these include the haptic sense derived from touch and walking. Spatial skills are developed through the conduct of various tasks, including habitual action. In navigating landscapes, people remember a sequence of patterns of bodily movement, changes of direction and topography which provide prompts. Tuan Yi-Fu (1977) described this by reference to diverse ethnographic examples ranging from understandings of architectural space to the spatial skills of Eskimos and the navigational skills of Pacific islanders. Just as architecture structures space and choreographs patterns of movement (Barrett 1994), so, on a much larger spatial scale, do the structures, including routes, which exist in landscapes, many of them created by past human agency. The spatial information acquired by the senses is augmented by stories, myth and legend as exemplified for instance by the Dreamtime of aboriginal Australians (Chatwin 1989). Together these all form part of the Lifeworld which Simmons (1993) defined as the sum total of a person's involvement with the cosmos, landscape being as much the work of mind and memory as the topography which is created by layers of rock.

Landscapes have both spatial and temporal dimensions, since all movement in space is movement in time which is the essence of time-space geography. Hägerstrand (1975) developed a social-environmental web model in which individual paths flow through time and space. An example is shown in Figure 1.4 with space on the horizontal plain, and time on the vertical plain. Places are marked by vertical columns and the model depicts a day in the life of four individuals in a rural landscape. At times paths converge, they meet and move around together in what has been called a space – time aquarium (Carlstein 1982). In this chronogeographic approach places are but pauses in movement (Parkes and Thrift 1980).

A focus on an individual's situatedness within the landscape led to an emphasis on phenomenology, which is concerned with the world as perceived by an observer and their embodied experiences of the landscape, its rocks, mountains, rivers and coasts. It also looks at the influence of such features on the placing of monuments and the structuring of people's lives and patterns of movement (Tilley 1994). Phenomenology facilitates thought, not just about how landscapes were in abstract, but about how landscapes appeared to people in the past and how that experience related to patterns of movement through the landscape. As Aldred (2014) says, 'It is only by using our own bodies that we can begin to enter a dialogue about actual past movements'. The approach has led to many prehistoric case studies and phenomenological approaches have been increasingly adopted (Cummings and Whittle 2004; Tilley 2010). Inevitably, however, consideration of prehistoric environmental perception can be quite subjective; how do we know which particular route, or direction, was taken through a landscape and which particular features were important to people at the time? Tilley (2010) contends that he does not claim to be able to see landscape phenomena in the way in which people did in prehistory. However, unless that is the objective it surely limits the value of the approach. To counter these difficulties Evans (C. 2009) has argued that, rather than adopting a single phenomenological perspective, multiple perspectives need to be evaluated. Developing a phenomenological approach requires investigation of the precise relationship between prehistoric monuments and natural features and identification of actual evidence for routes of movement. Fleming (1999; 2006) has demonstrated that this demands a significantly more critical and rigorous methodology than is evident from some published phenomenological studies. Since perception is clearly influenced by directions and patterns of movement (Ingold 2011), it is important that these patterns are identified in a precise and defined way using a methodology which is explicit and open to critique by others.

Phenomenological studies have also seldom taken into account the ways in which the landscape has changed since the period in question, for instance by using the available palaeoenvironmental evidence to evaluate past vegetation patterns, visibility and the influence which these patterns would have exerted on routes taken through landscape (Chapman and Gearey 2000). These are increasingly attainable objectives as the density of palaeoenvironmental sites in some landscapes increases and they become more precisely dated, such that Geographical Information Systems (GIS) and modelling can be used to upscale site specific data creating landscape scale reconstructions. The environments around Neolithic  complexes at Avebury and Stonehenge, Wiltshire have been reconstructed in this way and are discussed in Chapter 5 (Gillings *et al* 2008; Allen, M. 1997). In the Netherlands Doorenbosch (2013) has reconstructed the environment associated with heathland barrows and their relationship to routeways. Models of past landcover are now being produced using a multiple scenario approach to reconstruction which generates multiple computer models based on the various parameters and estimates which best fits the pollen data (Bunting and Farrell 2017).

**Anthropology: the contribution of Tim Ingold**

Of the other disciplines which interface with archaeology in the study of past mobility perhaps the most pertinent is anthropology, which shares with archaeology the central mission of exploring the rich diversity of human existence. Particularly influential, from this writer's perspective, has been the work of Tim Ingold who in a series of papers over the last 20 years has written from the perspective of anthropology in a way which resonates with, and informs, the work of the landscape archaeologist. His much quoted paper 'The temporality of landscape' (Ingold 1993) animated the landscape which he saw as 'the congealed form of the taskscape' in which 'paths and tracks impose a habitual pattern of movement on people' by the patterns of recursiveness they establish (Ingold 1993,162, 167). How people perceive the landscape is to a large extent seen as a result of the tasks undertaken within it and thus the associated patterns of movement. In *The perception of the Environment* Ingold (2000) brought together a series of papers on the perceptual theme, including one which contrasted the life-world as seen from an experiential centre with the externally viewed world perspective of the present-day environmentalist (Figure 1.5a and b). Thus the experiential world of Yupik Inuit cosmology is illustrated diagrammatically in Figure 1.5c in which the home is surrounded by concentric environmental zones to which it is linked by paths. Two other graphical representations which convey the importance of paths come from Walbiri aboriginal Australian iconography. Figure 1.5d represents their world as a network of concentric camps with waterholes at the centre linked by paths which were originally laid down by the movements of ancestral beings (Munn 1973). Figure 1.5e is a representation of kangaroo footprints and tail impressions moving towards a camp. The ancestral and mythical origins of these routes demonstrate one of the ways routes become entrenched over extended timescales. Such routes structure the encounters of successive generations, and thus to a degree their environmental perception, since each generation sees the landscape from the particular perspective provided by that route.

Ingold (2007) has increasingly focused on the importance of lines which human beings generate wherever they go; as he says, life is lived along paths and it is along paths that people grow in the knowledge of the world around them, 'inhabitants journey from place to place along a way of life' (Ingold 2000,193). Ingold (2011) acknowledges that his own intellectual journey has taken him in recent years from a focus on the experiential centre of place or dwelling, to recognise the importance of lines of movement in perception. He argues that 'the path and not the place is the primary condition of being or becoming' (Ingold 2011,12). Paths he sees as ways of animating or bringing the statics of anthropology to life. The same can be said of archaeology's need to escape from a rather static preoccupation with sites investigated in depth. Ingold contends that those who walk with bare feet are naturally more in touch and engaged with their environment and that for them the feet are as important as the heads and hands in their perception of the environment. A similar concept is translated to an educational experience at the Hunybedder Centre at Borger in the Netherlands, an open air museum focused on prehistory which includes a footpath along which children are encouraged to walk barefoot, experiencing the contrasting tactile properties of wooden trackways, mud, woodchips, charcoal, pebbles, peat and shell etc (Figure 1.6). Following an established route recalls previous patterns of past movement and tactile experiences (Ingold and Vergunst 2008, 17). That activity is seen, not purely as a set of individual acts, but a form of social activity whereby people's feet and patterns of movement are responsive to the presence and activity of others, whether they are actually present, or have created memories of their former presence in the landscape; these could be monuments, or traces of former presence in vegetation. Two studies should be noted as putting some of these ideas into practice by adopting a joint anthropological and archaeological approach. One concerned evidence for mass migration of the Tamu-mai people of the Annapurna Highlands in Central Nepal; the project looked at both the archaeological traces and the social memory of that movement (Evans C. 2009). The other is Jordan's (2003a) anthropological study of the Siberian Khanty which challenges the frequent assumption that hunter-gatherer-fishers operated in a pristine 'natural' world, by documenting the rich social symbolism of their encultured landscape and the ways in which physical transformation occurs through the making of places, shrines, paths and artefact deposition. Ethnographic evidence for the mobility of recent hunter-gatherers is increasingly being used by archaeologists to conceptualise the potential scale, nature and frequency of movement and its effects on the landscape (Sellet *et al* 2006).

**Landscape change and clues to movement**

Environments are not just a given product of particular factors such as climate, soils, geology, flora and fauna. Progressively through the Holocene they have been subject to significant transformation by human agency (Bell and Walker 2005; Dincauze 2000). Deforestation, drainage and embankment against the sea are some of the most obvious, but it goes right down in scale to the marks on the landscape made by paths or modification of individual trees. Environmental archaeological studies draw on a wide range of proxy sources to reconstruct landscapes and their changing nature. Where multiple sites have been investigated in a study area then it becomes possible to create a high resolution picture of the spatial variation of environment types. Where sources of evidence are fewer, spatial variation is less identifiable and there can be an unfortunate tendency to assume landscape homogeneity. However, certain locations would have provided particular attractions, such as the edges of lakes and rivers. The effects will also be concentrated in frequented routeways, and in places these can be readily predicted, for example where natural topography funnels movement, particularly in the passes between valleys. Such are often referred to as ' natural routes' and ridgeways along uplands are frequently cited examples. We need, however, to be cautious in identifying 'natural routes' given the risks of circular reasoning; we should not accept a route simply because it seems suitable. The hypothesis of its existence needs to be tested using other evidence, be it the spatial relationship to the distribution of monuments, such as barrows, or rock art, or dating evidence for particular sections of track.

Frequent travel along paths on a slope gives rise to erosion, forming a linear depression which during times of high rainfall acts as a channel for runoff and thus become more deeply incised, creating a pronounced hollow way (Figure 1.7). Such features are widespread on slopes in North West Europe, particularly on more erodible geologies such as chalk, limestone and sandstone. Boardman (2013) has recently shown that hollow ways can act as alternative lines of drainage and thus represent humanly-created geomorphic features, an example of geomorphic connectivity from slopes to valleys brought about by human agency (Wohl *et al* 2014). In North West Europe hollow ways can be difficult to date, but not always impossible, a problem explored in Chapters 8 and 10. In arid areas of the American South West major erosion gullies created by runoff were, in some cases, initiated by earlier routeways such as wagon trails. Similarly in semi-arid Near Eastern contexts, a landscape survey by Wilkinson (2003) has revealed extensive hollow ways. Some represent local routes radiating from tell sites of the third millennium BC, at Tell al Hawa, Iraq (Figure 1.8a), where they extend up to 5km from the tell, connecting it to its fields, a relationship evidenced by sherd scatters. Other hollow ways represent longer distance routes connecting major centres and providing clues to hierarchies of connectivity between settlements, some being connected, whilst minor sites lie away from these routes (Figure 1.8b-d; Wilkinson 1992).

On a wider spatial scale, clues to patterns of movement can be obtained from materials which have been transported, whether these are geological materials, plants, shells or animals. A decade ago we would have been more inclined to interpret the distributions of artefacts, such as stone or metal axes, mainly in terms of down the line exchange whereby the object was passed from one community to the next without much long distance movement of people. However, studies of isotope geochemistry have provided a contrasting perspective. In the Neolithic and Bronze Age of Britain, for instance, there is growing evidence that some people and animals came from areas of very different isotope geochemistry to that in which they were buried (Evans *et al* 2006) implying much greater mobility than previously supposed. Brown (2014) shows how a combination of isotope and DNA analysis of human skeletal remains can contribute to an understanding of female or male mobility and exogamy (marriage out of one's community). Schulting (2003) showed that in Mesolithic Brittany some women had moved from inland locations, where they grew up, to coastal environments, again reflecting exogamy. Transported materials, or contrasting isotope geochemistry, provide clues to patterns of connectedness but will rarely inform on the precise routes followed. However, in some cases routes can be predicted from topography and may also be attested from later historical sources. The Silk Route between China and South West Asia is well attested in later historical times but was clearly significant much earlier, as evidenced by the movement of artefacts (Cunliffe 2015; Frankopan 2015) and the introduction of millet from China to south west Asia and wheat from south west Asia to China (Jones 2016). Likewise, the astonishing diversity of artefacts from east and west deposited in Scythian graves in Central Asia (Simpson and Pankova 2017).

Since the 1960s archaeologists tended to interpret changes in material culture in terms of either development or acculturation, ie adoption from neighbouring influences, having rejected the waves of population movement favoured by earlier generations. However, the increasing capacity and sophistication of ancient DNA analyses presents a major challenge to recent assumptions. Re-evaluation has been especially marked in relation to the arrival of the Beaker complex in north west Europe (Olalde 2018) which demonstrates a significant ingression of steppe ancestry from eastern Europe. The change is particularly marked in Britain where in *c* 2400 cal BC the genetic evidence indicates a 90% population replacement within a few centuries. The same study has indicated that the earlier arrival of Neolithic farmers in Britain c 4000 cal BC involved significant genetic input from Iberia rather than just the Danubian farmers of central Europe. If further studies confirm these results it will bring about a fundamental rethink of the extent of population mobility and the causes of cultural change.

## Agency and niche construction: human and non-human

Pierre Bourdieu (1977) introduced the concept of habitus, underlying structures created by practice, as people interact with environments and with other people; the ways they do so influence future interactions. A development of this is Giddens' (1984) structuration theory whereby actions are influenced by pre-existing structures, but with the opportunity for active agents to act reflexively in making independent choices to change the social and environmental structures which they inhabit. Van de Noort and O'Sullivan (2006, 19) define agency as people's ability to make their own way, to choose and experience different aspects of identity. Thus, people make their own history but under particular circumstances and conditions inherited from previous generations (Simmons 1993, 154). There are two types of influence acting in opposition: one the creation of structures trending towards long term continuity and stability, and the other a capacity for radical change. As Kador (2013) has emphasised, the study of mobility must embrace both, the everyday routine actions as well as periods of change and their social consequences. This is essentially the distinction which the geographer David Harvey (1989) has made between routine and transformative action. As subsequent chapters will show both continuity and radical change are evident in the history of trackways. There are instances where people seem to have followed the same route for many millennia, and yet other cases where routes are totally abandoned and very different patterns emerge. People gain a sense of security and belonging from the familiarity of habitual daily actions and the reassuring marks on the landscape which these create. However, there is another trait of human nature, perhaps stronger in some individuals than the majority, to always want to look over the horizon, to beat a new path and to explore the new and unfamiliar. We will look at examples of this in Chapter 9 on maritime communication where at great, often to our minds, perhaps irrational, personal risk, people travelled distantly to obtain exotic goods and esoteric knowledge.

In preceding sections we have seen how human agency alters environments through its effects on plant and animal communities and the creation of routeways. Increasingly researchers are coming to realise that not only people, but also other entities, modify their own environments in ways that influence the activities of other organisms. The term ecosystem engineering has been employed to convey the way in which various organisms contribute to the development of ecosystem structure (Smith 2011). A wide range of organisms can be implicated as 'engineers' eg earthworms, ants, termites, beavers and many of these contribute to the ways in which the archaeological record itself is structured (Bell 2015).

The reciprocal and coevolutionary relationships between environment and culture have tended to be obscured by false dichotomies set up between people and nature in identifying the causes of environmental change (McGlade 1995). An integrated solution to this problem is provided by Niche Construction Theory (NCT) 'the process whereby organisms, through their metabolism, their actions and their choices modify their own and / or each others niches' (Olding-Smee *et al* 2003, 419; Laland and O'Brien 2010). Feedback loops within a niche alter the dynamics of the system creating change. Niche construction envisages that organisms have a triple inheritance, from genetics, culture and ecology. These influence future generations, including evolutionary processes, which can be seen as driven, not just by external factors such as climate, but for instance by the effects of human cultural practices which favour particular genes (Laland and O'Brien 2010). An example would be the transmission of environmental knowledge resulting in a modification of behaviour and selective advantage. Human niche construction involving the manipulation of wild plant and animal resources often mimics natural processes, eg the opening of woodland as a result of storms, floods etc. In these ways the effects of people and non-human agents reset succession to create more productive ecosystems (Smith 2011). This theory has been especially important in the study of coevolutionary relationships evident in the domestication of plants and animals (Zeder 2012; Smith 2011; Rowley-Conwy and Layton 2011). This is seen, not just as the one way street of people domesticating organisms, but a mutual process whereby organisms are in some senses domesticating people.

Through recognition of the mutual relationships between people and organisms comes an appreciation that both can be seen as having agency in the sense that they can instigate change. In these ways Niche Construction Theory provides a significant bridge between science and culture which is attracting increasing cross-disciplinary interest. Ingold (2011, 6) expresses a similar point with his usual clarity and insight: 'producers, both human and non-human do not so much transform the world, imposing their preconceived designs upon the material substraight of nature, as play their part from within in the world's transformation of itself'. Ingold and Vergunst (2008) highlight the case of pastoralists accompanying animals: Which is leading which? And where does the agency reside? Or is it in some way mutual? The close associations between people and animals, whether it be herders accompanying reindeer (Lorimer 2006), or naturalists engaged in the close and intimate observation of animal behaviour (ethology; Lorimer 2010), cause people and animals to develop entwined lives, each experiencing the agency of the other. In considering pastoralism, Chadwick (2007, 134-5) has similarly argued that ‘agency is the outcome of relationships between humans and the living and material world’. Herding, he suggests, should not be seen in purely functional terms because of the role it plays in the construction of identity and memory (Chadwick 2016). Nor can this active role be restricted to people and animals. Jones and Cloke (2002) critique the tendency to separate people and nature and argue for the agency of non-human life forms such as trees, thus making a case for what has been called hybrid geographies which are inclusive of non-human agents. A similar argument for the active role of woodland in Neolithic landscapes has been made by Noble (2017). Comparable cases have been made for the agency of inanimate material culture by Robb (2004) and by Van de Noort (2011) in terms of the influence exerted by the creation of powerful and iconic items such as boats.

**Cognition: thinking through things**

Recent developments in cognitive studies are especially pertinent to the routeway theme of this book because it is increasingly evident that thinking is not just an internal cerebral process but a process which is acted out through the engagement of our bodies with the material world. In short we think through things; our interactions with things and with the world provide clues and prompts influencing how we remember, think or act in a given context. These are the concepts of the extended mind and material engagement theory which so far have been mainly worked through in terms of the active role of material culture in the ways in which people act, perceive and think (DeMarrais *et al* 2004; Malafouris and Renfrew 2010). In the case of some routine actions this influence may be almost unconscious. We may speculate that habitual actions contribute to a sense of security and well being, that in a sense an individual is at one with the world through patterns of familiar and repeated engagement. The hippocampus is the part of the brain which is particularly concerned with long term memory and spatial navigation whereby cognitive maps of the life world are created. This part of the brain has been shown to be especially enlarged in highly experienced London taxi drivers who are trained in 'The Knowledge', a detailed understanding of the street map of the city (Maguire *et al* 2000). Thus habitual actions develop neural pathways, whereby parts of the brain become enlarged (Gosden 2010). Clearly these concepts are relevant, not just to the clues and prompts provided by material culture, but potentially to a greater extent at a landscape scale, where clues are provided by landscape features and the ways they are modified by human agency, the paths, monuments, and altered vegetation etc which influence the ways subsequent actors encounter that landscape. A pioneering application of these ideas has given new significance to barrow alignments in Himmerland, Denmark and suggested how movement through, and perception of, that landscape, could have been prompted by the disposition of burial monuments (Lovschal 2013).

**How literature and art help us to think about movement**

Archaeologists cannot expect to fully understand past routeways by looking at site plans, maps and air photographs. A fuller appreciation comes from the three-dimensional experience of walking routes on the ground (Stilgoe 2015). Our studies can be further nourished and given fresh stimulus by writers and artists who have thought deeply about, and recorded, their experiences of landscape from different points of view. Literature on movement, walking and observation has a long

pedigree, much of it of great value to the landscape historian; two Welsh examples are Giraldus Cambrensis (1191) *Itinerary through Wales* and much later George Borrow (1862) *Wild Wales.* Examples where a journey provides the vehicle for social and religious commentary include Geoffrey Chaucer's (*c*1400) *The Canterbury Tales,* recounting a pilgrimage from London to Canterbury, and John Bunyan's (1678) *The Pilgrims Progress,* which was partly anchored in the Bedfordshire landscape Bunyan knew. The ancient hollow ways of the Weald around Selborne fascinated the pioneer of Natural History writing, Gilbert White (1788; Mabey 2006), and later the rural reminiscences of Flora Thompson (Mabey 2014). The inspiration of both writers clearly derives from walking, meticulous observation and a deep empathy with landscape. Edward Thomas (1909) was similarly inspired by walking the paths of southern Britain and wrote on the Icknield Way (Thomas 1916), just as his fellow poet Hilaire Belloc (1910) wrote on the Pilgrims Way in Hampshire, Surrey and Kent. The supposed ancient origins of these long distance ridgeway routes has influenced subsequent generations but will be critically examined in Chapter 8.
What we might call the pedestrian literature of the early twentieth century reflects a world of increasing leisure, education and access to the countryside by railway and road as well as the wider availability of tourist maps. It was an interest fuelled by nostalgia for a rural pre-urban and pre-industrial idyll, exemplified by the writing of H.J. Massingham (Mabey 2014). The significance of a sense of place and the history of place in environmental writing and ecological understanding is particularly demonstrated in a North American context by the writings of Cronon (1983) and Worster (1990). Lang (1999) argues from an American North West coastal perspective that an ethical environmental history has to be informed by a developed sense of place.

Recently, the somewhat nostalgic walking-based literature of the twentieth century has been eclipsed by a more experiential and biographical literature, in which movement, encounters with landscape, individual memoir and a deep time perspective are frequent elements. The appeal of this literature must be, in part, because it maps onto what people actually do: thinking on their feet and through movement. This current literature defies disciplinary classification. It is not primarily archaeological, yet it so often exhibits the fascination which archaeologists have for landscape, frequently drawing on history and archaeology for evidence and inspiration. It encourages archaeologists to think in new ways about mobility and is introducing ideas and concepts which are helpful in doing so. An influential early example is Schama's (1995) *Landscape and Memory,* a wide ranging discourse on art, history and literature and nature, how they are perceived, altered and 'recreated' by successive generations. The symbolic associations of landscape are seen to be imbued with a wealth of myth and recollection, a bulging backpack of memories which we carry around. Many begin as highly personal stories, indeed Schama starts the book with the landscapes of his Essex childhood, then progresses backwards to those of his ancestors in eastern Europe. Writing from a more modernist and political North American perspective, Rebecca Solnit's (2014) *Wanderlust* promotes walking as a way of thinking and remembering, her argument punctuated by accounts of her own very varied walks through landscapes and life. Her *Book of Migrations* (Solnit 2011) concerns reflective self-discovery through travel, partly on foot, and a historical meditation on the Irish transatlantic diaspora. Focusing down on a local scale, Julia Blackburn's (2012) *Thin Paths* recounts walks around an Italian mountain village; through this she tells the story of its people and the last vestiges of seasonal transhumance, involving flocks moving for the summer to high mountain pastures, and how that way of life engendered the anti-fascism of an independent-minded mountain people. Her latest work recounts a personal quest to understand the vanished landscape of Doggerland, art and poetry inspired by the quest and its relationship to points and relationships in the writer's own life (Blackburn 2019). Juxtaposing the local and global is Gooley's (2012) *The Natural Explorer,* which begins each chapter with a segment of one day's walk near his home; this leads to wide-ranging reflections on diverse landscape themes around the notion that a traveller becomes a natural explorer by turning observation into art. Gooley's (2010) *Natural Navigator* concerns the ways in which people use evidence within the landscape to situate themselves and find their way around. He proposes that environmental clues create a sort of 'sixth sense' whereby we partly unconsciously navigate our way in the world (Gooley 2018). Stroud (2017) *The Wild Other* resonates with a significant theme of this book, the transformative effects of the horse on human connectivity, through an account of the role of horses in a young woman's self-discovery set against the backdrop of the Oxfordshire Ridgeway and its Uffington White Horse (Chapter 8).

Recent writing is particularly concerned with the relationship between nature and culture and has often been stimulated by a desire to connect with nature and discover a greener, more ecologically balanced way of life. A recent example is George Monbiot's (2013) *Feral,* which is a passionate case for rewilding with native trees and the reintroduction of regionally extinct animals, which challenges many of the tenets of agricultural and nature conservation policy. Such ideas gain increasing traction from the ecological success of current species reintroductions, especially of the beaver, and also pioneering rewilding projects (Tree 2018). Ecological emphasis is also strongly reflected in *Wildwood; a journey through trees* by Roger Deakin (2007), which is not so much a book about natural trees as trees and woods altered and perceived by people, just as other aspects of his empathy for landscape and its history is exhibited in his two other books (Deakin 2000; 2008). Deakin was very much an activist whose main writing was at the very end of a varied life. He was one of the founders of the organisation Common Ground, which aimed to encourage communities to empathise with their landscape context.

Robert Macfarlane is from a more traditionally academic background, a Fellow in English at Emmanuel College, Cambridge, who has published what he describes as a loose trilogy about people and landscapes: on mountains (Macfarlane 2003); wild places (Macfarlane 2007); and, especially pertinent to the subject in hand,*The Old Ways* (Macfarlane 2012). The latter he describes as about 'walking as a way of knowing'; it concerns ' the subtle ways in which we are shaped by the landscape through which we move' (Macfarlane 2012, xi). As an English scholar his perambulations are in part about understanding and situating other writers, such as the poet and essayist Edward Thomas, whose book on the Icknield Way was noted above (Thomas 1916). A recent short work on a title very pertinent to our theme is *Holloway* (Macfarlane *et al* 2013), an account stimulated by Geoffrey Household's (1939) novel *Rogue Male,* an adventure story of one man's battle against totalitarianism in which the ultimate hiding place was an overgrown and forgotten Holloway, a device which highlights the lost and mysterious nature of these enigmatic features (Figure 1.7). In *Landmarks,* Macfarlane (2015) considers the vernacular names given to landscape features and how those specific local names contribute to our sense of place. He lists 38 regional vernacular British names for tracks and paths (Macfarlane 2015, 202). Many of these are slipping out of use with the loss of the knowledge which those names convey concerning local perception and ways of life.

Macfarlane's writing, particularly on mountains and wild places, and most recently his journeys underground and in the Arctic (Macfarlane 2019), are characterised by remarkable feats of endurance and hardship through which he sought to escape from the paraphernalia and comforts of modern life to connect with nature and roots. Perhaps the most extreme of this genre is Nicholas Crane's (1997) gruelling walk along the mountain chains of Europe between Cape Finisterre in Western Spain and Istanbul, Turkey. During this seventeen month continuous walk he encountered surviving remnants of the way of life and ethnographic artefacts of seasonal herders who used the mountain pastures and paths. It is a book nostalgic for the old Europe and its folk life, and of historical value for insights to the rapid changes and economic challenges faced by many East European remote rural communities following the collapse of communism. Later in his career Crane (2010) went on to present the BBC television series *Coasts*, recounting journeys round the coast of the British Isles which brought many aspects of coastal ways of life and archaeology, including the footprints mentioned at the start of this chapter and Chapter 4, to a wide audience. Also on a coastal theme but local in its spatial ambition, is Jean Sprackland's (2012) *Strands,* which records the thoughts, observations and discoveries made by walking during one year along the same stretch of beach from Southport to Formby in north-west England, a distance of some 15km. That shore is especially significant in the present context because, as Sprackland observes, it is where some of the best examples of prehistoric human footprints have been found in Britain (Chapter 4). The highly individual and local accounts of writers such as Sprackland and Blackburn are more aligned to the experiences of the average walker for leisure. The bold adventurers in the writings of Macfarlane and Crane are more akin to Homer's Odyssey or medieval pilgrimage whereby endurance and hardship contribute to status building, demonstration of faith, or writers' credibility. Thus landscape writing contributes in myriad ways to our capacity to think about mobility past and present.

Art, just as powerfully as literature, provides a way of thinking about the traces we leave in the landscape including the vestiges, both physical and mental, of patterns of movement. Paths are a prominent aspect of the paintings of both Paul Nash (1889-1946) and Eric Ravilious (1903-42), whose work reflects a preoccupation with the paths of chalkland landscapes (Russell 2009), where routes stand out as white markings against the downland turf, as shown in his Chalk Paths painted in 1935 (Figure 1.9). The hollow ways, terrace ways and ridgeways of the downlands will be a significant theme in Chapters 8 and 10. Land artists such as Andy Goldsworthy and Richard Long also work in the landscape, creating instillations of rocks, patterns in sand and objects which mark the land (Malpas 2007), and a comparison is often drawn between their work and the monuments and symbols of prehistory (Renfrew 2003). A work particularly pertinent to the theme here is Richard Long's photograph 'A Line Made by Walking' taken in 1967, a path in grassland evidenced only by the effects of light catching moderate trample on the grass (Malpas 2007). The connectedness between these varied art forms is exemplified by Nicholas Crane's (1997, 157) rather startling revelation that his epic mountain journey was in part inspired by the linear land art of Long. Especially redolent of the coastal footprint theme developed in Chapter 4 is some of Anthony Gormley's work, especially 'Another Place' created 1997, which comprises 100 actual-size cast iron images of the artist's body in the intertidal zone at Crosby, all gazing out to sea and covered and uncovered by the ebb and flow of tides, just as the prehistoric footprints on the same foreshore at Formby 9 km to the north are uncovered and covered (Roberts *et al* 1996). As far as the writer is aware there is no link between the location selected by Gormley and the footprints, though both excite similar fascination. A work by Gormley more directly revealing of his interest in the past is a life-sized statue buried upside down with only the soles of the feet exposed in the pavement outside the Archaeology Department, Cambridge University where Gormley was a student. A photograph of those feet was used by Jim Leary to illustrate the introductory chapter of his *Past Mobilities* (Leary 2014, Fig 1.2).

So what more specifically do literature and art contribute to studies of past mobility? Firstly, in a multivocal sense there are the different perspectives provided by those whose primary focus is much broader than archaeology. Secondly the imperative of applying the particular skills of the archaeologist, or landscape historian, in ways which are relevant to a wider audience and contribute to broader debates concerning people, nature, sustainability, quality of life, connectivity and migration. The biographical nature of much current landscape writing demonstrates how reflections on, and encounters with, heritage and nature contribute to self-discovery and well-being.

**Timescale, dating and spatial scale**

Fortunately today, we have many advantages over the pioneering archaeologists, including the availability of scientific dating techniques which can be applied to trackways, footprints etc. A guide to each of the main dating techniques is provided by Walker (2005). Most widely applicable of these is radiocarbon dating. The dates given in this book are all calibrated to dates BC / AD. The original uncalibrated radiocarbon dates and laboratory numbers are not given when they are cited in the original published source referenced; to include them here would make the text cumbersome. Exceptions to dates BC are those of the pre-Holocene (ie before 9500 cal BC) where BP (Before Present 1950) is used, as are abbreviations ka, thousands of years, and ma, millions of years. Some sections, notably on wooden trackways, make use of dendrochronological (tree ring) dates which are given in the BC form. Also increasingly relevant to the dating of sediments associated with trackways is Optically Stimulated Luminescence dating (Duller 2008). Some sediments associated with footprints and trackways are also dated by the Uranium Series method. Dates derived from these various methods are frequently quoted in the text as a way of helping the reader to relate sites to a sequence and one site to another. This is necessary because the large number of site examples, from many areas and periods, means that it is generally not possible to introduce the local archaeological cultural sequences.

A particular concern in this book is the relationship between movement in space/ time continua and issues of perception as related to movement. We therefore need to keep in mind that scientific dating is only one way of measuring time. There is a distinction between linear chronometric time, as measured by scientific dating techniques, and time as perceived by people, which may for instance be circular or cyclical (Dietler and Herbich 1993; Gosden 1994) and marked, not by dates or calendars, but by the traces that people leave on the landscape. As regards spatial scale any form of movement is clearly relevant, ranging from the information we can gain from the individual footprint, through the activity space associated with specific tasks, to the scale of movement associated with the daily life of a settlement, or the more distant seasonal rounds and transhumant patterns of its occupants. There is also the more distant communication between peoples and places by walking, using animal traction, or travel on water. All are relevant to our understanding of the past, although in the space available only a selection of examples can be given.

**Terminology**

*Mobility* refers to the study of movement by people (and animals). *Route* and *routeway* are used here for any frequented axis of movement. *Paths* refer to movement on foot, and *Trails* movement on foot and by horse. *Lane* is a local route from settlement to its fields. *Trackways* generally imply constructed routes in wetland. *Footprint-tracks* are the traces left by the feet of people and animals. *Roads* are prepared surfaces generally allowing year-round passage by wheeled vehicles. *Hollow ways* are routes incised by erosion. Use of the word *droveway* requires special clarification. Here it is used for routes along which domestic animals were moved on any spatial scale: some went locally from farm to field; some were long-distance seasonal movement of tens of kilometres; and some went much further. A potential distinction needs to be recognised between these practices and medieval and post-medieval practices of droving involving the movement of animals from remote rural areas to urban and port markets. Animals were, for instance, moved from Wales to London along routes which acquired names such as ‘Welsh Way’.

Although growing evidence from isotope studies for the long-distance movement of animals in prehistory is noted in subsequent chapters, we should make a distinction between this and the market-oriented droving of recent centuries. Prehistoric long-distance animal movement may have had very different motivation, including ritual, symbolism, cosmology and tribute. *Transhumance* is used to refer to the seasonal movement of animals and people generally over long distances, tens to hundreds of kilometres, usually from lowland to mountain uplands, a practice which was particularly prevalent in the Mediterranean. *Lesser transhumance* implies smaller scale seasonal movement of a few kilometers to *c* 30km between contrasting ecological zones, such as between lowland and upland mountains and moors. It also includes movement from lowlands and hills to seasonally available coastal saltmarsh pastures which in prehistory, before seawalls, reclamation and erosion, were far more extensive and more socially significant than they are today. Stilgoe's (2015) approach to landscape puts particular emphasis on the names and origins of landscape features and what that can tell us about the perception of landscape. This work and Macfarlane's (2015) *Landmarks* highlights the importance of preserving and recording local vernacular terminology as part of local identity and a source for understanding its origins.

**Conclusions**

It has been argued that, by comparison with many other aspects of archaeology, trackways and mobility have often been neglected. New strands of evidence from many disciplinary sources, augmented by perspectives from the arts and literature help to chart a way forward. It is timely, therefore, to review the evidence and consider the challenge represented by translating field traces into an understanding of prehistoric people's encounters with landscape. The conscious act of translation which requires careful and critical analysis of the field evidence, the testing of ideas and the integration of evidence from diverse disciplines to establish whether, what may be an interesting and stimulating theory, is borne out by the evidence on the ground.

The disciplines, or strands of knowledge, which can contribute to the study of how people moved around the landscape include: ethnohistory; tracking skills; ichnology (traces of animal behaviour, eg footprints); field archaeology; botanical and other biological traces; historical analogues; geoarchaeological and geochemical traces, etc. The solution to the problems of identifying prehistoric patterns of movement advocated here is the adoption of a multidisciplinary approach, or what the environmental archaeologist refers to as a multi-proxy approach. Above all, the challenge is to integrate perspectives which are both social and scientific, using one source to test and develop ideas derived from the other. In anthropology Wylie (2002) has described such interpretations as being based on cables, comprising multiple strands of evidence, and as tacking, a dialectical process between the contrasting perspectives of the anthropologist and the subject (Wylie 2002, chapter 11). This is analogous to the process which Wylie (2002) has called 'triangulation', whereby an interpretation, which may not be entirely convincingly demonstrated from any one source, becomes more precisely grounded by triangulation with other sources of varying independence. The writer has recently reviewed these concepts in terms of their application in experimental archaeology (Bell 2014). The academic resilience of such a multi-stranded approach is significantly enhanced by two key concepts introduced by Hodder (1999). The first of these is multivocality, which values the contributions of a diversity of voices and approaches, both scientific and social. The second is self reflexivity, a critical awareness of the effects of scientific and archaeological assumptions on the data obtained and the effects of these on the communities involved. Together these two concepts challenge tendencies to scientific dogmatism and the arrogance of the 'expert view' which has made some people resistant to a scientific approach. Later, in Chapter 4, when reviewing Robbins' work on the forensic use of human footprint evidence, we will see rather dramatically the dangers of uncritical acceptance of the expert view.

Many of the points made in foregoing sections, concerning archaeologists' previous neglect of trackways, are made with specific reference to dryland situations and certainly do not apply to wetlands where there is a long history of successful studies, reviewed in Chapter 6. In wetlands trackways are readily identified and dated and there is a wealth of associated environmental evidence. In these wetland contexts the challenges are rather different, they particularly concern the relationship between wetland tracks and the wider picture of dry ground activity so that the wetland evidence can become more fully integrated into archaeological discourse (Van de Noort and O'Sullivan 2006). To a significant extent this is about bridging the gap between wetland archaeology, which is rich in evidence, but where social theoretical concepts have not been so much employed, and dryland prehistoric research, where the theoretical concepts have often been to the fore, and the available field evidence has sometimes been less rigorously engaged with. Chapter 6 shows that there are areas where both dry ground and wetland evidence is beginning to be integrated and the development of this field potentially offers new ways of identifying and dating past trackways.

A substantial part of the way forward is about patterns of connectivity between people, places and ideas. The proposition has been put forward that not just people but plants, animals, material culture and landscape features such as tracks influence behaviour and have agency. Each component, both people and the many facets of the world in which they live, contribute to Niche Construction. Interconnected relationships are increasingly foregrounded by recent writers who use related, but somewhat different, labels, what Ingold (2011) called meshwork, and Hodder (2012) refers to as entanglement. Establishing networks involves integration of evidence from multiple sources, linking wetland and dry ground perspectives, using one strand of evidence to test ideas derived from another, and in particular connecting the scientific and social evidence. In a landscape context it is often not possible, nor academically at all desirable, to separate the natural and the cultural; they are, in Ingold's (2011) terms, an interwoven meshwork. The path a hunter-gatherer follows will often be influenced as much by the activities of animals as any human decision-making. People may follow paths originated by animals and vice-versa (Figure 1.10). Macfarlane (2019, 273) visited a long abandoned settlement in remote north Norway at Lofoten where thin paths linking the doorways of ruined houses survived because they are still used by otters and other animals. Cleared areas which attract grazing by animals, foraging and settlement by people, come about through the combined effects of animals, people and other environmental processes such as storms and floods. The hollow ways which form in oft-frequented routes on certain geologies channel storm water and become geomorphical features. Routes which people take through a landscape are the result of interacting factors including issues of human environmental relationships, such as the food quest, patterns of contemporary social interaction and recursiveness to the past. Routes are often perpetuated over extended timescales creating a legacy effect for subsequent generations (Wohl et al 2014). Bradley (1993) has shown how sites of one period are frequently referenced by much later monuments, their status being legitimated by association. Thus, routes are created and maintained by an interaction of natural and cultural factors and may be said to have an agency of their own in influencing the subsequent structure of the cultural landscape and human activity.

**Chapter organisation**

Succeeding chapters look first at the ways in which non-agricultural communities use and mark paths and landscapes in ways which influence movement. Chapter 2 focuses on the North West coast of North America where archaeological evidence is augmented by a rich ethnohistorical record enabling the development of two key themes: niche construction and a more mobility-based or linear environmental archaeology. Chapter 3 considers the more ephemeral traces of hunter-gatherer movement in north-west Europe. Then occurs a distinct scalar shift down to the footprints of humans and animals, a relatively new topic for archaeologists and one which is considered drawing on evidence worldwide and from all periods. Traces of movement by early farmers are reviewed in Chapter 5 drawing on evidence from Britain and north west Europe and mainly focusing on the spatial relationships between monuments. Chapter 6 looks at the abundant evidence of wooden trackways in north west Europe, and attempts to draw some lessons from these about wider patterns of movement. Bronze Age alignments of monuments in north west Europe are considered as evidence of routeways in Chapter 7. Chapter 8 looks at the very abundant evidence for trackways in agricultural landscapes; so abundant is the latter that it is mainly focused on the British Isles. In Chapter 9 we then move from land to water to consider communication by river and sea which, it is argued, was a more significant aspect of long distance communication than often appreciated, its routes logically complementing and integrating with those on land. Communication by sea is comparatively brief because it has been well served by many recent publications.  Chapter 10 presents a case study from the Weald District of south east England utilising many of the lessons derived in preceding chapters and relating these to patterns of prehistoric and later historic landscapes. The concluding Chapter 11 pulls together evidence from diverse contexts and periods to identify general concepts and criteria which will help to advance the study of early routeways. In most of the chapters after this certain examples are designated as Case Studies which indicates that they are especially central examples of the key themes of this book, and they are outlined in a little more detail. The student who recently asked me which page of my last monograph that I was recommending that he should read will get some idea of the theme of this book by reading Chapters 1 and 11 and the designated case studies between, and  my hope is this may whet the appetite to read the rest!

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# Chapter 2: Walks in the temperate rainforest: developing concepts of niche construction and linear environmental manipulation.

## Introduction: Why the American North West Coast?

This chapter in part derives from thoughts stimulated by walks in the remnants of the temperate rainforest and in other areas of remote woodland on Vancouver Island, Canada and the Olympic Peninsula, Washington State, USA. Observations provide a framework within which to review evidence from a range of sources concerned with the archaeology, ethnography, botany and environmental history of the area. Though remote from north-west Europe, which is the main geographical focus of this book, It is an ideal area in which to explore some of the themes identified in Chapter 1, notably the ways in which trails and places are created through the interaction of human agency and the activities of animals, the role of non-agricultural communities in ecosystem change and how these factors relate to the paths along which First Nations people walked (Figure 2.1). The presence of a strong ethnohistoric record means that there is direct oral and written evidence of intentionality and the social significance of routeways, which in prehistoric European contexts we can only infer from very fragmentary clues. The North West Coast of North America offers these advantages because of the relatively late eighteenth century arrival of Europeans. Furthermore, some explorers, naturalists and early colonists had good scientific educations, so that they could compile detailed accounts of the way of life of First

Nations people. Today many of the traditions of plant use and manipulation still survive and are well documented (Turner 2014). It is also an extremely culturally rich area which has been the subject of extensive archaeological and ethnographic work and there are areas of surviving and historically documented semi-natural vegetation which themselves provide clues to the activities, patterns of movement and ecosystem management of past communities.

This chapter illustrates the role of people in modifying vegetation communities and how this might lead to a more linear and mobility focused approach to environmental archaeology. This is certainly not to imply that evidence from the American North West Coast can be directly extrapolated to pre-agricultural Europe. Clearly the context and biological resources are very different and there are evident philosophical and practical dangers in using the ethnographic recent to populate the prehistoric past (Finlayson and Warren 2010). The case is not for direct analogy but that the richness of the north American evidence provides the thinking space within which the writer, and hopefully readers, can come to appreciate the diversity of ways in which routes can be formed and marked. Many of these have been little considered in a European context.

**The Douglas Map**

The potential is demonstrated by a trail documented in a diary of 1840 by James Douglas, then of the Hudson's Bay Company, who went on to found Victoria and was later the first Governor of British Columbia. He recorded a route north of the Willamette Valley between the Nesquilly River and the Cowlitz Plain (Leopold and Boyd 1999). His map (Figure 2.2) is especially revealing in depicting a chain of small prairie areas in a wooded landscape, resembling the beads on a necklace. It is recorded that the prairie areas were burnt by First Nations groups to encourage the growth of berries and other plants. The burning took place as they moved to their winter camps in anticipation of rejuvenated plant growth when they returned the following year. These burnt prairie patches would also have attracted deer.

**The area and its archaeology**

The coastal belt of the north-western part of the United States west of the Cascade mountain range and western Canada west of the Coast Mountains, referred to here as the North West Coast (Figure 2.3), is dominated by maritime influences with annual rainfall up to 2.5m in parts of the Olympic Peninsula and the west coast of Vancouver Island. The Canadian coast is indented with numerous estuaries extending far inland and there are many islands, the largest being Vancouver Island and the group of islands known as the Haida Gwaii (formerly Queen Charlotte Islands). The maritime climate gave rise to a coastal temperate rainforest of which small areas have survived the effects of rapacious logging in the nineteenth and especially twentieth centuries. These remnants of Old Growth Forest are mainly characterised by western hemlock, Sitka spruce, Douglas fir and western red cedar. Some red cedars and Douglas firs may be up to 1000 years old (Nuszdorfer 2000). Trees modified by people, and known as Culturally Managed Trees (CMT), bear tangible witness to past ways of life.

The earliest reliably attested settlement of this area, and indeed in North America, is around 12-15ka BP (Fagan 1991). Over the last few thousand years before present there had developed a remarkably complex and sophisticated fisher-gatherer-hunter society not employing agriculture, in which the only domesticate was the dog. For this reason it is an especially instructive, and well documented, case of the environmental relationships of communities where the economy was not based on domesticates but nonetheless had extremely sophisticated and complex relationships with plant resources involving landscape niche construction on a scale which is only now becoming clear. The richness of coastal resources meant that this area achieved the highest population densities of any area in pre-contact North America. The people of the North West Coast had substantial winter villages; some virtually sedentary communities were established as early as 5000 cal BP. The houses were made of giant western red cedar posts and boards, which in the northern part of this area were fronted by totem poles often ranged along the shore, both houses and poles being richly decorated with painted carvings (Figure 2.4; Ames and Maschner 1999; Matson and Coupland 1995). The cedar houses and organic material culture of the area is most effectively demonstrated by the site of Ozette in Washington State, buried by a mudslide *c* AD 1750 (Kirk 2015). Here 90% of the material culture was wood and fibre. Anthropologists recorded that this was a winter village with people moving elsewhere to summer villages; however, faunal evidence indicates a more complex picture showing that part of the Ozette population remained year round (Samuels 1994). The evidence seems to point to sedentism on some coastal sites rich in resources, and greater mobility among inland groups (Deur 1999). Some groups moved five or six times in a year, dispersing in summer to smaller camps from which particular resources of fish, shellfish, game, root vegetables, berries and greens could be exploited (Ames and Maschner 1999). The patchiness of resources, spatially and seasonally, created a need for seasonal movement and the preservation and storage of food, such as salmon, halibut, shellfish, berries and plant foods.

Whilst in dietary terms plant resources contributed less than fishing and hunting, their use is especially significant in the present context because there is such a comprehensive record thanks to the activities of anthropologists such as Franz Boas (1921), and because plant resources have continued to be utilised up to recent times and have been carefully documented by ethnobotanists. A recent comprehensive survey by Nancy Turner (2014) provides a wealth of information about the traces in the landscape left by plant utilisation. First Nations communities were also characterised by a respect and empathy for nature. This indigenous understanding of biological interrelatedness has been called ethnoecology, or traditional ecological knowledge. This provides insights to the environmental perception of the communities involved and has informed recent debates about the sustainable use of resources, especially when compared to the ways in which Europeans have used the same areas in the last 200 years (Turner 2005; 2014; Goble and Hirt 1999).

This area has such a wealth of anthropological information due to the lateness of encounters with explorers from the Old World. It appears to have been visited by Juan de Fuca in 1592, after whom the straits between Canada and the USA were named, but only a limited second-hand account of that voyage exists. Much later Russian expeditions led by Vitus Bering in 1728 and 1741 began the fur trade in North West America. The Spanish began to colonise California in 1769 and sailed north to the Straits of San Juan de Fuca in 1778. There followed the expeditions of Captain James Cook in 1778 (Cook 1784) and Captain George Vancouver in 1792-4

(Vancouver 1801). European contact resulted in very rapid cultural change, which initially magnified certain characteristics of the indigenous communities. The ready availability of iron tools led to a fluorescence of wood carving and the production of totem poles which seem to have been less frequent previously, their production now being partly fuelled by the wealth generated by the fur trade (Kramer 1999). This also magnified the scale of potlatch ceremonies during which goods were competitively distributed by chiefs, often accompanied by the erection of totem poles. The fur trade initially conducted by Russia, then Britain and fuelled by demand from China, illustrates the severe consequences of early globalisation for First Nations communities. Such exploitation was unsustainable and rapidly brought one of the main hunted animals, the sea otter, to the verge of extinction (Riedman 1997) with the result that trade with some areas, such as Haida Gwaii, virtually ceased. The damage had been done, however; European infections, particularly smallpox in the north, led to major epidemics and a catastrophic reduction in the native American population (Ames and Maschner 1999). Malaria had an equally devastating impact in Oregon.  Many settlements were abandoned, and survivors moved to a smaller number of large settlements.

These dramatic cultural and settlement pattern changes inevitably make it difficult to separate pre-contact from post-contact practices, much of the evidence being drawn from anthropological and ethnobotanical accounts of the twentieth century. Particularly difficult to disentangle, given the settlement pattern changes of the last three centuries, are the patterns of seasonal movement before and after contact. However, Brody's (2002) anthropological investigations, related to land claim issues, have shown that traditional economies, and a seasonal hunting and gathering round, remain important to this day in some areas, notwithstanding the effects of European contact.

Although maritime and plant resources in certain areas, and at certain times of year, were very abundant, the environment was, and is, patchy both in time and space, varying with successional stages of forests, topography, moisture and habitat type. These communities adapted to this by developing sophisticated techniques for preserving, eg drying fish and plant foods and storing them in bentwood cedar boxes and in cedar packbaskets and storage baskets. Transport of edible roots, berries and other food stores, from harvesting sites to winter camps was a significant undertaking (Hunn 1999). Resource patchiness also gave rise to seasonal movements and to exchange with groups whose environments were differently favoured. Both Captains Cook (Cook 1784) and Vancouver (1801, 110) incorrectly inferred the wandering nature of these groups from the many seemingly deserted settlements and habitations observed on their voyages. Lewis and Clarke, in their expedition from the east down the Columbia River in 1804-6, made many observations concerning the seasonal movement of village groups to exploit particular resources during which temporary huts of matting are recorded as used by some communities (McMaster *et al* 1814). These expeditions noted that communities had already been decimated by small pox.

Helm (1972), writing of the Dogrib, a subarctic boreal forest group further north, records that each group was defined in terms of the main routes or axes of summer-winter movement. In the maritime western parts of the North West Coast, movement was often by canoe, whether locally to collect food for a day (Turner 1995), or as part of longer seasonal movements. Water transport would have been essential to move the cedar planks for housing, placed across canoes in catamaran fashion and stacked with supplies, children and dogs; these planks were often taken to summer encampments leaving only the massive cedar trunk frames of houses for the autumn return. Dugout canoes of cedar would also have been essential to move the bentwood boxes and woven baskets of preserved food. The flexibility which water transport confers means that the reconstruction of these patterns of movement is to a significant extent reliant on ethnographic records, supplemented by oral history and increasingly by materials analysis, such as the sourcing of lithic artefacts. Ethnohistorical sources show people travelled to the Cascade Range and Columbia River to obtain some lithic resources, particular types and colours of rocks being used for specific purposes (Stein 2000). Long distance trade networks are also known from Vancouver Island to the south carrying acorns, salt fish, shells, clothing, baskets and dogs. Obsidian came from eastern Oregon as established analytically by X-Ray Florescence. Groups from the south coast of Vancouver Island paddled 15 km across the Straits each summer to San Juan Island where they fished and dug camas bulbs (Stein 2000). The Straits Salish groups exchanged camas bulbs with people of the wetter rainforest areas on the west coast of Vancouver Island for other goods (Beckwith 2004). To the north the Haida people traded with mainland communities exchanging dried seaweed, crab apples and native tobacco for a range of berries and other products. In the south, communities on both sides of the Cascades Range met at portage sites (where canoes were carried past obstacles) and very rich salmon fishing stations on the Columbia River at The Dalles and Celilo Falls to trade products of the different environmental zones, coastal resources from the west being exchanged with those derived from the bison prairies to the east

(Ewert 1999). On the Columbia Plateau, winter was spent in the river valleys and groups went up into the mountains in spring and summer (Deur 1999). The extensive seasonal mobility which characterised the Columbia Plateau has been highlighted as a key factor ensuring that resources were not depleted, whilst at the same time supporting free access to resources facilitating socially significant large seasonal gatherings occasioned by the digging of camas bulbs (Hunn 1999).

**Trails and Prairies**

An individual insight to patterns of movement is provided by a body preserved in the ice of a glacier in northern British Columbia 800km north of the area shown in Figure 2.3. We now know that person was male aged about 20 and died AD 1400-90 (Beattie 2000). He is called Kwaday Dan Ts'inchi, which in the local First Nation Tutchone language is 'long ago dead person found' (Hebda 2017). His clothing included a hat of woven plant fibres and a robe of squirrel fur. He was found 80km inland from the nearest coast but isotopic studies showed that 90% of his diet in the preceeding 5-10 years had been of marine derivation and furthermore his gut contents included sea fish and crab. The pollen of maritime plants on his clothing showed he had been on the coast shortly before his death (Dickson *et al* 2004). He had also spent part of his life in inland locations and the ingested mineral particles in his gut identified the geology he passed through on his last journey from coast to high mountains. It is inferred from his movements that he was probably on a regular trading route because in the same area artefacts of more recent date have been recovered from the melting glacier.  Ice which formed much earlier in the Yukon some 7000 years ago is today melting due to global warming; as it does so large amounts of equipment from the hunting of caribou are revealed; the animals have a habit of congregating on snow patches as their dung in the melting ice shows (Greer 2002). That illustrates one of the factors which would have taken people to the mountains seasonally.

Journeys would have been undertaken on foot to obtain resources and for hunting expeditions. Routes in the mountains are in places marked by sunken paths (Wells 1987) and here and there routes or changes of direction are marked by small piles of stones (Figure 2.5). Routes may also be marked by small cairns marking the position of burials (Figure 2.6), or events. In the case of animal tracks the convergence of routes would have pointed the ways to watering places and river crossings. Thus, in addition to the physical traces of paths and cairns, plant communities may have provided subtle clues to a route very obvious to the experienced tracker alert to the merest traces.

First Nations people marked places with petroglyphs which were spiritually charged and associated with shamanic practices. Figure 2.7 shows examples from a concentration of petroglyphs at Nanaimo, Vancouver Island, the social significance of which is emphasised by the Coastal Salish name which means ‘meeting place’. Wood structures would also have marked activity areas and special places; of these fish traps of many different kinds are recorded among First Nation communities (Stewart 1977). Figure 2.8 shows an example near the Mud Bay settlement in Washington State which is dated *c* 1450 AD. The scale of niche construction is also demonstrated by landscape modifications including the placing of lines of large boulders on beaches to promote sedimentation and extend habitats suitable for clams, known as ‘clam gardens’ (Williams 2006; Moss 2013). There is also evidence for saltmarsh environments being modified to create favourable conditions for the growth of plants such as springbank clover, Pacific silverweed and northern riceroot (Deur 1999;Turner 2014).

When one walks along the rarely used paths in mountain uplands one is often aware that the path one is following is not only a human path but one which is far more regularly used by animals; footprints and faeces of Black tailed deer, bears, etc (Figure 2.9) are regularly found on the path. Writing about present day First Nations hunting practices on the British Columbia/ Alberta border, Brody (2002) records how the lines followed by trappers out from the winter camps follow the hunting trails of fur-bearing predators from one stream bed to the next. The tendency to use paths frequented by animals would be particularly evident in areas of very dense vegetation, such as the remaining areas of temperate rainforest where the forest floor is covered with decaying dead trees, and broken up by depressions, some water filled, resulting from tree throw etc.  As Liebenberg (1990) writes, concerning the tracking skills of people in South Africa, they utilise a wide range of pieces of evidence including:  footprints, slight disturbance, vegetation bent in the direction of travel, cracked twigs, kicked pebbles, scent, urine, faeces, saliva, pellets and feeding signs. Jaeger (1948) describes the many clues employed by Native American trackers and the way the strong nimble feet of these trackers literally feel their way along a trail. In North America generally, Jaeger also describes the technique of trail blazing whereby trees were marked to indicate routes (Figure 2.10). Practices included:  bending a sapling in the direction of a journey; removing patches of bark on trees or groups of stones to indicate right or left turns; pieces of bark slotted into trees; carvings indicating rights to beaver trapping; stakes indicating crossing places over water, or the direction to be taken at a river fork. Saplings were also bent in the direction of travel and these indications could be perpetuated in the form of the tree's growth for centuries (Blackstock 2001). Dale Croes (pers comm) reports that Squaxin Indians split conifers so that they grow in a fork, and split evergreen bushes 3 ways, braiding them so that the braided growth marks territories, events or burials.

One of the most striking and increasingly well documented ways in which communities in the temperate rainforest marked their landscape and provided clues to settlement and routeways is through the cultural modification of trees (CMT). At least twelve species have been recorded as showing evidence for various forms of cultural modification, with cedar the most important (Stewart 1984; British Columbia Ministry of Forests 2001; Mobley and Eldridge 1992). This cultural modification is particularly significant because of the extreme longevity of trees in the rainforest, some living trees providing evidence of tree management practices in pre-contact times. On the west coast of Vancouver Island some 15% of CMT go back to pre-contact (1778) times and one example is as old as AD 903 (Earnshaw 2017). Living trees had part of their bark stripped for fibre to make clothing, baskets etc. Planks were also split from living trees. Provided only part of the bark circumference was stripped, the tree continued living but was left with distinctive scars on the bark which are visible centuries later. The trees provide a fascinating example of the sustainable use of woodland resources. They are now recognised as important cultural artefacts and are protected under heritage conservation legislation. For archaeologists they provide evidence of trail locations and population movements and their presence is increasingly invoked as evidence of former possession in First Nations land claim cases (Turner *et al* 2009).

We may also speculate that routes which were particularly frequented, either by people or animals, may over time have developed a distinctive flora. Grazing animals would have removed new shoots preventing regeneration and gradually a somewhat more open corridor is likely to have come about, even without any deliberate intention by people. Frequented routes on impoverished soils would have nutrient enhancement from urine and faeces of animal or human origin, favouring certain plants eg of nitrogen-rich conditions. Seeds introduced from elsewhere on clothing, or the coats of animals, are likely to have sprouted along routeways. Seeds which remained viable after they had passed through the gut may have propagated. One may also speculate that some degree of transplantation is likely to have occurred, perhaps a stick from a favoured nut tree thrust into suitable ground beside a trail, or a stem from a berry shrub pushed in the ground at a sunny woodland edge. In these ways it may be supposed that some frequented paths could have developed a distinctive trail-side plant community which in time would provide valued resources for passers-by. Although these are to varying degrees suppositions, they are borne out by the observation in many geographic areas of useful plants along frequented routes. They are also in line with what we know of First Nations plant use in general (Turner 1995; 1998; 2014) and the specific association with trails can be suggested in some cases.

Three examples in particular provide evidence of an association between manipulation of plant resources and trails. The first is the Douglas Map (Figure 2.2). The second is the Willamette Valley, Oregon where the first European travellers described a pleasant park-like oak savannah landscape (Figure 2.11). A land survey of the 1850s shows prairies covering much of the valley. Leopold and Boyd (1999) show that the oak savannah had existed from 4000 BC originating in a drier period until 2000 BC, but was subsequently perpetuated by a combination of grazing by wild animals and burning by First Nations groups. Both grazing and burning will inevitably have been concentrated along favoured routes of animal and human movement (Boyd 1999). When burning ceased in the 1850s, after European colonisation, woodland regenerated in some areas, showing that the park savannah was fire climax vegetation. From the 1840s the Willamette valley was a key destination of the Oregon trail by which 350,000 Europeans colonised the west coast, the ruts of their waggon trains today being designated as cultural treasures. Colonists described the valley as a sort of untouched Eden, the fertile soil of which was brought to civilisation by the establishment of European farming. In reality it had been managed by First Nations communities for millennia and the fertile prairie soil was of their creation, although not necessarily deliberately so (Robbins 1999).

A third example concerns some well-documented 'grease trails' which were especially associated with the transportation of fish oil from coastal to inland sites. In Tsimshian territory the routes were owned by a chief who commissioned his likeness to be carved on trees along the way, which is also marked by culturally modified hemlocks (D. Mathews pers. comm). In the Fraser valley First Nations trade networks are well documented and have been mapped (Schaepe 2001; Oliver 2010).

Brody (2002, 193) describes former First Nations practices of burning in Northern British Columbia, in this case during spring, of very carefully chosen areas, to encourage new growth of browse for moose and deer, and to renew pasture for horses. He also recounts the burning of dead fallen trees on paths and trails. Prairies inland of the famous Ozette settlement have been shown to have been maintained by First Nations burning, although with the abandonment of this practice they are subject to incursion by trees. Here early historical sources make it possible to map trails connecting prairies and other resources (Anderson 2009).

In voyaging north along the coast from what is now northern California, Oregon and Washington State, George Vancouver (1801) recorded a predominantly forested landscape but with discrete cleared areas and settlements. South of Cape Flattery he noted cleared spaces in the forest ‘which gave the resemblance of a country in an advanced state of cultivation‘ (Vancouver 1801, 27). The islands in the Strait of Juan de Fuca and Puget Sound, such as Widbey Island, were especially noted for their open grassy aspect with just scattered trees within the forest which again gave the appearance of having been cleared (Vancouver 1801, 66). Vancouver says of the park-like landscapes in parts of the Northwest Coast, ‘a picture so pleasing could not fail to call to our remembrance certain delightful and beloved situations in old England’ (Vancouver 1801, 66). Only later does he seem to have come to understand that these people were not farmers and the cleared areas were a result of Native American burning practices (Boyd 1999). Alexander Henry described in 1814 ‘a most delightful situation for a fort, on a prairie 2 miles long and broad… with pines at the rear’ and deer in abundance; a decade later that became Fort Vancouver, Washington (Leopold and Boyd 1999,146). Similarly in 1842 the previously mentioned  James Douglas was looking for a site for a Hudson’s Bay Fort and selected Victoria at the southern end of Vancouver Island. It was, he described, ‘a perfect Eden in the midst of the dreary wilderness of the North-West coast’

(Turner 2005,147). Grass and herbs covered the area and there were stands of Garry Oak trees. In some small areas, such as Beacon Hill Park and Cattle Point in Victoria, remnants of this park-like savannah landscape remain today (Figure 2.12; Huck 2006). By 1858 it was evident that this parkland was not entirely natural; 'miles of ground burnt and smokey' are described. The Hudson Bay Company records at Victoria document the firing of prairies every year before the first autumn rains. Thus, both the modern city of Victoria and Fort Vancouver, Washington were originally selected because the sites exhibited discrete patches of park-like landscape of a type familiar and attractive to British colonists, although in fact they were the human artefact of a very different First Nations way of life. This is a significant point demonstrating that modification of landscape by one group, including the creation of routeways, may create conditions favourable for another human group, whether or not there is any direct continuity between them.

**Plant utilisation**

George Vancouver (1801, 123) describes all the inhabitants of a village of 80-100 people 'engaged like swine rooting up this beautiful verdant meadow in the quest of a species of wild onion and two other roots'. The account of the Lewis and Clark expedition of 1806, down the Columbia River, describes small alluvial prairies within woodland, these being characterised by many of the plants used by First Nations communities, including areas of almost pure wild onion or camas lily (McMaster *et al* 1814, 24 and 59). Such pure stands are little found today and are considered to have been the product of First Nations practices. The blue camas bulb was an especially favoured food plant (Figure 2.13). Good plots were owned and inherited, areas being marked by modified trees/plants; they were looked after in a way which can be described as cultivation (Beckwith 2004; Turner 2014). Plants were encouraged by burning and the removal of rocks and scrub (Turner 1999). The poisonous Death camas was weeded out at flowering time. The larger blue camas bulbs were dug using digging sticks and small bulbs and seed heads returned to the ground; disturbance encouraged propagation. There is also evidence that camas was transplanted to areas where it had not grown naturally (Lepofsky *et al* 2005). Harvest was followed by burning which helped to fertilise the ground as did deer attracted to the later lush growth of young plants. The bulbs were cooked by steaming with hot rocks in pits and could be stored for the winter. Charred camas are found on sites as early as 5000 BC and earth ovens used in camas processing occur from 3000 BC in the Willamette Valley (Beckwith 2004). Today the park-like landscape characterised by camas field and Garry Oaks is reduced by some 98% but areas of this distinctive landscape survive in Beacon Hill Park where there are also burial cairns made by removing rocks from the camas fields (Figure 2.12; Huck 2006).

Camas provides one of the clearest cases of cultivation and deliberate environmental modification but many other plants were associated with similar practices. Berry patches were burnt and pruned. Turner (2005, 220) documented the fertilisation of berry patches using waste from cleaning salmon and animals and the scattering of ashes and broken clam shells to improve the soil. Berry bushes were also transplanted to favoured sites. Nettles were extensively used for medicine, dye, fibre, string and nets and were effectively cultivated in areas of nutrient-rich conditions created by long occupation. To ensure a good fibre supply the best plants were transplanted to these areas. Captain Cook (1784,310) records the consumption of bracken fern rhizomes by Nuu-chah-nulth people at

Nootka Sound. Later sources record how bracken was particularly found in disturbed and burnt areas and the rhizomes were used to make flour for bread. Both grinding stones and rhizomes were found on the wet site at Hoko River, *c* 1000 cal BC (Croes 1995). Estuarine root gardens were established to expand areas where valued plants grew and these were owned and inherited. Fruit and fibre plants were transplanted to settlements (Turner et al 2013). A range of plants, cedar bark and roots, grasses, etc. were carefully husbanded to provide materials for baskets used for transporting and storing foods. Many of those which survive in museums are of superb quality. The designs and techniques of basket making were distinctive of a group's social identity for millennia (Croes 2015). Acorns were also very important resources in some areas, as demonstrated by the excavation of 114 acorn leaching pits in the Sunken Village site, Oregon (Croes *et al* 2009) and the discovery of many acorns during excavations at the Qwu?gwes site (D. Croes pers comm.)

Many First Nations groups made use of well over 150 plant types (Turner 2014). Where there was a concentration of plant resources, or fish, different communities came together and routeways converge. Turner (2014, vol 2, 23) called these 'Cultural Keystone Places' because of their role in sharing social knowledge. The range of documented management and enhancement practices includes burning, trimming or pruning, coppicing, thinning, bark ringing, selective harvesting, water diversion to encourage growth, sparing (setting aside for later use), replanting of propagules, fertilising, mulching, weeding and transplanting (Turner 2014). There was a sort of empathetic belief among First Nations communities that plants need to feel human presence as they do when people walk on them, prune, harvest, burn etc. These practices are best described as cultivation (ie the encouragement of growth) rather than domestication (control of reproduction) (Harris 1969). The only apparent domesticated plant may be tobacco, the growing of which from seed is documented by the Haida and Tlingit just 13 years after European contact in 1776 (Deur 1999).

**Elsewhere in North America**

In considering the relationship between people and plant resources in North America as a whole, Smith (2011) has drawn on ethnographic evidence to identify six main categories of ways in which people act as Niche Constructors: (1) general modification of vegetation; (2) broadcast sowing of wild annuals; (3) transplanting of perennial fruit-bearing species eg near settlements and along major trails; (4) in-place encouragement of economically important perennials; (5) transplanting and in-place encouragement of root crops; (6) landscape modifications to increase abundance in specific locations. In California, as in the North West Coast, where there were no pre-contact domesticated crops except tobacco, there is extensive evidence for the use of fire and the manipulation of plant resources (Blackburn and Anderson 1993; Fowler 1996). Acorn crops in this area were particularly important, management of this resource by some groups amounting to tree agriculture. Willows were coppiced near springs or seeps to provide long straight stems for basketry. Pinon pine nut trees were whipped, which stimulated bud and thus nut production, and the areas of Pinon pines were kept clear of dead wood to facilitate nut collection. Some groups sowed wild seeds, irrigated favoured food plants and tended root crops. In the semi-arid areas of the American South West routes can sometimes be followed for hundreds of kilometres and there are ethnographic records of some being associated with the acquisition of salt and others served primarily spiritual and ceremonial purposes (Snead *et al* 2009; Sneed 2011). In the Mojave Desert Native American routes are ethnographically recorded and networks of them have been mapped (Fowler 2009).

On the east coast of North America, Europeans arrived very much earlier than on the west coast, beginning with John Cabot in 1497 AD, so the early contact period historical sources are often less detailed. Early explorers, such as Drake in the 1570s and Hudson *c* 1600, observed clouds of smoke arising from Native American burning. The cultivation of domestic crops such as maize, beans and squash occurred in New England and some burning was to prepare ground for crops. However, this burning was documented as occurring much more widely in connection with hunting and gathering, including in areas to the north beyond the limits of crop growing. William Wood (1635), writing of New England, described a landscape which was open and park-like with a greater abundance of fruits and wild animals. The accounts of early writers highlight the role which fire played in hunting animals, improving pasture for wild grazers, driving animals for the hunt and increasing the ease with which people could move through the landscape. Drawing both on the accounts of early travellers, and recent evidence of management for nature conservation purposes, Mellars (1976) showed that burning can increase the carrying capacity for herbivores between 300 and 700 per cent. In areas where crops had been grown, continued burning created conditions favourable to strawberries, blackberries, raspberries and other plant foods.

By the mid nineteenth century Native American management practices had been prevented or abandoned through exclusion of people from their traditional lands, and many areas of earlier fire climax vegetation became colonised by secondary woodland. Introduced plants provided clues to patterns of movement. The broad-leaved Plantain (*Plantago major*) thrives on trampled paths, hence Native Americans calling the plant 'English Man's Foot '; wherever the white men went it was found (Mabey 1972). Following the introduction of the horse, weeds such as fat hen proliferated along trails dispersed in horse dung (Turner 2014, vol 1, 209). In the Great Lakes region of Canada, First Nations people often made use of animal paths and dried stream beds to move through woodland (Coles 1984). Intriguing evidence for the influence of wild animals on patterns of movement, settlement and land use is shown by beavers, as their dams provided crossing places over rivers and wetlands. Following European colonisation the sites of some beaver dams were perpetuated as crossing places for roads (Cronon 1983, 106). Where bodies of water were retained behind beaver dams Europeans harnessed the water to power mills. Thus in New England many of the first European settlements were in the more open areas of landscape created by Native American burning, departed beavers, or in some cases by the effects of seasonal floods (Cronon 1983). These rivers, once considered by geomorphologists as models of natural meandering steams, have now been shown to be the result of patterns of sedimentation resulting from successional niche construction by beavers and later people (Edgeworth 2011). Goldfarb (2018) assembles evidence showing that in many parts of North America beavers are a keystone species, ie they often determine the character of entire ecological communities to the advantage of their biodiversity. In Pennsylvania it has been possible to map networks of Native American paths using the journals of early travellers, maps and land records (Wallace 1965); some routes served as documented war paths (Snead 2011). Levy (2007) has considered how these trails provided a context for the interaction of Native Americans who initially guided Europeans but were progressively supplanted by them.

**Palaeoenvironmental perspectives**

The foregoing discussion has presented evidence for the role of human agency in environmental change in pre-contact North America which is a significant part of this book's argument that the effect of human activity will, more often than generally realised, have been concentrated along trails. Evidence for the manipulation of vegetation, particularly by burning, comes both from groups on the east coast which combined small-scale crop husbandry with hunting and foraging and also from non-agricultural groups on the west coast which have been the main focus of this chapter. The evidence comes from the accounts of the early European explorers who describe discrete prairie patches and burning and anthropologists who describe plant manipulation by First Nations communities (Turner 1999). That these changes occurred on some scale is evident from the widely reported secondary successions from prairie to woodland that followed the cessation of burning in some areas, one such case is the Nisqually prairies between 1850 and today (Leopold and Boyd 1999). Although these practices go back well before European contact, their origins and time depth are more difficult to identify. Pollen studies provide only limited evidence for the effects of First Nations peoples. Kruckeberg (1999, 58) states that, prior to the arrival of Europeans, people made hardly any detectable sign on the pollen record of the Puget Sound Basin, whilst also acknowledging that some bogs may show an increase in fire. This seems oddly at variance with the ethnohistorical evidence from the Puget Sound area. A partial explanation may lie in the contrasting spatial scales and locations of ethnobotanical knowledge and pollen analysis and the fact that much North West Coast pollen analysis has been concerned with the broad scale, very much off-site, patterns of Holocene vegetation colonisation and change, as opposed to high resolution, often on-site, studies where there are concentrations of past human activity in, for instance, Britain. The broad-scale Holocene vegetation histories from the North West Coast are nonetheless informative. They demonstrate that in the earlier Holocene there were episodes when savanna and prairie vegetation was more extensive in the south-west Washington rain shadow of the Olympic Mountains (Anderson 2009). More open conditions are attested in pollen diagrams at Battleground Lake between 8800-3200 cal BC and at Cranberry Lake prior to the deposition of volcanic ash from Mount Mazama *c* 5700 BC (Leopold and Boyd 1999); this is inferred to be the result of more arid climatic episodes which were followed by a wetter late Holocene when woodland expanded. Similarly on the south-eastern coast of Vancouver Island and the islands in Puget Sound there is also some rain-shadow effect from the Olympic range and Vancouver Island ranges giving rise to rather drier and more open woodland of Garry oaks as compared the temperate rainforest on the west coast. This may explain why the 1778 expedition of Captain Cook (1784) described a virtually continuously forested landscape, since his landfalls in what are now Washington State and British Columbia were confined to the west coast temperate rainforest. In contrast the 1792-4 expedition of Captain Vancouver (1801) explored inner Puget Sound, and the south and east coasts of Vancouver Island where occasional grassy prairies with settlements surrounded by woodland were described; these we now appreciate are the combined result of rain shadow effects and First Nations burning practices (Weiser and Lepofsky 2009; Boyd 1999). Charcoal from sediment cores on southern Vancouver Island indicate increased levels in the last

2000 years, which do not appear to be climatically related and suggest deliberate burning (Brown and Hebda 2002, 2003).

On the east side of North America there are similar issues on a much larger scale. Pollen analysis shows that west of the Great Lakes the boundary between the continental interior prairie has undergone significant fluctuations, with the prairie advancing to the east between 10,000 and 7500 BP at a time of drier conditions, and then retreating west between 7500 and 500 BP (Webb *et al* 1984). In this area charcoal occurrence varies through the Holocene and has generally been interpreted as an indicator of natural fires during drier periods, rather than evidence of human agency. In terms of North America as a whole McAndrews (1988) considered that less than 7% of Holocene pollen diagrams register prehistoric agricultural impacts, perhaps reflecting the absence of domestic stock and relatively small-scale crop growing within a more diverse economy in many areas (Wills 1995). Even so, on some sites vegetation changes and evidence of fire can be related to periods of occupation at nearby sites, for instance at Crawford Lake (McAndrews 1988; Clark and Royall 1995). As already noted, early accounts by Europeans provide a good deal of evidence for burning by First Nations people in the eastern part of North America. When burning ceased and bison which grazed the prairies were driven to the verge of extinction by Europeans, then in some areas secondary woodland regeneration from prairie occurred. For instance, after burning was controlled in Illinois the forest margin advanced markedly and it was concluded that some prairie areas would naturally have been wooded if it were not for Native American burning in the last 5000 years (Williams 2003).

**The social significance of routes**

So far in this chapter we have been concerned with various types of physical evidence for environmental manipulation, some of which provide clues to the mobility practices and routes of Native American communities. The anthropologist Ken Basso (1996), working with the western Apache on a reserve in Arizona, provides a very different philosophical perspective on the issue of landscape routes. The Apache hunters and gatherers of the Great Plains had a mobile way of life, the range of which increased greatly with the acquisition of the horse *c* 1650 AD. Basso recounts how the Apache see their past in terms of a well-worn path or trail which was travelled by ancestors and which subsequent generations have travelled ever since. It could be understood with the aid of clues or prompts provided by historical materials, or memorable landscape traces which were sometimes called ‘footprints’ or ‘tracks’ that have survived to the present. Descriptive names given to these places conveyed the optimal viewing points from which the ancestor originally gave a place its name, so that people could situate themselves at that point standing in their ancestor’s tracks. Descriptive place names served as shorthand anchors for stories which were at the same time moral object lessons guiding people as to social norms. They were reminded about how to behave by events which had taken place at a specific location, hence the title of Basso’s book *Wisdom sits in places.* The enlightened were seen as moving along a trail of wisdom. In similar terms the English writer Robert Macfarlane (2012, 28), who has drawn on Basso’s writing, notes that the Klinchon people of North West Territories, Canada use the terms knowledge and footprint interchangeably, as do the Tlicho (Dogrib) Athabaskan people of Canada’s North West Territories. Legat (2008) recounts how among the latter, learning takes place through recounting stories and travelling along trails whilst carrying out tasks in places. People describe themselves as following an ancestor's footsteps and using this transmitted knowledge about trails and places to survive (Johnson 2010).

**Conclusions**

Emerging from this narrative are factors influencing the location and extent of human activity and prairies. These include climatic factors relating to continental interiors and rain shadows, the incidence of wildfire related to climate, the activities of wild grazing animals and other fauna such as beavers, the use of fire by people and their other effects on vegetation. All this is more relevant to the theme of routeways than has generally been supposed because the activities of both grazers and people can be predicted to be more concentrated along the main axes of movement. We have also noted that beaver dams may provide crossing places and beaver lawns attract settlement. This is analogous to the synergistic relationships which have been identified by Smith's (1995) studies of early agriculture in North America where natural disturbance factors in river valleys are also associated with anthropogenic disturbance related to agriculture. People used, and brought into domestication, the plants of disturbed riverine environments. It may also be that the disturbed and nitrogen-rich conditions along routeways brought about the conditions for closer relationships between people and some plants; many of those utilised are, after all, plants of the woodland edge (Turner *et al* 2003). These processes can be seen as examples of niche construction or co-evolutionary relationships between a series of factors, each of which has some degree of agency (Smith 2011). This situation is very much as foreshadowed in Chapter 1. It no longer seems particularly profitable to search for a single causative factor such as: climate, people, animals etc, when the more realistic and interesting story relates to the interactive agency between a range of factors.

Of the people of the North West Coast White (1999, 46) has written: ‘far from being creatures of their environment the Indians had shaped their world and made it what it was when the whites arrived’. This chapter has emphasised that they did so in the context of a range of interacting influences, or active agents, the existence of which undermines long standing, but artificial, distinctions between human and natural factors. Examples from the Willamette Valley (Figure 2.11) and the bead-like string of prairies depicted in Douglas’s map of the Cowlitz to Nisqually trail (Figure 2.2) show more clearly than anything the relationship between human environmental manipulation and trails. If we could visualise the pre-European contact prairie / woodland edge at a large scale we may predict the existence of corridors of prairie extending into woodland along major axial routes. We may also predict that patterns of movement will have occurred between more open grassy areas and those with abundant woodland edge resources. These are working hypotheses suggested by the North American evidence; they  remain to be tested by developing a linear approach to environmental archaeology which is more focused on routeways than the present site-based emphasis.

Nor should we see people’s activity in the landscape in purely economic and utilitarian terms. Basso’s Apache studies serve to emphasise the role of perception and storytelling, just as, in many communities no doubt, song, dance and art contributed to understandings of place. Those who have explored phenomenological approaches in archaeology (Chapter 1) emphasise geological and topographic features: rock outcrops, upland peaks, coastal features etc. Such landscape features would have been much more prominent in an open landscape than in one which was densely wooded. Less widely appreciated is that in forest venerable trees, traces of woodland management, cleared areas, food plants and places where animals gathered, are likely to have figured prominently in storytelling and mythology. This highlights the imperative of building a palaeoenvironmental dimension into phenomenological studies.

Oral history would have served to perpetuate patterns of movement through the landscape and the activities conducted, so that the ways in which people have modified plant communities would have helped provide, not just sustenance, but prompts as to the correct way of life. Traces left by people are likely to have created readable routes, along which were favoured resources, some naturally there, some enhanced by human agency. More subtle signatures would also have played a part. Animals would deposit faeces rich in both nutrients and the seeds of their favourite food plants such as huckleberries. The same would apply, probably to a lesser extent due to gut chemistry, to human defecation along regularly used routes. This may have given rise to linear occurrences of those of their favourite food plants which remain viable after passage through the gut and which are suitable for local growing conditions. This would have reinforced the value of using that route during subsequent foraging expeditions. Other factors could include deliberate landscape modification, eg by burning along corridors (Lewis and Ferguson 1999), the effects of sharing routes with wild and domestic animals, and the more subtle effects of trampling, disturbance and defecation. Each would have contributed, both to the readability of a route, and its capacity to provide food in transit. It may also be speculated that, because of the botanical and other traces along a route, these could have provided readable evidence for the frequency and seasonality of use. The physical evidence of trail-marking blazes and the plants present may also have afforded visual clues as to the particular social groups involved and the bounds of their territories since Hastorf (1999) demonstrates that food preference is a key medium by which people establish their social identity.

# Chapter 3: Niche construction and place making: hunter-gatherer routeways in north west Europe

## Introduction

This chapter picks up the theme of hunter-gather environmental relationships and the evidence which these can provide for routeways from a European perspective. Identification of hunter-gatherer routeways is inevitably speculative. Here we look at sources of evidence for the structuring of landscape by movement from ecology, environmental archaeology, isotopic evidence and material culture. A new direction in environmental archaeology is advocated, with an emphasis on movement and connectivity between sites. This builds on the increasing availability of landscape-scale environmental reconstructions in areas where evidence from multiple sites facilitates the creation of a spatial picture.  That aligns with Jordan's (2003a and b) advocacy for increased consideration of the ways in which hunter-gatherer social symbolism transformed landscapes. Evidence presented in Chapter 2 for the ways routeways became defined in North American landscapes suggests how we can approach these questions in much more challenging earlier contexts in Europe.

Environmental archaeologists have written a great deal about vegetation disturbance and burning by hunter-gatherers, yet there has been surprisingly little consideration that these changes would often have been concentrated along axes of movement. In part this reflects an almost unconscious tendency by archaeologists to think in terms of a static site-focused picture. In this chapter a deliberately broad view of disturbance factors is taken, on the premise that since all actions are articulated by movement then the traces they create will be concentrated on the routes used. This chapter is mainly concerned with dry ground situations and how movement may affect woodland and other terrestrial environments. The locations of the British sites discussed are shown on Figure 3.1. Chapter 4 reviews the smaller-scale clues provided by footprints and Chapter 6 evidence for wetland trackways, but those latter are almost all associated with later farming communities. In considering patterns of movement we must keep in mind that terrestrial evidence is only part of the picture of mobility; in prehistory many trips will have been undertaken by boat on rivers and the sea, which would have served as arteries of connectivity, rather than the obstacles sometimes imagined (Chapter 9). Where there was a heavy dependence on boat transport, dryland routes may be short, interrupted stretches originally connected by boat, such that the dry ground parts may appear counter-intuitive in today's very different environmental context, or to those unfamiliar with moving around by boat.

**Anthropological perspectives**

Insights into the range of ways in which landscapes can be structured by movement may be derived from situations where anthropologists have mapped the paths of recent hunter-gatherers. For the Nunamiut of Alaska, Binford (1983) has mapped the annual seasonal round of a group (Figure 3.2a). He also looked at the contrasting activity areas represented in different landscape facets, and the ways in which residential areas shift due to resource depletion at *c* 10 year intervals and at stages of an individual's life course. Such studies emphasise the considerable areas over which hunter- gatherer activity ranges, both over a year and a lifetime. The household patterns of movement of Skolt Lapps in Finland in the year 1938 (Figure 3.2b) are very much focused on branching radii from the focal point of the winter camp. Figure 3.2c is derived from the Kutchin of Alaska where two separate traplines in places cross (Nelson 1973). It is notable that three out of four cabin sites are at points where lines of the same trail join. For the Inuit, their country was perceived as a mesh of interconnecting lines rather than a continuous surface (Ingold 2007). Both maps a and c illustrate situations in which the main effects on the environment are focused on seasonal or temporary dwelling sites. Figure 3.2d demonstrates a contrasting pattern created by the migration paths of Swedish mountain Lapps who intercept reindeer at various points along the migratory routes (Ingold 1986, Fig 7.7). There was inevitably great diversity in the forms of hunter-gatherer mobility and settlement. As Broadbent (2010) has demonstrated, in the harsh environment of northern Sweden, periodic changes in economy and patterns of movement can be related to cyclical changes in the abundance of coastal sea mammals and inland caribou. The capacity for such adaptability is a key part of the resilience of hunter-gatherer communities. The duration of stays and the distances travelled between camps and during the course of a year will vary greatly. In the course of a single foraging day it is recorded that the Anbarra of Australia travelled 20 km or more before returning to base camp (Meehan 1982).  Of 161 mobile hunter-gatherer groups documented worldwide by Binford (2001; 2006), mean mobility distance among those most dependent on animals as 548km, those most dependent on plants 373km, and those dependent on aquatic resources 289km.  What is clear from anthropological perspectives is that we cannot reduce patterns of movement to ecological or economic necessity (Politis 2006). Jordan’s (2003a) work among the Siberian Khanty shows how space was socially encultured by placement of animal bones, artefacts, shrines and carvings on trees in special places. Settlements were always located upstream of burials, usually 0.8-1km and some 10% of the landscape regarded as sacred was not visited.

In Australian aboriginal thought (Munn 1970; 1973) 'objects or features of the landscape engender subjects in the form of living persons and are the congealed embodiments of the past creative activity of ancestral beings' (Ingold 1986, 139; Munn 1970; 1973). The Walbiri of Australia see the life of a person as the sum of that person's tracks, the total inscriptions of lifetime's movement. Here again they imagine country as a network of lines (Chatwin 1989; Ingold 2007). Footprints left by humans and animals provide clues to the location of resources and the movements and activities of other groups (Ingold and Vergunst 2008). Often there may be no meaningful distinction between the movements of people and animals. In this context the agency, in creating a linear space, lies not with people or animals, but through their mutual interaction. People must often have followed routes favoured by animals. As Olwig (2005) observes, hunter-gatherers develop a 'feel' for the land which is mediated as much by the feet of the animals they follow as their own and this is also true, to an even greater extent, of pastoralists who walk with animals (Jordan 2003a; Lorimer 2006). Hunter-gatherers normally share territory with other visiting groups; meeting with them provides a means of acquiring information about resources, exchanging materials and, most crucially for long-term survival, genetically different sexual partners. It is likely, therefore, that the most important intersections of paths where group meetings occurred acquired a special significance. It will be argued in Chapter 5 that these places of deep-seated ancestral significance may, much later, have become elaborated and celebrated as monuments.

**Topographic factors and 'natural routeways'**

In landscapes of dramatic topography, extensive water bodies, or restricted river crossing places, it may be possible to predict the existence of 'natural' routeways, a concept which will be introduced using Pleistocene and early Holocene examples. The role of topography will be introduced using Pleistocene and early Holocene examples. Creswell Crags, Derbyshire is a prominent gorge in limestone (Figure 3.3). The flanking cliffs have many caves, some occupied by Neanderthals (*c* 60-36 ka BP) and later by Creswellian hunters (*c*12.5ka BP), who were responsible for art in some caves in the Upper Palaeolithic (Bahn and Pettitt 2009). In each case the evidence suggests short-term visits during which both people and animals made use of the natural routeway through the gorge. Cheddar Gorge in Somerset provides a comparable example; it is a routeway from the lowlands of the Somerset Levels and Axe Valley to Mendip uplands. Caves, such as Goughs Cave, were occupied in the Upper Palaeolithic (Jacobi and Currant 2011) and there is also a very early Mesolithic burial. On the north side of Mendip, the gorge at Burrington Combe, is the location of Aveline's Hole, a cave occupied in the Upper Palaeolithic and containing the largest Mesolithic cemetery in Britain, with evidence for Mesolithic geometric art (Schulting 2005; Mullin and Wilson 2004). The associations with art and, in both the Somerset cases, with burial, hints that the 'natural' gorge routeways were not purely significant as hunting, or stopping places, but they accrued particular social significance.

In the late glacial of northern Europe topographic features inherited from the glaciers both channelled movement and created contexts where animals could be intercepted. The tunnel valley at Stellmoor, Germany creates a natural crossing point, providing the perfect place for interception hunting of reindeer by Ahrensburgian hunters (Terberger 2006).Topography inherited from glaciation can serve as an important influence on patterns of movement in the Holocene. On the Bothnian coast of northern Sweden, eskers (ridges formed by sub-glacial drainage) were favoured dry locations for Sami settlement and provided the axial routes of coastal-inland movement, defining economic zones which are reflected in the distributions of artefact types (Broadbent 2010).

**The wildwood, disturbance factors and routeways**

The Mesolithic has often been portrayed as a period in which people were puppets of the environment affected by the rapid environmental and sea level changes which resulted, for instance, in the inundation of Doggerland between Britain and north west Europe.  There was once an assumption of virtually continuous closed woodland in north-west Europe during the Holocene climatic optimum *c* 9000-4000 cal BC, such that a squirrel could traverse the country from end to end without needing to touch the ground (Fox 1932). That view, maintained until recently, is now being significantly revised in the light of ongoing ecological debates, particularly given the increasing number and geographical coverage of palaeoenvironmental studies. These suggest a distinctly more variable and patchy picture than previously imagined. Drawing on experience of conservation ecology, Vera (2000) argued that the natural wildwood of the early Holocene was more open and park-like than previously imagined. His observations suggested that light-demanding oak and hazel, which are important components of the pollen record at this time, could not have regenerated in closed woodland. He proposed that grazing animals, such as deer and aurochs, created more open areas and that patches of thorny scrub acted as nurseries for woodland regeneration on a cyclical basis. Vera's theories have been significant in promulgating a more dynamic view of woodland history and highlighting the significant role of grazing animals. However, as a universal model of temperate zone wildwood history the Vera model has been subject to critique from multiple palaeoecological perspectives. In Ireland, it is now clear that the main potential grazers, red deer and aurochs, were not present in the first half of the Holocene, yet pollen diagrams show oak and hazel were abundant and must therefore have been able to regenerate (Mitchell 2005). The same applies on Danish islands, after wild grazing animals became locally extinct, probably as a result of Mesolithic hunting. Trees preserved below peat, for instance in the East Anglian Fenland, or in coastal submerged forests, generally have very tall straight trunks (Figure 3.4) showing that they grew in dense closed woodland, rather than the low branched trees familiar to us today from the park-like landscape which Vera envisaged.

In critiquing Vera we must avoid throwing the baby out with the bath water. It is increasingly clear, from a range of modern analogue studies, that pollen analysis consistently overestimates the proportion of woodland cover, trees being so much more productive of pollen than grasses and herbs. Grazed semi-open woodland in Denmark produces tree pollen values as high as 85-96% of the total pollen count (Buchwald and Svenning 2005). Pollen analysis in present-day parklands in the Netherlands shows trees are greatly overrepresented by comparison with grasses and herbs, the pollen productivity of which is suppressed by grazing (Groenman-van Waateringe 1993). A more realistic evaluation of the degree of openness and the effects of grazing animals can be obtained from a multi-proxy approach, both in the case of modern analogues and palaeoenvironmental studies. Non-pollen palynomorphs, such as fungal spore types associated with animal dung or fire, are increasingly used to assess disturbance factors within woodland (Buchwald and Svenning 2005). Modern analogue comparisons of pollen and beetle evidence have been successfully employed to evaluate the extent of disturbance and openness in grazed and ungrazed woodland (Smith *et al* 2010; Hill 2015). In earlier Holocene contexts, beetles also indicate the presence of grazing animals and openings within woodland, although not generally on the scale which the Vera hypothesis would lead us to expect (Whitehouse and Smith 2004; 2010).

A central weakness of the Vera hypothesis is the emphasis placed on a single disturbance factor: grazers. In the wildwood a range of factors would have contributed to the creation of sub-climax plant communities, these include people, fire (wild and anthropogenic), storms, floods, disease etc (Brown, T. 1997; Svenning 2002; Bell and Walker 2005). A further significant problem is the implicit assumption of the park-like model that disturbance was somehow evenly distributed across the landscape. This is not what the palaeoecological record suggests, nor is it what we would predict from consideration of any of the disturbance factors. The effects of storms (Figure 3.5) and floods will be focused on particular topographic locations, ie those susceptible to high winds, or low-lying areas subject to flood. Fire will be more frequent in areas of dry woodland, those in which pine and birch dominate, and topographic locations susceptible to frequent lightning occurrence. Opening due to pests and tree diseases will often be of patchy occurrence and on average probably more frequent along routes of animal and human movement. The activities of beavers will be concentrated in low lying areas with streams and water bodies. Many finds of bones and beaver-gnawed wood (Figure 3.6) show they were widespread in riverine environments in Britain during prehistory (Coles and Orme 1983; Coles 2006). Beavers fell trees and create dams in streams and wetlands which can lead to extensive flooding. When beaver ponds fill with sediment, fertile beaver lawns are created. The activities of beavers will create more open tracts in river valleys; their encouragement of flooding must often have made the floodplain difficult to traverse, whereas felling activities could have created more open, easily traversed areas along the floodplain edges. Dams, which in some instances have been shown to persist for millennia, would have made ideal crossing places as noted in Chapter 2 (Coles 2006). Grazing animals play a pivotal role as ecosystem engineers in nutrient biochemical cycling and distribution, depending on the density of grazers. The effects of grazing animals will have been concentrated near waterbodies, in areas of good grazing or browse, or in the case of deer, good rutting grounds. Locations which were warmer and sheltered in the most hostile periods of the year will also have been favoured. Pertinent to the present context, the effects of animals will also have been concentrated on the paths and routeways which link frequented places. They help spread seeds and concentrate edible food sources along animal tracks. Likewise, the activities of hunters and gatherers will also be concentrated in many of the same areas. The various disturbance factors can seldom be envisaged as operating individually. Warren *et al* (2014) have highlighted the applicability of Niche Construction Theory to the role of people in studies of the Mesolithic landscape of Ireland. Openings created in woodland by one factor, storms for instance, are likely to have been perpetuated by another, such as grazing animals (Buckland and Edwards 1984), or people attracted to an open area and resources of the woodland edge which it offered. These mutual attractions are especially pertinent to the way in which patterns were created within landscapes. It follows that the effects of human agency will often mimic ‘natural’ disturbance factors (Smith 2011), indeed are integral to them in ways which make the extent of ‘natural’ or human agency difficult or impossible to disentangle.

Contrary to Vera, we should envisage more of a mosaic environment (Forman 1995; Pickett and White 1985 ) with extensive areas densely wooded, but other areas, in which disturbance factors were concentrated, being more open and park-like, as well as areas of scrub and grassland (Svenning 2002; Fyfe 2006). An additional factor affecting the openness of landscape is geology. Svennings’ (2002) palaeoecological survey of vegetation openness in North West Europe shows that areas with shallow soils, eg chalkland and sandy soils, had more open and patchy woodland with grassland. The hypothesised mosaic environment gains a measure of support from recent palaeoecological studies on the English chalklands. On Cranbourne Chase in Dorset the evidence suggests thin Holocene soils and only a partial tree cover during at least the first part of the Mesolithic (French *et al* 2007). Conversely in another chalk landscape, the South Downs, palaeoecological evidence indicates woodland during the Mesolithic and this was also the case with some sites selected for monument construction during the Neolithic (Thomas 1982). It remains open to question whether these emerging spatial contrasts are the result of superficial geology, soils, the social behaviour of people, or animals, or a combination of these. In the chalk landscape of the Upper Kennet valley, Wiltshire the Encountering Avebury Project (Gillings *et al* 2008) modelled the susceptibility of landscape topography with a tree throw windfall risk map (Figure 3.7a). This in turn generated a predictive map of the locations of possibly clearer areas and hypothetical paths were drawn between these clearings (Figure 3.7b). This map highlights the susceptibility to tree throw of particular topographic contexts : (i) the steep escarpment on the north side of the Vale of Pewsey on the bottom edge of the map; (ii) to a lesser extent the escarpment formed by the present Ridgeway route to the north of Avebury; (iii) the susceptibility of valley sides to tree throw is also highlighted.

It is clear from the foregoing discussion that closed woodland was more extensive in the early Holocene than a literal interpretation of the Vera hypothesis would suggest and that is confirmed by analysis of the pollen data in some areas, such as Wales (Fyfe 2006). Nonetheless, a range of disturbance factors would have created some open disturbed and park-like areas. In the more open areas routes may have been quite fluid and changeable. The creation of more open areas will rarely have been attributable to one disturbance factor and more often would be the result of interactions between a combination of factors, each exhibiting, to various degrees, agency in influencing change in other factors. The key point for archaeologists, which has not so far emerged clearly from the extensive literature on the nature of early Holocene woodland, is that to a significant extent, particularly in wooded areas, the mosaics created by disturbance factors would have exhibited linear patterns along frequented routes of animal and human movement just as we saw in the North West Coast American examples, the Douglas map and Willamette Valley (Chapter 2).

**Woodland manipulation and management**

In addition to the effects of mobility itself we need to consider European evidence for the deliberate modification of vegetation and its possible role in the structuration of landscape by routeways. Trees may have been consciously modified and thus enter the cultural sphere by virtue of modification, or because they were perceived in particular ways (Jones and Cloke 2002). Examples of Culturally Modified Trees (CMT) have been referred to from North America and there is similar evidence from the Siberian Kante (Jordan 2003a). Aboriginal Australians also modified trees, removing bark for canoes, containers, shields and shelters; some trees were carved, or decorated (Victoria State Government 2008a). In Denmark Mesolithic coastal sites have recently produced vast numbers of even-sized long straight poles which clearly formed part of fish traps: at the site of Ronas Skov there were 100,000 such rods, and at Tybrind Vig there were 7000 (Andersen 2013). Such numbers of poles imply the deliberate management of hazel coppice in order to provide suitable materials, an inference supported by the high hazel pollen values which are found at coastal sites (Christensen 1997b). Fixed fishtraps and the concomitant long-term management of woodland resources raises important issues of the ownership of resources by hunter-gatherers; ownership is recorded in relation to these intensified practices in a north American context (Stewart 1977, 20). Similarly, very finely-made basketry fish traps at several sites, including Magrethes Naes on the Storebaelt, Denmark and Agerod V, Sweden (Pedersen *et al* 1997; Larsson 1983), imply careful management of willow and hazel in order to produce the perfect materials for such fine work, analogous indeed to the husbanding of basketry resources seen ethnohistorically in North America (Chapter 2). Mesolithic fish traps recently found in Ireland in the River Liffy, Dublin and at Clowanstown have both been interpreted as evidence of the husbandry of wood resources (McQuade and O’Donnell 2007;

Fitzgerald 2007). Warren *et al* (2014), however, highlight the problems in establishing the extent to which formal coppice cycles, as opposed to adventitious coppicing (selecting suitable rods), were practised in the Mesolithic. From the perspective of the development of landscape structures and routes, the distinction between regular and adventitious coppice is not so significant because places where either was practised are likely to have produced readable signs in the landscape.

**The broad spectrum revolution and niche construction**

People have often husbanded plants and animals which do not differ from wild taxa (Ingold 1996) and they do not necessarily recognise the distinction which westerners make between wild and domestic, nor the concept of nature being transformed by people. Barker (2006) argues that in many parts of the world hunter-gatherers adopted forms of behaviour presaging animal and plant husbandry long before domestication occurred. These often took the form of a developing co-evolutionary process with mutualistic benefits. The development of these relationships, involving a widening range of plant and animal resources, occurred in many parts of the world in the late glacial and initial Holocene, a transformation labelled by Flannery (1969) the Broad Spectrum Revolution (BSR). Such an expansion of the range of resources seems often to have been linked to a process of induced environmental change or Niche Construction which significantly increased the abundance of these resources (Smith 2011; Zeder 2012). In some areas plants and animals which formed part of the BSR became domesticated, in others they did not. The BSR is often linked to more sedentary, less mobile, communities, in part perhaps because, as populations grew, there was less opportunity to move around and greater need to intensify the use of available resources. Zeder (2012, 259) observes that 'greater permanence of human presence opens up new opportunities for plants and animals to move into new anthropogenic environments and develop a range of relationships with humans'. The social implications of this are likewise significant. Increased concentration on local resources strengthens the community's role as a source of environmental knowledge and the social ramifications of this may help to explain the flowering of art, ritual and symbolism which is a characteristic of immediately pre-agricultural and early farming communities in the Near East (Zeder 2012).

**Hunter-gatherer plant use**

Plant foods would have made a significant contribution to Mesolithic diet. Arguably, human physiology generally requires something like 30-40% of plant food (Zvelebil 1994). Clarke (1976) observed that archaeologists tend to foreground the role of hunting, giving insufficient emphasis to plant resources, of which there are several hundred potentially edible and useful plants in the deciduous forests of north west Europe (Mears and Hillman 2007). Zvelebil (1994) assembled the evidence for wild plant use in Mesolithic Europe and Bishop *et al* (2015) have demonstrated systematic and intensive plant exploitation in Scotland.  Hazelnuts are the most frequently represented plant resources in Mesolithic Europe; hazel was widespread in many areas and its charred nuts are frequently preserved. The settlement of Staosnaig, Colonsay, Scotland had a pit, dated to 6700 cal BC, containing a large cache of hazelnuts, together with evidence for other plant resources such as lesser celandine tubers and crab apples (Mithen 2000). Significant hazelnut exploitation is likewise demonstrated on various sites in Ireland (McComb 2009) and the Duvensee, Germany (Holst 2010). Charred tubers and evidence for the use of white waterlily (*Nymphaea alba*) seeds occurs on sites in Ireland (Warren *et al* 2014). At the waterlogged site of Tybrind Vig, Denmark use of a wide range of plant resources is documented (Andersen 2013).

Zvelebil (1994) noted that antler mattocks are widely found in riverine and coastal contexts and he argues these were used for digging of roots and tubers. As noted in Chapter 2, from North American evidence, the very digging of roots and tubers encourages their reproduction and growth. In a similar way, fruit trees can be seen as weedy colonisers which will have flourished in disturbed habitats, to which they may also have been transplanted. Many species with weedy tendencies are plants of the woodland edge which will have been spread along routeways and flourished in these more open, disturbed and nutrient enriched environments. Rackham (1986, 279) notes a number of species characteristic of trackway edges, some fertilised by dung, or by mineral material washed from a road surface, others germinated in water seeps in hollow ways.

**Hunter-gatherer vegetation disturbance in Britain**

This topic is significant because, as the North American evidence in Chapter 2 demonstrated, environmental disturbance is one of the ways in which early routeways are likely to have become marked. There is significant evidence for Mesolithic disturbance in Britain but specific instances have not generally been related to the topic of routeways. Zvelebil (1994) identified 105 sites with possible evidence of Mesolithic vegetational disturbance, fire being implicated at 29 of them. A predominantly upland moorland distribution and later Mesolithic date also seemed apparent (Simmons 1996; Innes *et al* 2013 ). This carried the possible implication that vegetation disturbance was an evolutionary development arising from increased population density, sedentism and environmental manipulation. Sites have continued to be identified and a subsequent survey prepared as background for this book, and presented in detail in supplementary Appendix 3.1, lists 195 sites which are mapped in Figure 3.1. The evidence is predominantly derived from pollen and charcoal but other palaeoenvironmental evidence contributes in a smaller number of cases (Figure 3.8a). The new sites change the distribution significantly, with many more sites in southern Britain and Wales. No longer is there a mainly upland distribution. 46% of sites are below 50m OD and 17% below 0OD (Figure 3.8b), emphasising the importance of the coasts to Mesolithic communities, especially if one considers that the majority of coastal sites must now be permanently submerged. There are more radiocarbon-dated sites in the last 2 millennia of the period (56%; Figure 3.8c). That is further increased to 63% if we include sites which are not radiocarbon-dated but where disturbance clearly predates the elm decline, although not all of these are necessarily pre-farming. However, if we look at the sites where there is a clear association with human agency in the form of artefacts, there is a more even distribution across the period. Earlier arguments that the changes are of late Mesolithic inception are challenged because some of the clearest evidence of human involvement, at sites like Star Carr and Thatcham as outlined below, occurs in the first 1-2 millennia of the Holocene.

The strength of the evidence for human agency as a cause of disturbance varies greatly. In a small number of cases (4%) it is based solely on the presence of cereal-type pollen which could be attributed to certain wild grasses, or precocious farmers (Edwards 1988). In a much larger number of cases there are only slight changes of vegetation eg woodland reductions and the presence of species of disturbed conditions which could be the result of a range of disturbance factors. It would probably be fair to say that there has been too much readiness to attribute disturbances to people without considering alternatives. Also problematic is establishing the contribution of fire, whether deliberate or natural wildfire. Fire determines the character of vegetation in many parts of the world, interfacing with human culture in myriad ways (Pyne 2012) from its earliest occurrences associated with archaeological sites in Africa c 1,500,000 years ago (Gowlett 2016). The occurrence of natural wildfire provides a proxy record of drier climatic periods in many areas (Harrison and Sanchez Goni 2010; Marlon *et al* 2013). Some episodes of charcoal occurrence in Britain do seem to correlate with periods of drier conditions, for instance in late glacial Scotland (Tipping 1996; Edwards *et al* 2000). As dating precision increases due to Bayesian statistical modelling of sequences, so the possibility of correlating disturbance phases with distinctive climatic episodes attested from other sources increase and Wicks and Mithen (2014) have recently argued that disturbance phases in woodlands of the Inner Hebrides correlate with climatic episodes. It is also probable that a proportion of the charcoal occurrences relate to campfires as opposed to the deliberate modification of vegetation. Even so, there are many cases of marked charcoal occurrence in pollen sequences of Mesolithic date, both on sites with artefacts and in off-site contexts. Often this accompanies other forms of vegetation disturbance such as a reduction of trees and peaks of plants of open conditions. It is generally agreed that the temperate woodlands of Western Europe , and Britain in particular, are very difficult to ignite (Pyne 2012; Rackham 1988; Brown 1977). Mellars (1976) has highlighted the role of fire among hunter-gatherers generally and in terms of the significant archaeological evidence from Britain, arguing that it created favourable conditions for game especially deer. Clarke (1976) also highlighted the role of fire in the encouragement of wild plant foods. Particularly telling is that in several moorland sequences charcoal occurrence virtually ceases with the appearance of the first farmers c 4000cal BC and this is without obvious climatic explanation (Edwards 1988). There is a marked concentration of sites in upland moors especially the North York Moors and Pennines (Figure 3.1) where some episodes of charcoal deposition are associated with artefacts below later blanket peats. The evidence is most persuasive on sites such as North Gill and Bonfield Gill, Yorkshire where there were repeated episodes of charcoal occurrence (Simmons 1996) and those where pollen and charcoal evidence is supplemented by additional sources such as non-pollen palynomorphs indicating the presence of grazing animals (Innes *et al* 2013; Innes *et al* 2010; Ryan and Blackford 2010). Evidence for Mesolithic vegetation disturbance in Ireland has recently been reviewed by Warren *et al* (2014); out of 33 palaeoenvironmental sequences they found evidence of disturbance at 16. On two sites this was as early as the 8$^{th}$ millennium cal BC but instances were more frequent late in the Mesolithic, with 16 sites having disturbance evidence after 6000 cal BC; one site, Mount Gabriel, showed evidence for multiple episodes of burning. Deer and aurochs being absent in Mesolithic Ireland anthropogenic disturbance was more likely for the encouragement of wild plant resources.

***Star Carr***

One of the most pronounced concentrations of Mesolithic sites is in the Vale of Pickering, Yorkshire around a former lake. Here the Mesolithic site at Star Carr has long been recognised as the most significant of this period in Britain. Occupation occurred at the beginning of the Mesolithic between 9300-8500 cal BC in open grassland with birch scrub and reeds fringing a lake shore. Beavers were already active in a landscape undergoing gradual woodland colonisation (Milner *et al* 2018).

However, the vegetation was impacted by repeated burning of vegetation including reedswamp on the lake shore (Mellars and Dark 1998). Phases without burning and with reduced activity suggest occupation was not continuous. Evidence for a distinct seasonal focus is not apparent because animals were killed in all seasons. There is evidence of dwelling structures on the dryland and at the lake edge successive timber platforms were constructed and ritual deposition of artefacts took place, including frontlets of deer antler. These activities attest to common patterns of deposition and belief over some 800 years at what was clearly a focal and socially significant point repeatedly returned to over centuries. Flint sources suggest patterns of connectivity to the coast 10-20km to the east and also south to the Yorkshire Wolds.

***Case study : Kennet valley***

At about the same time in the early Holocene in southern Britain the Kennet Valley, a tributary of the Thames, has a concentration of Mesolithic activity and disturbance along a 25km stretch of the valley around Thatcham (Figure 3.9); key aspects of the evidence from these sites is summarised in Table 3.1. The sites are on the floodplain and the edge of the river terrace (Wymer 1962; Froom 2012). Activity is concentrated in the first two millennia of the Holocene, with some sites occupied in the later Mesolithic. Activity occurred as woodland became established on the valley sides, initially birch and pine, then hazel. However, trees remained patchy. The floodplain was more open and colonisation by woodland seems to have taken place more slowly than in surrounding areas, apparently due to a combination of disturbance factors. Several of the occupation sites begin on dry ground but became subject to increasing seasonal flooding, though activity continued despite increased wetness, suggesting occupation was seasonal. The flooding can be attributed to the activities of beavers, represented by bones on several sites, and they will have contributed to the maintenance of open areas (Coles 2006). Deer bones and boar predominate on many sites of this period and grazing by animals moving up the river valley may have helped maintain more open conditions. Particularly significant is evidence from Thatcham reedbeds for repeated episodes of burning, including that of reedswamp, suggesting that Mesolithic communities were deliberately creating more open conditions to favour grazing animals and the plants of the woodland edge (Barnett 2009). Thus, a series of niche-constructing factors were in play: the river flooding, animals and human agency interacting together to create a linear corridor of more open conditions and productive environments attractive to human communities. The corridor can be seen as part of a natural axis of movement between the Thames valley to the east and the River Avon and the Severn Estuary to the west.  That the later Neolithic centre at Avebury lies mid-way along this hypothetical axis may be further evidence of its longer term significance.

A notable feature of these sites, both the Vale of Pickering, the Kennet and also other tributaries of the Thames such as the Colne is that the concentration of early Mesolithic activity occurs near Long-Blade sites of the late glacial or initial Holocene (Figure 3.9; Conneller and Schadla-Hall 2003; Froom  and Cook 2005;  Lewis  and Rackham 2011). This may indicate that patterns of river valley focused mobility were originally established in the Pleistocene-Holocene transition, at a time when horse and reindeer roamed very different open landscapes. Such patterns may then have perpetuated by following existing trails enhanced by human  and animal niche-constructors, as woodland encroached in the first millennia of the Holocene.  Such a natural corridor of mobility may be seen as analogous in a way to the case of human niche construction documented from botanical and historical sources in North America such as the Willamette Valley (Chapter 2).

| Site | Date cal BC | Environment | Sediments | Pollen | Mollusca | Flooding | Beaver | Reference |
|---|---|---|---|---|---|---|---|---|
| Victoria Park | 8430-8240 | floodplain open, some woodland | ✓ | | ✓ | ✓ | ✓ | Bell *et al* in prep. |
| Faraday Road | 8600-8300 | grassland / sedge floodplain some trees | ✓ | | ✓ | ✓ | ✓ | Ellis *et al* 2003 |
| Thatcham Sewage Works | 8500-7200 | pine hazel grass herbs partly open | ✓ | ✓ | | | | Healy *et al* 1992 |
| Thatcham Wymer sites | 10300-6550 | pine, birch grasses | ✓ | ✓ | | ✓ | ✓ | Wymer 1962 |
| Thatcham reedbeds | 9150-7520 | floodplain sedge and grass, dry ground birch, pine then hazel | ✓ | ✓ | ✓ | ✓ | ✓ | Barnett 2009 |
| Ufton Bridge | 9300-7380 | pine birch partly open floodplain | ✓ | ✓ | ✓ | ✓ | | Barnett 2009 |

Table 3.1 Mesolithic sites in the Kennet Valley outlining date, environmental evidence and its sources.

**Case study: A Welsh model of river valley based mobility**

A hypothetical model of coastal and river valley based mobility is shown in Figure 3.10 based on evidence from sites in Wales (Bell 2007a). Here coastal locations with submerged forests have produce evidence of burning, from both on- and off-site locations (Figure 3. 4). Goldcliff is an example of the former. On the edge of a bedrock island surrounded by wetland are several small and short-lived seasonal camps (Bell 2007a). The model envisages episodes of activity on the coast to gather plant resources, hunt and fish at times of eel and salmon runs. Seasonality evidence shows this was particularly in the autumn, with shorter visits at other times of year. The model postulates the existence of aggregation camps, represented by major artefact concentrations, at times of particular abundance in autumn. The possibility of winter-base camps in sheltered locations such as estuary heads is suggested and in summer movement upriver to the uplands is attested. Caves in the Wye valley were used and seashell beads attest to a coastal connection ( Barton and Roberts 2015). People went upvalley to exposed moorlands, probably following deer in the summer, where, at sites such as Waun-Fignen-Felen, there is evidence for the repeated burning of vegetation over several millennia from 6000 cal BC, a classic case of a regularly visited 'persistent place' (Smith and Cloutman 1988; Barton *et al* 1995). The evidence for burning in both coastal locations, favoured in autumn, and in uplands, utilised in summer, means that Mesolithic communities were engaged in niche construction at both ends of their hypothetical annual territories. Such a coastal / inland model makes sense in the topographic context of Wales with an extensive central upland and a radial pattern of rivers flowing to a generally narrow coastal plain. If this model is anything like reality then the drowning of coastal lowlands as a result of sea-level rise, which inundated the Severn Estuary, Cardigan and Liverpool Bays, as Figure 3.11 shows, would have had the effect of reducing annual river catchment-based territories by an average of 46% (Bell 2007a, 335).

**Continental Europe**

Until recently, the evidence for Mesolithic vegetation disturbance and burning in Britain was in marked contrast to that from continental Europe, where it is still much more limited, but instances are increasingly recognised (Figure 3.11). Some charcoal occurrences in late glacial Allerød contexts have been interpreted as a result of lightning strikes (Behre 1988). However, at the Upper Palaeolithic site at Milheeze, Netherlands a reduction in birch / pine forest is associated with pine charcoal and is contemporary with an Upper Palaeolithic site dated 11200-10600 cal BC (Bos and Janssen 1996), appearing to suggest an association with human activity. A little later at Zutphen, Netherlands an early Mesolithic site c 9100-8500 cal BC was in open grassland which seems to have been maintained by burning (Groenewoudt *et al* 2001). Particularly revealing is the site of Weimer-Nieder-Weimar, Germany in the valley of the River Lahn, a Rhine tributary, where there are two episodes of woodland reduction (*c*. 8470 and 8350 cal BC) at Mesolithic sites on the river terraces; both were associated with charcoal and the occurrence of plants of disturbed and nutrient-rich conditions (Bos and Urz 2003). The association on this site of charcoal with disturbed, nutrient-rich conditions hints at a natural routeway of animal movement along these river terraces, as was suggested in the case of the Kennet. The Dutch and German evidence for vegetation disturbance seems to be more marked in the early Mesolithic, as woodland cover was developing, and perhaps as communities burnt to retard woodland succession in areas of key resources, which may often have been along routeways.

In Denmark there has been extensive research on the Mesolithic, including many substantial shell midden sites, the oldest dating from *c* 5600 cal BC and some in use for 700-1000 years (Milner 2002). In such cases a significant effect on the environment might be anticipated. Yet in terms of clear evidence for burning, or vegetation disturbance, there is limited evidence from palynology. Only at one site, the inland site at Ringkloster, does a reduction of woodland occur at the time of the site's occupation *c* 4400 cal BC (Rasmussen 1995). Submerged forest trees in the Storebaelt also produced two charred trees, which might be attributed to human activity (Christiansen 1997a, 40). At Hassing Huse, Jutland, two elm declines, slight hazel rises and slight charcoal peaks in the mid and late 5th millennium cal BC occur (Andersen 1993; Andersen and Rasmussen 1993), but the authors regard the evidence for Mesolithic disturbance as extremely weak. Paradoxically, however, as already noted above, Denmark has yielded the most convincing evidence for the manipulation of woodland by hazel coppicing to produce vast numbers of straight poles and some fine basketry for fish traps (Christiansen 1997b). At Tybrind Vig the pollen diagrams show a landscape of primeval forest with a dense canopy and it is clear from submerged trees that the forest extended to the shore (Andersen 2013). The pollen of terrestrial herbs was very limited and it was concluded that openings in the forest were few, and that 'the forest was without visible trace of human interference'. However, the plant macrofossil evidence suggests a different picture: 42% of the utilised wood was of hazel and the charcoal is dominated by hazel and other understorey species. This indicates that people had affected the composition of the lime forest, to encourage hazel which provided nuts and poles for fish traps. Evidence for burning occurs in association with a small number of Mesolithic sites in Norway, Sweden and Finland (Welinder 1990; Regnell *et al* 1995; Berglund *et al* 1996, 167).

Across Europe some notable and paradoxical contrasts emerge in terms of Mesolithic environmental disturbance. In what is now mainland Europe, the evidence seems to be mainly early in the Mesolithic and to relate particularly to the stages of vegetation succession prior to the development of climax woodland. In that sense it is analogous to the early Holocene British sites at Star Carr and Thatcham. At this time Britain was linked to continental Europe. In the later Mesolithic, after the drowning of Doggerland (Figure 3.11) *c* 7000 cal BC, which must have had a severely disruptive effect on patterns of Mesolithic connectivity and environmental knowledge (Leary 2015), there is very little evidence for vegetation disturbance, even in parts of Denmark and Schleswig Holstein where sites are abundant, rich and long-lived. Overall there is far more evidence for Mesolithic vegetation disturbance in the British Isles than continental Europe.

**Mobility and Sedentism**

The emphasis here has been on the identification of patterns of movement in the Mesolithic, but it has been argued that some groups were sedentary or semi-sedentary, especially in rich coastal environments capable of supporting year-round occupation. The later Mesolithic shell middens of Denmark are vast accumulations of shells and cultural material which demonstrate a wide range of resource utilisation. Some may represent year-round activity (Andersen 2000), associated perhaps with the ownership of fixed resources, such as the fish-traps and managed woodland and also burials in some middens. However, studies of shell collection seasonality have revealed concentrations at certain times of year and clear evidence for year-round occupation remains elusive (Milner 2005). Identification of seasonality and sedentism is a challenging topic and, in common with many of the themes discussed here, rests generally, not on a single source of evidence, but on evaluating a range of sources in a comparative way. The middens may have served as base camps, with sections of the community decamping elsewhere for periods to exploit specific resources in logistical (ie task-specific) camps. The shell middens on the tiny Scottish island of Oronsay provide biological evidence for occupation of the island in all seasons of the year (Mellars 2004), although that seems counter-intuitive on a small and exposed island and Mithen (2000) has argued for shorter visits at various times through the year. Sedentism has also been proposed where there are substantial pit houses, as for instance at Mount Sandel, Ireland (Woodman 1985) and Howick, Northumberland (Waddington 2007). However, recent analysis of date sequences from pit house sites suggests that, rather than continuous occupation, they are characterised by repeated visits with interruptions over extended timescales (Mithen and Wicks 2018). Some recent British excavations have uncovered extensive areas of Mesolithic landscape, revealing multiple discrete artefact scatters with little between, which would seem to suggest recurrent, relatively short-term, activity over extended timescales. Had activity been more continuous one would have expected a much more blurred picture and substantially greater quantities of artefacts than characterise most sites. Discrete clusters are found at some of the Vale of Pickering sites, such as Seamer Carr (Conneller and Schadla-Hall 2003), a site complex at Bletchingly, Surrey where activity occurred over 4000 years (Jones 2013), the Goldcliff intertidal sites occupied for 1000 years (Bell 2007a), and at Bexhill, Sussex there is a complex of over 200 discrete artefact scatters on the edge of coastal wetland (M. Donnelly pers comm). Discrete artefact clusters are also seen in the Kennet valley sites at Thatcham and Wawcott (Froom 2012). Where various comparative sources of seasonality evidence are available, as at Goldcliff, Wales, they tend to point to activity mainly concentrated in one time of year, but with evidence for occasional visits at other times of year (Bell 2007a). In other words the general picture seems to be of seasonal and logistical (task specific) mobility. The discrete multiple artefact scatters and the pit houses with episodic use, point to recurrent patters of activity which have often been rationalised in terms of the attractive ecological resources of the place. Such long-term foci may, however, make more sense as places on frequented routes marked by animal and human passage imprinted on landscapes by linear niche construction. Sometimes, as perhaps at Star Carr, these places may have become significant for social reasons as much as for the ecological resources they provided.

**Artefact areas and 'monuments'**

Much of the evidence considered so far takes the form of what may often have been unconscious traces of human activity and movement in the landscape.  Mesolithic communities also left traces of their activities in the form of lithic and artefact scatters which would often have been obvious to others moving along the same trackways. Sometimes there is evidence that artefacts were deliberately buried and hidden in tree throw pits before people moved on, although this might relate to the deliberate caching of materials which could be reused on a subsequent visit (Evans *et al* 1999). Lithic artefacts with distinct episodes of reuse, for instance retouch through patination on previously worked flints, indicate that this occurred. The association between Mesolithic artefacts and tree throw pits is seen also in Belgium where the inference drawn is that people were attracted to tree throw areas (Crombé 1993). Animal footprints on the edge of tree throw features in Belgium are noted by Langohr (1993) as highlighting the attractiveness of these areas to grazing animals.

In coastal areas the focal points of activity often left obvious traces in the form of shell middens. These would have stood out on account of their smell which would have been obvious at significant distance; their white colour; the trails and disturbance by scavenging animals they attracted; and the distinctive plant communities associated with the geochemical signature created by such concentrations of calcium and nitrogen-rich midden material. This would have been enhanced by a halo of plants growing from seeds deposited in faeces. It has been argued that middens should be seen as Mesolithic monuments  playing a social role in delineating landscape (Chatterton 2006).  This inference is strengthened by middens, such as those on Oronsay, which contain individual human bones (Mellars 1987; Richards and Sheridan 2000), and some Scottish middens which have Neolithic tombs built on them (Pollard 1996). An association between shell middens and Neolithic tombs is also found on Guernsey (Sabre 2005). Shell middens are numerous and often very substantial round the coast of Denmark and are likely to have acted as important way marks for those travelling by water.  The soils created by concentrations of shells in otherwise non-calcareous environments are also likely to have attracted early farmers to the sites of Mesolithic middens because they would have been fertile places for garden agriculture, as is suggested by evidence for later Neolithic cultivation on middens at Northton, Harris and Prestatyn, north Wales (Gregory *et al* 2005; Bell 2007a).

However one interprets the midden evidence, it has become increasingly clear that Mesolithic communities did create structures which are akin to monuments and there is growing evidence that these related to routes. Three or four substantial post pits found in the Stonehenge car park have been dated between 8800-6590 cal BC. It is at least possible that the relationship to the much later Stonehenge (Chapter 5) is not coincidental and that the posts mark the special significance of a place which was much later monumentalised, Mesolithic activity having left some tangible trace marking the significance of the place. That possibility becomes less fanciful if we posit a path or route, or a convergence of paths, which led successive generations of people and animals to the same point, maintaining a grassy clearing to which myths and legends and genealogies became attached. Allen and Gardiner (2002) cite several other instances of post holes and / or pits dated to the Mesolithic on sites which later became significant foci of Neolithic activity, some of which are discussed in Chapter 5. A particularly interesting example is at Crathes, Aberdeenshire, Scotland where 12 pits have been excavated forming an alignment over 50m; at least two seem to have held wooden posts (Murray *et al* 2009). They have radiocarbon dates centring on the period 7000-6800 cal BC and appear to have been dug in open hazel and birch woodland over several hundred years, with some activity continuing to the Neolithic. The surrounding area remained important in the Neolithic with two rectangular buildings at Warren Field and Balbridie nearby.

**Isotopes and mobility**

So far this chapter has concentrated on the traces that peoples' activities and movements leave on the landscape. A complementary perspective may be obtained from the evidence which movement leaves in the stable isotopes incorporated in the bodies of people and animals (Sealy 2001). Carbon ($\delta^{13}C$) and Nitrogen ($\delta^{15}N$) isotopes provide evidence of diet and trophic level (position in the food chain). Using this evidence, it is possible to estimate the proportion of marine / terrestrial food in diet from the carbon isotopes. Nitrogen isotopes can produce evidence of what contributed to that diet as between, for instance, primary producers and top carnivores. In the Bristol Channel, UK analysis of early Mesolithic burials in Aveline's Hole, a site 100km from the coast at the time of its occupation before sea level rise, shows no evidence for the consumption of marine resources, indicating that the people did not spend extended periods on the coast (Schulting 2005). Burials further to the west on the south Wales coast mostly show a high reliance on marine foods, indicating that people spent most of the year on the coast (Schulting and Richards 2002). Significantly, there are one or two individuals with little evidence of marine diet and they may have spent most of their time at inland locations, although they were buried near the coast. In Denmark some individuals from inland locations have been shown to obtain a significant proportion of their diet from marine resources indicating that most of the year was spent on the coast (Fischer 2003). On the tiny island of Oronsay, Scotland human bones from shell middens have an isotopic composition indicating that most of the year was spent in coastal locations (Richards and Mellars 1998). Midden sites on the islands of Teviec and Hoedic, Brittany have male burials who consumed higher proportions of marine protein than younger adult females, who, it was inferred, had spent the early part of their lives in inland locations (Schulting and Richards 2001; Schulting 2003). From this it was deduced that some females moved to coastal locations on marriage indicating patrilocal postmarital residence. In many areas of north west Europe, it is striking that, following the advent of farming, most burials, even those close to the coast, show little or no evidence for the consumption of marine resources, pointing to a marked and rapid change in economy and patterns of movement (Richards *et al* 2003). There is, however, continuing debate concerning the interpretation of this evidence and its implications for understanding the process of Neolithisation (Milner *et al* 2004). Oxygen isotopes could also be employed to identify individuals who derive from climatically contrasting areas and strontium isotopes those who originate from areas of contrasting geology.

**Material culture and movement**

Material culture, particularly the geological sourcing of lithic materials, can also provide clues to patterns of hunter-gatherer movement (Conneller and Schadla-Hall 2003; Preston and Schorle 2013). However, in this case we have to consider the question of whether it is the people that are moving, or just materials being passed on from one community to another by a process known as down the line exchange. In northern Fennoscandia patterns of Mesolithic mobility can be established from the occurrence of lithic raw materials that originate on the coast but are found on sites up to 100km inland (Manninen 2009). That indicates a similar extent of mobility to that recorded for recent East Sami people in the same area (Figure 3.2d). In the Mesolithic, movements of raw materials suggest movements of tens, sometimes hundreds of kilometres. The Dutch sites at Hardinxveld derived some lithic raw materials from distances of between 50 and 150km (Louwe Kooijmans 2001a and b). Lithic raw materials from the Mesolithic site of Chedzoy in the Somerset Levels include flint obtained from chalk outcrops and Greensand chert, both indicating connections to Cretaceous strata 40-50km to the east (Norman 2003). In north west England, Preston (2013) has used lithic raw materials, artefact typology and the sequence of lithic artefact production (*chaines operatoires*) to challenge existing simple models of east-west movement and others suggesting distinct coastal and inland social groups. He argues that the evidence points to a more complex and extensive regional pattern of mobility, with the Pennine upland as a key node. On the

Inner Hebrides islands of Scotland there is a developing picture of task-specific settlements on several islands, with mobility between relatively distant groups of islands (Mithen 2000; Wicks *et al* 2014). Wickham-Jones (2005) has identified the use of bloodstone from the island of Rhum on sites up to 40km away, whilst mudstone from Staffin on the island of Skye was used on sites up to 120km distant.

**Conclusions**

Tilley (1994, 206) in writing about phenomenology noted that Mesolithic sites would often have been situated on paths. We have noted a whole range of ways in which the places and paths used by hunter-gatherers would have left visible traces. Some might be seen as accidental, others deliberate, although for people who would have been so adept at the skills of tracking that distinction must often be questionable. What to us are ephemeral or equivocal traces are likely to have been very obvious to them. This range of traces, together with the presence of natural routes produced by topography would all have contributed to the creation of persistent places used over extended timescales (Barton *et al* 1995).

A range of disturbance factors will have created openings within woodland and thus contributed to the patch dynamic, eg storms, floods, the activities of animals, disease etc. Open areas, however caused, are likely to have attracted both animals and people. It will often have been easier for people to maintain existing openings than to create them anew (Simmons 1996). It could thus be argued that debates about causation are, to an extent, academic because in most cases cleared areas, including those along routes, will reflect the interaction of animals, natural disturbance factors and people, which in combination had agency in helping to determine subsequent actions and routes through landscape. Burning may often have taken place for social reasons as much as resource enhancement (Lillie 2015). The ethnohistorical record refers to ease of movement as one reason for burning by aboriginal Australians (Jones 1969). Fire may sometimes have served as a symbol of presence and territoriality (Simmons 1996), perhaps marking, or laying claim to an area, as much as for any direct economic benefits.  What cannot at this stage be directly demonstrated is that the distribution of those clearings was determined in part by routeways, although this seems a likely proposition which would repay investigation of the spatial distribution of disturbance whether linear, or curvilinear, patterning related for instance to topographically 'natural routes'.

As noted, multiple sources of evidence can contribute to the identification of patterns of movement by hunter-gatherers including: artefact typology and raw material sourcing; groupings of sites on natural topographic routes; and isotopic studies. Further sources at a more intimate scale will be discussed in Chapter 4 on footprints. Geographical Information Systems and Agent Based Modelling provide ways of integrating these various strands of evidence in models of  Mesolithic settlement, as has been done for the Southern Hebrides (Woodman 2000; Lake 2000). Fieldwork around the Federsee, Germany adopted a least-cost path approach to the study of Mesolithic movement; in that case it was concluded that there was a need to integrate other factors than functional least cost, including social factors concerned with the significance of particular places (Star and Harris 2009).  Inevitably the emphasis here has been on paths which may have engendered long term routeway continuity.  However, the converse is equally interesting, where factors led to the closure of routeways. Sometimes the cause would have been environmental, such as the radical changes consequent on the inundation of Doggerland by sea level rise. Other more local changes are described, for instance, by Jordan (2003a), writing of Khanty ethnohistorical practices in Siberia, where paths leading to burial places were symbolically closed with saplings after feasts to remember the dead.

A key point is that the effects of human activity such as disturbance and the associated plants, animals, chemistry etc will be concentrated around settlement areas as archaeologists generally recognise; less routinely recognised is their enhancement along routeways. This is perhaps most evident in the case of plant resources, but routeways and associated more open grassy areas will also attract many animals which will act to reinforce the distinctive character of the route. In the case of both plants and animals the manipulation is a mutual process, people affecting and being affected by the floral and faunal patterns which people, animals and natural disturbance factors have helped to create. As people settle down, the way they construct their environment may be predicted to change from circular/ net-like, linear/ branched or multi-stranded patterns, identified in Figure 3.2 a and c-d, to patterns with a stronger focus on individual sites, more like Figure 3.2b. Settling down has other consequences; it concentrates things in a central place and in the routes to and from that place. Places and routes become enriched biologically and chemically. Parasites and disease organisms will likewise become concentrated and, as routes become more formal and frequently used, so that transmission of these organisms and that of exotic species from place to place will increase.

There does seem to be clear evidence that hunter-gatherers in Europe played an important role in niche construction which involved the manipulation of plant resources.  In some cases, the active agency is not with humans alone but in the interactions between people, animals, plants and fire, all of which contribute to the conditions which bring about change. The evidence for niche construction, and the intensified use of plant resources and burning, fits a larger pattern of the Broad Spectrum Revolution, which in some areas of the world, such as the Mediterranean and south west Asia and east Asia, is well-attested from the Upper Palaeolithic and initial Holocene when conditions ameliorated after the Last Glacial Maximum (Barker 2006). Many of the situations considered in this chapter such as environmental changes associated with settlement areas, burnt patches and areas of modified vegetation, will have been articulated together by patterns by movement. All of these contribute to what the writer has described as the structuration of landscape by antecedent conditions (Bell 2007a). The legacy traces of these movements will often be one of the most significant factors in that landscape, and will sometimes have long-lasting influences on subsequent activity.

# Chapter 4
# Footprints of people and animals as evidence of mobility

## Introduction

Investigation of patterns of prehistoric movement is necessarily multi-scalar, encompassing everything from a footstep to an intercontinental journey. The human footprint is a key piece of evidence and a topic which readily captures the imagination of the public (Figure 4.1). People feel that they can relate to the individual in a way that is more difficult to achieve with artefacts such as pottery and metalwork, because we are observing the actions of a living flesh-covered body. Obvious as the popular appeal may be; the question remains: can this, rather unusual, evidence supplement and go beyond what we can learn from other sources? We often have some idea of the age-group structure of a population from burials, but it is frequently clear that that only a sample of the population is represented in the burial record and footprints provide an alternative way of addressing demographic questions. They also tell us about human ecology at a specific place, and in a defined environment and sedimentary context and individual human actions and sometimes patterns of social and family interaction. Ingold (2011) contended that movement is the heart of perception, being in the world and how we make ourselves. Walking is a way of knowing the world which Ingold and Vergunst (2008) refer to as ‘tactile feet first engagement with the world’. Those who habitually go barefoot have much greater dexterity with their feet and are bound to have an enhanced perception of the terrain and substrate over which they move.

Ingold (2011) goes so far as to say that a function of modern footwear has been to separate locomotion from cognition so that people are no longer able to think through their feet. Thus, traces of movement, however fragmentary and difficult to interpret, should lie at the heart of the archaeological project. In some situations we may be able to glimpse multiple fragments of past footprint trails and thus to identify the locations of lost or buried settlements. Previously, when the discoveries of footprints in archaeological contexts were very few, these would have seemed rather pious expectations, however, in the last few years discoveries have proliferated, especially in British coastal environments, greatly encouraging the belief that this is a form of evidence which is far more common than previously supposed, and the vast majority of footprint finds probably go unrecognised. As the number of finds increases, so does our capacity to generalise about them in a way not previously possible.

Methodologies for footprint investigation are still being developed. Some previous studies have been insufficiently critical and many, whilst identifying past human and animal footprints, have not made a great deal of the evidence they can provide. Fortunately a recent monograph by Bennett and Morse (2014) makes a substantial contribution to the field of archaeological footprint recording and analysis by putting it in a more solid scientific basis. That book has its main emphasis on Palaeolithic human footprints and their implications for human anatomical evolution. This chapter, whilst briefly reviewing the Palaeolithic evidence, has a particular emphasis on Holocene human and animal footprints and the social implications of the evidence they provide. Bennett and Morse (2014) refer to some 44 sites and partial surveys have also been published by Lockley *et al* (2008) and Willey *et al* 2009 for the Americas. Figure 4.2 shows the location and sedimentary context of 93 sites of which 79 have human footprints and 39 animal footprints. Supplementary Table 4.1 provides details of all sites. The list of sites is certainly not comprehensive; discoveries are now regularly being made and many are not yet fully reported.

**Trace fossils**

Footprints are a form of trace fossil known as ichnofossils after Ichnos, Greek for trace. They are the marks made by the activities of organisms in sediment, as distinct from fossils of body parts, such as bones, shells etc. The field of ichnology has grown and a journal *Ichnos* devoted to trace fossils was founded in 1990. It has published many papers on footprints in geological deposits, especially those of dinosaurs. Only since 2008, however, have Quaternary animal and human footprints started to feature in the journal, highlighting the developing nature of this field. The investigation of footprints draws on a remarkable range of disciplinary fields, including palaeobiology, archaeology, physical anthropology, forensic science, natural history and ecology, ergonomics and biomechanics, but there has been limited exchange of information between these separate fields (Allen *et al* 2003, 55).

The study of dinosaur prints is particularly instructive, in terms of comparison with the trajectory of archaeological research (Lockley and Hunt 1995; Lockley and Meyer 2000). The first examples were described in Scotland in 1828, although incorrectly identified at the time as tortoise prints (Pemberton *et al* 2008). Rapidly growing interest in dinosaurs in the 1970s was followed by something of a revolution in the study of dinosaur tracks from the last two decades of the twentieth century, when it became clear that the evidence they provided significantly supplemented that from fossils of body parts. The new evidence concerned herding, social activity, the ecological and sedimentary environments in which the animals were actually living. For work on human footprints the field of forensic science, the use of footprints in criminal investigations, has been especially influential. Robbins (1985) developed this field of study in the United States and contributed to a number of related archaeological investigations including the earliest human footprints at Laetoli, Kenya and footprints in a number of North American caves; however, her work was not, as we shall see, without controversy.

**Formation processes and terminology**

As with any form of archaeological evidence particular attention needs to be given to the formation processes of footprint-tracks, a topic pioneered by Allen (J.1997). His careful observation of present-day examples was followed by laboratory experiments employing, for instance, punches and laminated plasticine to refine understanding of footprint impact on sediment. The effects will differ according to the type and consistency of the sediment, the same foot leaving very different traces under contrasting conditions (Bromley 1996; Allen, J. 1997; Bennett and Morse 2014; Gatesy and Falkingham 2017). The ideal conditions for preservation are, relatively fine grained sediments, moderately moist conditions, a change of lithology (eg clays or silts to sand), low rate of disturbance, rapid sedimentation, and minimal compaction (Ashley 2003). In the case of minerogenic sediment, water content is a particularly important factor. A footprint in very wet sediment may leave little more than a disturbed oval crater. Sediment which is yielding but not too sloppy may produce a faithful print, if it is then allowed to dry and becomes rapidly filled with sediment of a contrasting type, for instance a print in silt filled with sand, or volcanic ash. Footprints can be particularly well preserved in alternating laminated bands where, for instance, the footprint being made in relatively fine grained silts or clays and then buried by sand laminations (Figure 4.1).

When laminated sediments are exposed by natural erosion, most commonly marine or deflation (wind blow), the contrasting particle size, compaction and cementation may result in lamination surfaces being revealed. If the footprint fill is of a coarser particle size, or less compact, it will be differentially eroded away so that the original footprint is exposed. In other cases, a footprint-track is revealed by differential fill, as for instance when a footprint in peat is filled with minerogenic silt (Figure 4.14.c-e). Footprint horizons may also be cemented by secondary carbonate deposition; this contributed to preservation of footprints at Willandra Lakes, and Clare Bay, Australia (Webb *et al* 2006; Belperio and Fotheringham 1990). Deposition of secondary carbonates in some contexts is associated with the development of microbial mats (Marty *et al* 2009). Given the exigencies of preservation we need to consider to what extent the footprints preserved are a representative sample. If people or animals were present at a site at a time when conditions were unfavourable for preservation they may be unrepresented or underrepresented.

Based on observation of modern tracks and simple experiments, a terminology has been developed by Allen (J.1997; Allen *et al* 2003) which is applicable in the range of fields to which footprint-tracks contribute. The following key terms are illustrated, where appropriate, on Figure 4.3.

*Footprint-tracks*, the individual traces made by people and animals. The entire three-dimensional body of sediment disturbed by the descent of the foot and subsequent sedimentary processes (Figure 4.3a-c).

*Trail*, a succession of footprint-tracks representing the axis of movement.

*Stride length*, the complete cycle of limb movements, eg from left heel to left heel of successive prints.

*Cadence*, the rate or timing of footfalls.

*Footprint,* the surface which was in contact with the underside of the foot.

*Undertraces* are formed when the footprint pushes into and distorts the sediments below producing deformations which are particularly clear where sediments are laminated (Figure 4.3a-c).

*Shaft* is created by the impressed foot, which, when withdrawn, becomes filled with sediment.

*Overtraces* are the distorted, often layered sediments which blanket the uneven surface created by a footprint-track.

*Marginal ridges,* sediment squashed up in a rim around the print.

*Marginal folds*, emplacement of a foot produces small-scale folding of adjacent sediment.

*Footprint assemblage*, the complete sample from a site.

**Recording methodology**

Footprint- tracks are three-dimensional forms, the detail of which is important in understanding of the formation processes of the evidence and identification of the maker. Conventional archaeological planning is important in putting the evidence in a wider context. However, the challenges of recording are greatly exacerbated in intertidal contexts in which discoveries may only be exposed for an hour or two. Previous studies have used conventional photography, tracing and have taken casts using plaster of Paris or dental alginate. Today's more sophisticated approaches include photogrammetry, and portable optical laser scanning; the range of methods and their relative strengths and limitations are outlined by Bennett and Morse (2014). Where exposures are brief 3-D photogrammetric recording (often called 'structure from motion') provides major advantages (De Reu *et al* 2013; Plets *et al* 2012). Distinctive targets at measured intervals are placed around the subject and multiple photographs are taken from all angles in a surrounding hemisphere. These are then digitally stitched together to make a 3D model of the surface which can be rotated, lit and viewed from any position and converted to a contour diagram. Figure 4.4 shows this method being used in the Severn Estuary by Dr Kirsten Barr (2018).

**Dating and timing**

A wide range of dating techniques can be applied to sediments with footprint-tracks. In some cases dates will be derived from stratigraphic context in relation to units of known date. For Pleistocene contexts before about 50ka BP dates are often provided by Potassium-Argon in volcanic situations and by Uranium Series where there is calcareous sediment, bones or shells; where the latter are present Amino Acid Racemisation can also be used as a dating technique. In the case of quartz or feldspar-rich minerogenic sediments with footprints, Optically Stimulated Luminescence (OSL; Duller 2008) dating is appropriate. From *c* 50ka BP radiocarbon dating is the most widely employed technique used to date footprints in peat, or where organic material is incorporated in minerogenic sediments, although care is needed to avoid reworked organics. There are a few Holocene sites where dendrochronology has contributed. There is also a growing number of sites where footprints occur within occupation contexts on archaeological sites which provide artefacts, or other evidence for date. In these cases the footprints may make a particularly direct contribution to the understanding of human activity patterns, or, in the case of animal footprints, patterns of husbandry. In the case of some laminated minerogenic sediments which are seasonally banded the footprints provide evidence for the seasonality of human or animal activity at that site.

**Identification and Interpretation**

The information which can be obtained from a footprint-track is dependent on the faithfulness and detail of the footprint impression. Where these are excellent and there is a trail of footprints much can be deduced. In the case of poorly preserved, or indistinct footprint-tracks (often over- or under-traces), the first issue is to identify specific features which indicate whether they were made by humans, or other animals. Some previous studies have been insufficiently rigorous in this regard. Claimed footprints at Valseqvillo, Mexico (Huddart *et al* 2008) were said to indicate human colonisation of the Americas *c* 40ka BP,  which is about 25,000 years before the earliest well-attested other evidence. Published photos show no characteristic features of human footprints and they are now thought to be the teeth marks of a quarry machine. If marks form a trail with a distinct bipedal gait (alternating right / left), and no other bipeds (eg apes) are known in the area, they are clearly human. Where other bipeds may be present, or in the case of single footprints, there are identification features (Figure 4.3d), which may be present even in poorly-preserved examples. A prominent big toe is often evident, somewhat splayed from the other toes which are often less clear. Other features are the presence of a distinct heel and a curving arch between the heel and the ball of the foot with a relatively straight outer edge to the foot. These and other features are more fully outlined in anatomical terms by Bennett *et al* (2010, 69) and Bennett and Morse (2014). Even poorly preserved overtraces, or undertraces, have value if they are clearly the product of human bipedal gait. They demonstrate that people were present in the area, the number of trails providing some idea of the intensity of activity. The directions in which they are moving may give clues to the resources being used, and axes of movement, for instance towards the sea or a lake or they may converge on activity areas.

When a footprint is sufficiently well-preserved for its size to be measured, then it is possible to make an estimate of the age of an individual. Calculations are based on the relationship between foot size and age in modern human populations. Figure 4.5 shows a graph of this relationship. For a given age female feet are on average up to 1cm smaller. Up to about age 14 in girls and 16 in boys there is a steady increase in foot size with age, so footprints provide a reasonable estimation of age, although from the age of about 10 there is an overlap between children and a proportion of smaller adult foot sizes (Bennett and Morse 2014, fig 6.2). Above the teens we may simply be able to say that an adult is represented. We do need to be aware of course that these figures are based on modern populations; a range of factors particularly genetic and dietary, but perhaps also behavioural, are likely to mean that the relationship between foot size and age differed in prehistory to some degree. To address this problem a number of studies have used comparative footprint data from non-western populations local to the footprint site. For instance, recent aboriginal data was used in the interpretation of the late Pleistocene footprints from Willindra

Lakes, Australia (Webb 2007). Davies *et al* (2014) discuss the effects of habitual movement on skeletal plasticity and the extent to which specific activities and degrees of mobility may be identified in the skeleton. In discussing early Neolithic burials Wysocki and Whittle (2000) have observed that the males show stronger musculature than females, which they interpret as showing they had a more mobile lifestyle accompanying herds.

The topic of ageing is an important one, because as we will see, children are remarkably numerous among prehistoric footprint-tracks. However, many of those children are so young, in several cases below 10, that any likely difference in prehistory in the age / size relationship will not alter the inference that young children were involved, though it may alter their ages by a year or two. It has long been established that there is a relationship between foot length and a person's height and it is generally taken that foot length is 15% of height (Tuttle 2008; Scales 2006; 2007). Formulae are also available which enable calculation of the speed of walk from the foot and stride length (Bennett and Morse 2014, 154).

There are many other attributes which may be determined from footprint-tracks. In the case of Pleistocene examples such as the 3.6 ma year old tracks at Laetoli, Kenya, there is the question of whether they are made by a fully bipedal hominid, and in later Palaeolithic examples there are comparisons between the footprints made by Hominins at different evolutionary stages. There is also the question of footwear and the differences which wearing shoes makes to the structure of the foot. Nearly all prehistoric footprint-tracks are barefoot and distinct from those of shod individuals today. A doctor writing in *The Lancet* from on a mission hospital on the

Soloman Islands compared shod and unshod footprints (James 1939). Those of the natives were broader than the Europeans, the toes were spread and radiated. The prehistoric examples are similar; they tend to have a more prominent splayed big toe, often with a gap between that and the other toes (Bennett *et al* 2010). Tuttle *et al* (1990) compared early hominid footprint-tracks at Laetoli, Kenya with those of present day Machiguenga people from Peru who have never worn shoes; they show many similar features which it was argued showed that the Laetoli individuals exhibited many features of modern human gait.

More problematic is attribution of sex. On average female feet are smaller than those of males but there is significant overlap between small male and large female foot sizes (Bennett and Morse 2014, fig 6.2). Whilst we may be reasonably confident that especially large footprints are mostly those of adult males, smaller examples cannot be confidently assigned, nor does it seem to be possible to make a clear distinction between females and a small proportion of males with small feet and adolescents. Some writers have taken a far more optimistic view. Robbins (1985) maintained that an individual's footprints were almost unique and could be used to determine sex, ethnicity etc. The most ambitious of Robbins' claims have been successfully challenged as pseudo-scientific since her death in 1987 (Tuttle 2008). This had significant implications for the role of forensic expert opinion in criminal justice, because convicts were on death row awaiting execution on the basis of her footprint interpretations and were subsequently released (Tuttle 2008).

As generally in palaeoenvironmental studies, the pitfalls of a single 'expert' view are reduced if a critical and questioning approach to scientific evidence and a multiproxy approach is employed, whereby evidence from a range of sources is compared in a self-reflexive (ie critical) way by a group of researchers of varied disciplinary backgrounds. This in any case reflects the collaborative nature of many archaeological projects (Hodder 1999; Bell 2015). Significant extensions of this approach have been Pastoors' *et al* (2015) involvement of Bushmen trackers in interpretation of Palaeolithic footprint-tracks in French caves and Webb's (2007) work with Pintubi Australian Aboriginal communities, brought up without European influence, in the interpretation of the Late Pleistocene Willandra Lakes human footprint trails. With their tracking skills they were able to enhance some archaeological interpretations and challenge others. However, in the Willandra case it would also have been interesting to know if there were any interpretations by which they were less convinced and whether archaeologists modified these accordingly.

**Associated animals**

Animal footprints are very relevant to our theme given the evidence presented in Chapters 1-3 that humans and animals often follow the same paths and that much human mobility is related to animals in terms of hunting, herding, etc. The identification of animal tracks is aided by some very good guides, mainly created for those with wildlife interests; the best of these cover not only the footprints and trails but also trace fossils such as beak marks, feeding traces, faeces etc. Available guides include coverage of Europe (Bang and Dahlstrøm 2001); European birds (Brown *et al* 2003); south and east African wildlife (Stuart and Stuart 1998); and North America (Jaeger 1948; Sheldon and Hartson 1999; Halfpenny 2007).

Modern analogies of animal footprint-tracks have been used in the interpretation of sub-fossil examples. Allen (J.1997) compared the tracks of recent domestic animals in the Severn Estuary and Barr and Bell (2016) compared the footprints of primitive rare breed sheep and cattle with prehistoric examples, especially to establish the age structure of the herds and test the hypothesis of seasonal estuarine saltmarsh utilisation (Bell 2013).

### Palaeolithic footprint-tracks on open sites

***Volcanic and related contexts.*** The discovery which put footprints on the archaeological radar was made in 1978 at Laetoli, Kenya in an expedition led by the renowned archaeologist Mary Leakey (1984). Even so, it was to be another 20-30 years before they started to be more widely recorded; although there had been several earlier discoveries in the Americas and in French caves, these did not generate widespread attention. What made Laetoli so significant was its Potassium-Argon date 3.66 million years ago (ma) and the fact that the prints were made by a fully bipedal hominin prior to the earliest evidence for stone tool use, currently 3.3ma (Gowlett 2016). Tuttle (1987) describes this as 'among the most dramatic and scientifically important discoveries of modern palaeoanthropologists'. The footprint-tracks were of 3 individuals walking in parallel (Figure 4.6): G1 was the smallest (1.2m tall); G2 was the tallest (1.8m); and G3 was 1.4m tall and walked, apparently deliberately, in the footprints of G2. It was suggested that they walked as a group which may have comprised male, female and offspring (Leakey and Harris 1987). They are generally considered to have been made by *Australopithecus afarensis* (Bennett and Morse 2014, 47) and were walking in an area of falling volcanic ash from an eruption of the Sadiman volcano 35km to the east. The volcanic tuff is cemented, resistant to erosion and splits along bedding plains exposing footprints (Hay 1987). It was inferred that it was laid down in a few weeks at the end of a dry season and in the early stages of the wet season; grass had been grazed down to stubble and later in the tuff there are traces of raindrop impact. Study of associated animal footprint-tracks supplemented this picture significantly. In all 9500 animal prints were recorded from 9 separate exposures of the footprint tuff (Leakey and Harris 1987). In places there were deeply-worn game tracks, some produced by rhinocerus, others by buffalo. Below the human footprint level those of animals represent a restricted range of species which remain in the savannah during the dry season. Above this, in the horizon with human footprint-tracks, there is a wider range of animals suggestive of rainy season migration.

Two Palaeolithic footprint-track sites have been located in the Koobi Fora Formation of Kenya where much other early hominid evidence has been found (Bennett and Morse 2014, 53). At Ileret, two distinct footprint-track horizons were identified, they are thought to have been made by *Homo erectus* and were accompanied by animal and bird footprint-tracks. The two levels were bracketed by volcanic tuffs with dates c.1.52ma (Bennett *et al* 2009). In the same sedimentary formation 45km away on the shores of Lake Turkana are footprint-tracks in lake margin and fluvial sandy mud sediments, buried by sands and dated to 1.4ma (Behrensmeyer and Laporte 1981; Bennett and Morse 2014, 58). They include a bipedal hominin trail; large vertebrates including hippopotamus and bovids, as well as birds. Olduvai Gorge, Tanzania, cuts through a major sedimentary sequence made famous by the Leakey family's discoveries of hominid fossils; there are also footprint-tracks in sediments here representing groundwater-fed wetlands between volcanic tuffs dated 1.75ma. There is much evidence for trample by vertebrates including hippopotamus (Ashley 2003), but no human footprints. Early Palaeolithic footprint-tracks were preserved in volcanic sediments at Roccamonfina, Italy. Three fossil trails are dated by Argon/Argon to 345 ka BP; they were on the surface of a pyroclastic flow (Mietto *et al* 2003; Avanzini *et al* 2008). The trails had been recognised by local people prior to scientific investigation and were given the name 'devils trails'. The prints are not well preserved; some have traces of toes, but they were fully bipedal, they appear to be adult, and one of them zig-zags down an 80° slope, where there is occasional use of the hands to steady the walker in steep areas.  A large collection of 350 human footprints is also reported from Engare Sero, Tanzania; preliminary dating suggests they were made *c* 120ka BP in wet volcanic ash near the former shore of Lake Natron. They are of children and adults, walking at different speeds, thus not apparently walking together (Hatala *et al* 2011) The volcanic contexts are particularly important because of their contribution to human anatomical evolution, because they can be dated by U-Series and in some cases, as at Laetoli, the wealth of associated environmental evidence.

***Coastal and riverine contexts.*** Lower Palaeolithic  footprint-tracks have recently been found in estuarine sediments at Happisburgh, Norfolk, UK  (Ashton *et al* 2014). This forms part of a sequence of Pleistocene freshwater, terrestrial and marine sediments which are extensively exposed in cliff sections round the coast of Norfolk and north Suffolk and have been well known since the nineteenth century for the animal bone and other biological evidence they contain (Ashton 2017). No human artefacts had been found in these sediments until, in 2000, flint tools were found with the bones of deer and bison at Happisburgh. These deposits are thought to date between 1-0.78ma and this represents the earliest evidence of hominins in northern Europe (Parfitt *et al* 2010). Above gravels containing flint artefacts there were laminated estuarine sediments and it was within these that human footprint-tracks were revealed by intertidal erosion (Figure 4.7). A recent origin for these prints could be discounted because the sediments were compacted, had a low water content and were too firm for recent prints. The footprints were recorded by multi-image photogrammetry and laser scanning. They survived coastal erosion for less than a month. Five individuals, possibly *Homo antecessor*,  both adults and children, were present,  suggesting that people were out foraging with no division of labour between sexes and ages (Ashton *et al* 2014).  They walked across mudflats to a tidally influenced river within a wider landscape of coniferous forest with alder in wet areas, and on drier ground, heath and grassland. The plant communities suggest the activity took place at the beginning or end of an interglacial which is thought to correlate with Marine Isotope Stage 21 or 25.  A younger coastal campsite dating to *c* 400ka BP at Terra Amata, Nice, France was associated with a single human footprint in sand (de Lumley 1969).  Footprints also occurred in later Hoxnian interglacial riverine sediments  in the Thames valley at Swanscombe dated *c* 420ka BP; these were of animals,  probably elephant, rhinoceros, cervid and bovid (Davis 1996). They were in riverine sediments, the Lower Loam, where it was overlain by sand and pebbles. Coastal and riverine sites are important because of the information they provide for early human colonisation at Happisburgh, the utilisation of these environments and the associated biological evidence.

***Aeolian contexts.*** In south Africa coastal wind-blown calcified sands preserve footprints thought to be those of anatomically modern humans at two sites of last glacial date *c* 120ka BP: at Langebaan, where there are human and hyena trails, and Nahoon where humans are accompanied by other animals and birds (Roberts 2008).

Probably the most extensive area of footprints so far recorded is at Willandra Lakes, Australia, a complex of lakes and former wetlands associated with runoff from the last glacial maximum; Optically Stimulated Luminescence provides dates between 23-19ka BP (Webb *et al* 2006; Webb 2007). The footprints are in laminated calcareous silts deflated from a lake and buried by aeolian sands (Figure 4.8). Extensive areas of clay lamination were exposed by wind erosion and trails could be excavated where they were still buried by laminated sediments. In all 563 human prints were identified, made by both adults and children, and forming 23 distinct trails.

***Travertine.*** Finds from the Tibetan Plateau illustrate particularly unusual contexts in which footprint-tracks may be preserved. They were found at a height of 4200m and provide remarkable evidence for the human presence close to the last glacial maximum at 20ka BP in an area previously believed to be completely covered in a huge ice sheet (Zhang and Li 2002). The evidence is in the form of foot and hand prints of 6 individuals, 2 of them children, in a calcareous travertine laid down by hot springs and dated using Optically Stimulated Luminescence. Nearby was a hearth shown by luminescence dating to be contemporary, important evidence from an area where prehistoric finds are few. Of even greater significance in terms of the history of human colonisation is the finding of human footprints at Monte Verde, Chile dated *c* 14.6ka BP. Though at the extreme south of the Americas this represents one of the earliest really securely documented sites of human occupation in the continent (Dillehay 1989; Dillehay *et al* 2008).

***Caves.*** The wider practical and spiritual motivations for people venturing underground have been imaginatively explored by Macfarlane (2019) and it is in caves that people's footprints leave some of their most insightful traces. The earliest examples are Vartop Cave, Romania, dated 62ka BP (Onac *et al* 2005), and Theopetra Cave, Greece, dated 48ka BP (Bennett and Morse 2014, 67). There are also a series of important finds from the floors of French caves. These sites inform, not so much about everyday activities, but those possibly involved in ritual within these caves and, surprisingly perhaps, children are often well represented. Where caves have remained sealed from prehistory to the time of discovery and the finders have had the foresight to protect the traces of activities left on cave floors, remarkably detailed records can be obtained, some from caves with Palaeolithic art. The way people moved around the caves can be established from footprints, invariably barefoot, the remains of torches, carbon smudges on the roof of caves and human faeces. A particularly well-documented example is Chauvet cave, which is exceptionally rich in Palaeolithic art dated 30ka BP. In this case a good radiocarbon chronology demonstrates that the footprints are later than the art (Clottes 2003). The art was followed by a period of cave bear occupation represented by hollows in which the bears hibernated, many bear bones and footprints. Then *c* 26ka there followed a human visit represented by 20 footprints forming a trail of 70m made by a single pre-adolescent of height 1.3m, with sootmarks on the roof and path showing the passage of the person's torch. The cave has also produced a single wolf or dog print, fossil canid faeces and ibex prints. Reinvestigation of footprint-tracks in four French caves employed the expertise of African Bushmen trackers who advanced more detailed and precise interpretations, than had been suggested by conventional analysis (Pastoors *et al* 2015). In the extensive cave system at Niaux, France, parts of which are richly decorated with art, the trackers identified footprint-tracks forming deliberately made patterns created by a 12 year old girl (Bahn and Vertut 1997, figs 1 and 2). Fontanet cave found in 1972 had been preserved because the entrance became blocked in the Magdalenian period. The front part of the cave is decorated with paintings dated 13-14ka BP, whilst deeper within the cave are what the trackers identified as the footprint-tracks of 13 individuals, men, women and children aged 3 to 60. Peche Merle cave, richly decorated with art, had the tracks of five individuals aged 9 to 50 (Lockley and Meyer 2000). Particularly notable were the trackers' observations at Tuc d'Audoubert where they concluded that the footprint- tracks were those of a man aged 38 and a boy of 14 engaged in obtaining clay to model two bison figurines. At other cave art sites a relationship to animal tracking is demonstrated by the depiction of feet in twisted perspective such that the footprint is depicted at the base of the leg. On this basis it has been argued that art played a part in the acquisition of hunting skills in the young, something potentially critical to survival in the worsening environmental conditions of the last glacial maximum (Mithen 1991). One other cave site should be noted, although it is not associated with rock art. This is Ciur-Izbuc cave, Romania where 400 footprint-tracks were found in 1965; dating cave bear bones has recently revised the date of this site to 36ka BP (Webb 2014; Webb *et al* 2014). Other Pleistocene caves with evidence of human footprints are shown on Figure 4.2 with details in Supplementary Table 4.1.

**Holocene hunter-gatherer-fishers**

**Case Study: Mesolithic paths in the Severn Estuary**

The Severn Estuary in western Britain has emerged as a particularly significant area for the study of prehistoric footprint-tracks, due to the extensive exposures of sedimentary contexts, especially laminated sediments, that preserve them well. An additional factor is the enormous tidal range of 14.8m, the second or third greatest in the world, which means that large areas of intertidal sediments are exposed at low tide. The great body of water mobilised by the tides and the effects of wave erosion, especially during storms, cuts sections through the stack of Holocene and earlier sediments exposing impressive sections on the foreshore. Extensive investigation and dating of the sedimentary sequence by Professor J.R.L. Allen (1987, 1997, 2001) has established a secure framework for the many archaeological sites and footprint-tracks which have been discovered in the intertidal exposures. It is the close association of footprint-tracks with excavated sites which justifies rather more detailed treatment of the evidence than that from other areas.

The first footprint-tracks in the estuary were discovered by the late Mr Derek Upton, an amateur archaeologist and natural historian with a lifetime's intimate knowledge of the estuary and exceptional gifts of observation. He spotted the first footprint-tracks on the foreshore at Uskmouth in 1986 and a team of specialists under Aldhouse-Green (*et al* 1992) was assembled for their investigation, leading to further work on the formation and stratigraphic occurrence of footprint-tracks in the Severn Estuary by Allen (J. 1997). The Uskmouth  footprints were below reed peat dated *c* 5245 cal BC and an antler mattock found on the foreshore nearby was of a similar date (Aldhouse-Green and Housley 1993). Three trails were identified in laminated sandy silts, two made by adult males, one by a child. Palaeoenvironmental evidence shows they were walking in a saltmarsh / mudflat environment. Red deer footprint-tracks are also very abundant in the laminated sediments (Figure 4.9). Modelling of the palaeotopography from coring indicated that the nearest dry ground at the time was 4km to the north or east (Allen 2001), and the nearest known setlements are at Goldcliff 4km east.

Goldcliff is of special significance because a series of four excavated Mesolithic settlement areas are associated with extensive areas of footprint-tracks and abundant palaeoenvironmental evidence (Bell 2007a). Figure 4.10a shows the geography of the area which is dominated by the remains of a former bedrock island originally 1km by 0.5km, today much reduced in extent by coastal erosion (Allen 2001). The margins of the island are buried by Pleistocene and Holocene sediments which in places reach 12m and are exposed in section by coastal erosion as shown in Figure 4.10b. At the base of the sequence above Pleistocene Head is an old land surface with a submerged forest of large oak trees (Figure 3.4). These were drowned by rising sea levels, and a thin reed peat formed *c* 5700 cal BC. Then, with continuing sea-level rise, 4-6m of silts were laid down, some parts of which are strongly laminated and have very abundant footprint-tracks. An upper peat started forming 4500 cal BC and a second submerged forest grew from about 4400 cal BC. Most of the footprint-tracks are in the lower part of the laminated sediments, which formed between c 5500-5200 cal BC. The Mesolithic occupation sites date between 5900-4800 cal BC; each successive occupation was at a higher level on the island edge as people moved upslope in response to sea level rise which buried and preserved the earlier settlements below estuarine silts. The sediments are laminated and comprise fine silts alternating with more sandy bands. It has been shown that these rhythmical coarse and fine bands reflect annual changes in the estuarine tidal regime with the coarse bands being laid down in the cooler and more turbid waters of autumn and winter months and the finer silts in the warmer and calmer waters of spring and summer (Allen 2004; Allen and Haslett 2006). This interpretation has been confirmed, both by sedimentary modelling and the study of pollen in the bands, which has also shown that charcoal, and thus perhaps human activity, was more frequent in the summer months (Dark and Allen 2005). This banding evidence is of great significance for the interpretation of the footprint-tracks because it contributes to understanding the seasonality of activity by showing that the most well-preserved examples were made during occupation in high summer. The footprint-tracks were securely stratified in laminated sediments as demonstrated by a sequence of photographs of Site E (Figure 4.11): (a) shows initial discovery where they project from a small erosion cliff; (b) and (c) show trails progressively revealed by a technique Dr Rachel Scales developed by careful finger-tip peeling back of laminations over a month to expose four trails comprising 33 overtraces. All were heading out to sea; three were youths aged *c* 12-14, and one aged *c*16. Scales (2007) demonstrated they almost certainly walked together, no prints overlapped and tellingly the individuals paused, and the stride pattern altered at the same point, indicating that they acted together with common purpose, perhaps hunting, or fowling; red deer prints were found at the same level. As this excavation was ending the tide eroded part of the area exposing an exceptionally well-preserved footprint (Figure 4.11d-e) of a young person aged 8-9 walking in the finest of summer silts in the opposite direction to the party of four. In a second area (Site C), where footprint-tracks were also observed disappearing into a low erosion cliff, Scales uncovered 165 footprint-tracks of two individuals, one a child aged 3-5, the other aged 10-11 (Figure 11.1). A year later erosion exposed a really well-preserved footprint in the same area (Figure 4.1), of a young person aged 10-12.

When all the evidence assembled over 19 years of intertidal survey at this site is put together, this includes 342 recorded footprint-tracks and 21 distinct trails (Barr 2018). These create maps of footprint alignments, although in interpreting this we cannot necessarily assume that paths were straight (Figure 4.10a). A few lead to excavated settlement sites, others converge on points on the former island edge where we may suppose there were settlements now lost to erosion. Two predominant axes of movement are evident. Low in the laminated sequence (below – 4.2mOD) the footprint-trails have a predominantly north –east / south-west orientation, roughly at right angles to the axis of the palaeochannel within which they lie (Figure 4.12). On Site N multiple roughly parallel trails form a band 16m wide which could be described as a Mesolithic footpath (Figure 4.13) perhaps leading from a lost island edge encampment to traps, or a boat landing place in the channel. Indeed, in 2017 V-shaped post and wattle structures identified as fish traps, and dated 5210-4912 cal BC, were found at Site T on the alignment of this path between Site N and the island edge (Bell *et al* forthcoming a). It is notable that the trails on Site N mainly lead away from the island and those on Site M predominantly converge on an area at the island edge, the inference being that people followed a circuit, rather than two way path, although two way passage is also represented in several cases. A circuit would perhaps be consistent with visiting a number of fish traps or other stations. Later in the laminated sequence (above -4.2mOD; Figure 4.12) footprint-trail orientation is more varied but predominantly north west / south-east, which is parallel to the axis of the palaeochannel, probably as a result of walking along its banks, as in the case of the four companions at Site E.

Of the 21 distinct trails 19% were of children under 8, 19% probably children under 10, 43% older children, females or slight males and 19% probably adult males. These proportions may imply that activities within 300-500m of the campsites were mainly the province of children and females rather than adult males. Children, some as young as 4, were venturing out into the muddy estuary and can be assumed to have contributed to the active life of the community. The Uskmouth footprint-tracks show that children with adults also ventured several kilometres from dryland camps. The most faithfully preserved footprints were clearly made in the fine sediments of spring and summer, although much of the other seasonality evidence indicates that the main period people were present at the occupation sites was late summer and autumn (Bell 2007a, Table 18.4); only one site had animal bone evidence of winter occupation. Virtually all the footprints which were clear enough were made by people who were barefoot. Associated with the human footprint-tracks at Goldcliff were those of red and roe deer, the occasional aurochs and many birds.

Recognition of footprint-tracks in the Severn Estuary has been followed by discoveries in similar intertidal contexts round the Welsh coast. At Lydstep, Pembrokeshire, a boar with microliths from a weapon was found in intertidal peat (Leach 1918) and is dated to the final Mesolithic; footprint-tracks of adults, children and deer have recently been found on the peat (Murphy *et al* 2014). Other Mesolithic footprint-tracks of people and deer were found at Rhyl, North Wales (Bell 2007a) and Porth Eynon, Gower (Philp 2019).

On the other side of the world, around Clare Bay in South Australia, calcified saline coastal lagoonal sediments revealed footprints of adult and child humans, emus, kangaroos and wallabies dated *c* 5000 BP (Belperio and Fotheringham 1990). Footprints were first spotted here by the notable pioneer of aboriginal studies Daisy Bates *c* 1914.

**Footprint-tracks in later prehistoric contexts**

Footprint-tracks from contexts post-dating the introduction of farming provide similar information to the foregoing hunter-gatherer contexts, concerning localised patterns of movement and demographic composition. Additionally there are often footprints of domestic animals which provide insights to patterns of animal husbandry. A site similar to the Mesolithic examples previously discussed comes from the very extensive excavation of coastal environments at Rodbyhaven, Denmark in advance of a major tunnel between Lolland, Denmark and Fehmern, Germany (S. Sorensen pers comm 12.8.15). Many wooden fishtraps have been discovered in former lagoons and next to one of these, dated *c* 3000 cal BC and thus Neolithic Funnel Beaker period, were *c* 20 human footprint-tracks. The footprints were made in gyttja (organic mud) and filled with sand in a storm which preserved the prints but damaged the fish trap. A further very significant outcome of this major excavation has been to demonstrate that people did not visit this coastal wetland for purely utilitarian activities such as fishing, for there is also evidence for the ritual deposition of artefacts in the late Mesolithic and Neolithic. Similar deposition practices occur across the two periods thus providing new insights to the process of Neolithisation.

Another huge archaeological project which has recently produced footprint-tracks is the Istanbul Metro and associated rail link across the Bosphorus in Turkey (Polat 2013). Not only has this revealed 37 ships, many complete with cargo, of Roman to medieval date but also a Neolithic settlement some 8m below sea level dated 6500-6000 BC. Associated with this were more than 2000 footprints of people who had walked on wet clay around the settlement, their prints then filling with sand. Animal footprints have not so far been reported. The published human prints are all clearly made by people that wore footwear. This is the earliest evidence the writer has found for shoes specifically related to footprint tracks, although examples in mud brick and other contexts in the Near East are to be expected. One sedimentary context where we might expect footprint evidence is the lake edge contexts of the circum-Alpine zone where so many wonderfully preserved Neolithic and Bronze Age lake villages have been excavated.Surprisingly, the writer has only come across one example with human footprints, the Neolithic site at Clairvaux, France (Pétrequin and Pétrequin 1988, 171).

The greatest concentration of human footprint-tracks from later prehistory has been recorded on the foreshore at Formby, Lancashire,UK, as a result of 25 years of dedicated recording by retired Formby schoolmaster Gordon Roberts (2014; Roberts *et al* 1996; Huddart *et al* 1999b; Roberts and Worsley 2008). The evidence extends along 4km of shore and the best footprints are preserved in laminated silts, interstratified with sand which are seaward of extensive dune sands along the shore. Some of the 219 trails which Roberts reports were excellently preserved. Most people were barefoot, though some had  footwear. They occur in two main horizons; the lower horizon has Optically Stimulated Luminescence dates with quite large standard deviations which dates them between 5400-3200 cal BC, ie late Mesolithic to early Neolithic. Others are dated from *c* 2000 cal BC and through the Bronze Age. As at Goldcliff children predominate, with smaller numbers of adult females and a few adult males. The latter tend to be associated with red deer prints and this has been interpreted as reflecting hunting activity. Other wild animal prints are roe deer, aurochs, wild boar, with crane, oyster catcher, and many wading birds. Domestic animals are cattle, sheep/ goat, small unshod horse and dog / wolf. Palaeoenvironmental evidence shows that at times there were offshore dunes to seaward and the humans and animals were walking on lagoonal mudflats subject to direct marine influence (Gonzalez *et al* 1997). No artefacts have been found associated with the Formby footprint-tracks. The nearest known occupation sites are Neolithic, *c* 5 km inland around the peatlands of Downholland Moss, and there are also lithic scatters of Mesolithic to Bronze Age date and a Neolithic trackway at Hightown *c* 6km to the south (Cowell 2008). Pollen analysis from the peatlands of Merseyside has produced a good deal of evidence for burning in the Mesolithic and later (Cowell and Innes 1994), including charcoal in sediments in which footprints occur (Roberts and Worsley 2008). It appears therefore that the Formby footprints relate to people whose settlement were on drier land at some distance and that they were visiting the shore particularly for foraging, hunting and fishing activities; domestic animals were grazed in the coastal environment, but not apparently to the extent discussed below in the Severn Estuary, perhaps because the sandy Formby shore offered less rich grazing than the Severn saltmarshes.

**Case Study: seasonal pastoralists in the Severn Estuary**

In the Severn Estuary many foreshore sites have produced footprint-tracks of domestic animals; they are particularly found on the surface of a Bronze Age peat which overlies silts containing the Mesolithic footprint-tracks discussed above. The peat is in turn overlain by estuarine silts of the middle Bronze Age to Iron Age (Allen,

J. 1997). At the stratigraphic interface between the peats and silts are footprints, six sites with buildings and trackways interpreted as seasonal settlements of pastoralists who grazed animals on the saltmarsh during the spring and summer period of lush vegetation growth and reduced tidal range. The most detailed study of footprint-tracks from one of these settlements has been at Redwick, where they were associated with four rectangular buildings dated to the middle Bronze Age (Figure 4.14a-b; Bell 2013). Ten human footprint-tracks were present and one of these was very well preserved where a child aged *c*7 had trodden a thin layer of silt into the peat (Figure 4.14c). In all five were of children aged under 11 and two may have been adults. The presence of young children is significant, especially given the specialist pastoral nature of this seasonal settlement, once again it suggests the active engagement of children in the activities of the community. The rectangular Bronze Age buildings are on slight natural rises of peat partly encircled by shallow curvilinear depressions. The floors of these depressions are covered by animal footprint-tracks, mostly cattle (71%), with some sheep / goat (16%), and a few pigs (Figure 4.14 c-e). The presence of footprints and bones of neonatal calves and lambs in the first three months of life indicates activity in spring and summer. Isotopic evidence from animal teeth strengthens the case for saltmarsh grazing for part of the year (Britton *et al* 2008; Britton and Müldner 2013).

Figure 4.14f is a reconstruction of the setting of one building constructed from palaeoenvironmental evidence. A cow is being driven by the seven year old along the depression to the building for milking. Tidal incursion occurs along the depression and there are saltmarsh plants on its margins and to seaward and this provides grazing. Landward is extensive raised bog and beyond, about 4km away, the rising land where the main settlements of this community probably lay.

Six kilometres west is an Iron Age site at Goldcliff with eight rectangular buildings of Iron Age date, again occupied in the summer months, some were associated with the footprint-tracks of cattle (Bell *et al* 2000). One such building housed subdivisions interpreted as animal stalls and the inference that the buildings  were shared by people and animals is confirmed by the presence of cattle lice (*Damalina bovis*) and human fleas (*Pulex irritans*) in the flooring. The widespread occurrence of cattle footprint-tracks on the surface of the Bronze Age peat is testimony to the extensive nature of seasonal animal husbandry on the coastal wetlands from the middle Bronze Age to the Iron Age.

**Other later prehistoric examples**

There is evidence for similar practices more widely. On the north shore of the Bristol Channel at Kenfig, Wales the surface of an intertidal peat exposure revealed by a storm was marked by some rather indistinctly preserved footprint-tracks, some forming trails and thus apparently human; they were optical laser scanned by Bennett *et al* (2010) and dated between 3700-2200 cal BC.

Further north in west Wales at Borth is probably the finest intertidal exposures of submerged forest in Britain. Marine erosion is eating into the margins of the vast Borth Bog at the mouth of the Dovey Estuary. A storm early in 2012 revealed footprint-tracks on the peat surface dating between *c* 2000-1000 cal BC (BBC 2012).

They were of people ranging in age from a 4 year old child  to adults, with cattle, sheep/ goat and possibly bear.

In the East Anglian Fenland footprints of animals including cattle and people have been found in the edge of a palaeochannel, some predating a wonderfully preserved settlement at Must Farm  (Figure 6.11) dated 900-800 BC and some just outside the palisade which surrounded the settlement (M. Knight pers. comm.). Nearby at Fengate / Flag Fen, animal footprints were found at the end of a droveway where it reached the wetland, consistent with use of the droveway to move animals from enclosed dryland fields to open wetland seasonal grazing (Pryor 1998a). In the Netherlands at Kolhorn a context of the single grave Neolithic culture had cattle hoof prints, which were in soft clay of the maritime zone with a fill of darker sediment. They mainly defined a path across a channel and also radiated from a freshwater well in the settlement. The animal bone assemblage is cattle-dominated but there was also much evidence of fowling and fishing. No buildings were found, despite favourable preservation conditions, and the site is interpreted as seasonal (Bakels and Zeiler 2005).

A significant Swedish footprint site is at Ullunda, in an area on the Baltic still subject to huge isostatic land rise following the melting of the ice sheets (Bell and Walker 2005,117); consequently this site, originally just above the beach on a fjord, is now well inland. The site is a Bronze Age long house dated 1400-1200 BC (Price 1995). On a clay surface below a gravel spread several hundred unshod horse hoofprints were recorded; they appeared to be engaged in the very specific activity of importing the gravel to the site as hard standing. They provide the earliest evidence for the horse in Sweden and demonstrate the involvement of horses in apparently everyday, rather than purely high status, activities, as had previously been supposed.

A site at Walvis Bay, Namibia highlights the potential of coastal sediments in other parts of the world. Here the footprints date to between 450-1450 AD. Thousands of probable ovicaprid prints are represented and the animals were apparently being driven as a flock. Overlying human prints are interpreted as those engaged in driving them and significantly some are of children as young as 5.

Footprint-tracks are rather rarely reported from inland locations, perhaps because excavators have not considered the possibility of their occurrence. However, there are some examples and significantly they tend to be associated with the coaxial field systems and drove roads of Bronze Age date which are more fully discussed in Chapter 8. A muddy ditch which formed part of the Shaugh Moor Bronze Age reave field system on Dartmoor revealed many footprint-tracks of cattle, sheep, the occasional horse and badger (Smith *et al* 1981), welcome evidence of the animals living on acid moorlands where bones rarely survive.

Very different contexts for footprint preservation are represented by later prehistoric volcanic deposits. The most spectacular of these is at Avellino, near Vesuvius, Italy where thousands of human footprint-tracks are associated with a Bronze Age settlement at Affagola; many were apparently footprints of those fleeing an eruption *c* 1830 cal BC, the ash from which preserved the settlement and footprints ( Livadie 2002; di Vitro *et al* 2009). At Jeju island off the south coast of the Korean Peninsula, human footprint-tracks were found in shoreline sediments stratigraphically related to volcanic deposits. They were originally dated to the Pleistocene (Kim *et al* 2009) but a critical review of the stratigraphic context and redating using a combination of radiocarbon, U-Series and OSL has shown that the footprint horizon is coeval with a volcanic eruption dated *c* 1750 cal BC (Sohn *et al* 2015). Paradoxically it was the apparent Pleistocene age of the Jeju site, and its implications for human colonisation of Korea, which stimulated a conference bringing together much of the existing work on footprints (Lockley *et al* 2008). Almost two thousand human footprint-tracks are reported at Kilavea, Hawaii and are interpreted as people fleeing a volcanic eruption in the eighteenth century AD (Mayor and Sarjeant 2001).

**Footprint-tracks in the Americas**

The earliest and most significant find from the Americas at Monte Verde II, Chile has already been note in the Palaeolithic section which, given the site's date c 14 ka BP, is of great significance in terms of the human colonisation of the Americas. Colonisation is generally considered to have taken place when low sea level linked Beringia to Alaska with people moving south of Alaska around 14ka BP. The recent discovery of 29 human footprints, of three individuals including a child on Calvert Island, coastal British Columbia has a radiocarbon date of 13ka BP and demonstrates coastal adaptation and a possible coastal colonisation route into the Americans (McLaren *et al* 2018). Also of significance in demonstrating early human presence are footprint-tracks at Cuatro Ciengas, Mexico within tufa (calcareous spring) deposits dated 10550 BP and the later 7240 BP (Felstead *et al* 2014). The earlier group demonstrates human presence in that area *c* 1500 years before the earliest other dated evidence, which comes from coprolites.

At Monte Hermoso, near Buenos Aires, Argentina footprint-tracks are associated with freshwater pools with a fill of silty clay laminae intercalated with wind blown sands, which as a result of erosion are now exposed in the intertidal zone, though there was no marine influence at the time of their formation (Politis and Bayon 1995; Aramayo 2009). In these lagoon silts 420 human footprint-tracks have been recorded; they were predominantly of children, with some probable women's prints and infrequent prints of adult males. Associated plant and animal remains are dated around 5900 cal BC. Footprint-tracks of birds and artiodactyls (even toed ungulates) are also present. Just 200m away is the site of La Olla, where there are bones associated with the processing and consumption of sea mammals dated 6200-5500 cal BC; the site is considered to be associated with the nearby footprint-tracks. These well stratified and dated sites have resolved debates about the early coastal settlement of this area. Around Lake Managua, Nicaragua, footprints were revealed in a quarry in 1874; and were once considered as evidence for the very early colonisation of the Americas. They have now been redated to *c* 4800 cal BC. They were in volcanic mud which was covered by volcanic ash. A total of 322 human footprint-tracks, some of exceptional quality, were found together with those of deer, opossum and bird. The humans represented 15-16 individuals in a series of sub-parallel lines, some forming trample paths and certainly indicating defined axes of movement. It was suggested that the people were fleeing from a volcanic eruption to the nearby lake shore (Bryan 1973; Lockley *et al* 2009). On a terrace of the Mojave River, California footprints dated *c* 3000 BC were found in silty clays underlying a later excavated settlement. There were 54 footprints of 5 individuals and several animal tracks forming a pathway; 3 of the individuals were immature. A few artefacts were found at the footprint horizon suggesting nearby occupation (Rector 1979; Rector *et al* 1983).

North American caves have, like the Palaeolithic caves of France, been productive of footprint evidence and some of them have particularly dry (and / or saline) conditions which also preserve remarkable organic evidence such as footwear, plant remains and coprolites. One of the most productive is Salts Cave, Kentucky (Watson 1969). Two individuals left adult size prints in dust where they walked along the passage and back leaving the cave walls with soot marks from their torches. That cave also contained a child's mummified body and bundles of wood faggots.  The people had left  faeces in which 45% of the plants were of varieties cultivated by these early woodland communities, with dates from the cave between 1400-270 cal BC. Jaguar Cave, Tennessee has produced the footprint-tracks of nine cave explorers, the number based on metrical analysis (Watson *et al* 2005). They were identified as males and possibly some female; most were barefoot but one was shod. Their route was also marked by carbon smudges from torches on the cave roof and radiocarbon dating of this carbon showed they were formed *c* 3000 cal BC. Ritual practice in caves is illustrated by middle American cases, such as Naj Tunich, Guatemala where Maya art, hieroglyphs and associated footprints on the cave floor date to the eighth century AD (Brady and Stone 1986). Extensive cave systems on Isla de Mona, Puerto Rico are decorated with pre-Columbian art *c* AD 1200-1500 below which are footprints of the artists in calcite crusts on the cave floor (Cooper J. pers. comm.).

**Footprints: perceptual and symbolic aspects**

Just as we may be able to predict the location of a campsite 7000 years ago from patterns of footprint-tracks one wonders what people then made of the footprints they observed as they moved around. Observing animal footprints would have been an important part of tracking skills. Reading human footprints as evidence of the composition, routes and activities of other groups would have been an equally important part of life. It is a reasonable proposition that adolescent males living in a sparsely populated Palaeolithic or Mesolithic world were a great deal better at identifying the footprints of young females (and vice versa) than we are today. People would naturally think about and rationalise the footprints they observed whether fresh or fossil.

Fossil footprints in many parts of the world have provided a basis for mythology and beliefs (Mayor and Sarjeant 2001). One example is the Algerian legend of a giant Roc bird which may derive from observation of dinosaur footprints. A fascinating insight to the perception of footprints comes from a !Kung Bushmen cave painting in Mokhali cave, Lesotho (Ellenberger *et al* 2007). It is thought to have been made in the first two decades of the nineteenth century and depicts a footprint and an image which is interpreted as the print maker, a large bird-like bipedal creature like an ornithopod dinosaur. Tellingly a dinosaur skeleton is exposed in the cave and their remains are frequent in the area. It is supposed that the !Kung, renowned trackers, observed the footprint and imagined the creature which produced it, which we now know had been extinct for some sixty-five million years. Equally tantalising is a case reported from the Weaber Range in Australia. Here aboriginal communities depicted bird tracks and images in their art. One of them appears to be a precise anatomical representation of the footprint of a bird which is thought to have become extinct either just before, or just after, the human colonisation of Australia (Ouzman *et al* 2002). Although undated, the artistic representation is not thought to be anything like that old. The favoured interpretation is that it represents a creature from aboriginal dreamtime mythology. Oddly the possibility does not appear to have been considered that Aboriginals had observed sub-fossil footprints of the extinct bird and that these contributed to the mythology.

The perception of footprints by prehistoric people is also illustrated by footprints in the Bronze Age rock art of Scandinavia (Figure 11.2; Nimura 2016). A recent study of their orientations suggests they may relate to solar observance and are part of the wider cosmological scheme of Bronze Age Scandinavia which involved ships, horses and the passage of the sun, all significantly symbols of mobility (Chapter 10; Skogland *et al* 2017). Assuming the footprints are lifesize, some appear to represent children or adolescents (Bradley 2009). A surprising number appear to be shod. This is the reverse of the actual footprint-tracks where shod prehistoric examples are very rare. Some lines of footprints are seen as walking away from barrows as at Järrestad, Sweden where Bradley (2000) suggests these are the footprints of the dead moving from cairns across the liminal coast to the sea.

In more recent medieval Christian times marks on rocks interpreted as the supposed footprints of saints were venerated and in contrast others were supposed to be the cloved hooves of the devil (Mayor and Sarjeant 2001; Walsham 2010). One wonders if some of these ideas were based on religious rationalisation of observed sub-fossil footprints. It was noted above that Lower Palaeolithic footprints at Roccamonfina, Italy which, when originally observed, were interpreted by local people as ‘devils trails'. In terms of perception most recent and evocative of all are the bare footprints in concrete of Jewish slave labour workers involved during World War II in the construction of the Atlantic defensive wall in France (Roberts 2010). They represent a permanent ichnofossil record of one of the darkest episodes in recent human history.

## Conclusions

When footprint evidence began to be found more frequently on archaeological sites a comment made several times to the writer by archaeologists was that they were fascinating, but what could they actually tell us? The question perhaps tells us more about archaeologist's preoccupation with pottery, flints and buildings than it does about the limitations of footprint evidence. It is up to us as scientists to tease out what they can reveal and the objective of this chapter has been to show that they can contribute to a very wide range of archaeological questions. The chapter has also included as many different examples as possible with the objective of demonstrating the increasingly widespread nature of this form of evidence and types of context in which it occurs. Figure 4.15 (based on supplementary Table 4.1) picks out some of the key patterns in the footprint data presently available including: (a) the geographical spread of footprints; (b and c) the sedimentary contexts in which they occur; (d) the occurrence of children; (e) occurrence of human and animals; (f) associations with art and archaeology; (g) footprint occurrence through time. Note the changes of scale marked by vertical lines.

It follows from the range of sedimentary contexts that sub-fossil footprints are likely to be far more frequent than the published literature indicates, a point also made by

Bennett and Morse (2014). That point is also demonstrated by a dramatic increase in the number of finds in recent years. Of the British finds mapped on Figure 4.2a, seven out of eighteen have been reported in the last six years, almost entirely as a result of an increasing focus on the archaeology of the intertidal zone. There must, however, also be many terrestrial contexts where the evidence will be found. Lockley and Hunt (1995), writing about dinosaur tracks, make the point that footprints ought to be far more abundant than bones; a creature has one skeleton but creates myriad footprints during a lifetime. A active individual human has been estimated to make 224 million footprints in a lifetime (McLaren *et al* 2018). Of course, only a minute proportion is likely to escape the destroying hand of time.

So many of the cases touched on in this chapter highlight the importance of a geoarchaeological approach, which has been so well illustrated by the work of Allen (J. 1997) and Bennett and Morse (2014). These show why it is important to pay particular attention to the sedimentary and geomorphic context of the footprints, the formation processes of the record and of course the palaeoenvironmental evidence, to which animal footprint-tracks make their own distinctive contribution.

Just as we need to be aware of the possibilities of this relatively new form of evidence so we need to be alert to its limitations and the problems of interpretation. It was noted above that footprints occur in specific sedimentary contexts, so we need to consider to what extent these patterns are representative of the totality of activity. Some apparently represent people fleeing the catastrophic event of a volcanic eruption. Those are not everyday activities but provide a snapshot of humans coping with environmental disaster. In other situations, such as the laminated silts at

Formby, the Severn Estuary, and Monte Hermoso, we are dealing with something much more like the palimpsest pattern created by everyday activities. However, the evidence may be more likely to be preserved at particular seasons, or events resulting, for instance, in the change from fine to coarse sediments at the transition from summer to autumn. We have therefore to consider to what extent the footprint-track record can be considered representative.

In the study of footprint-tracks we are particularly constrained by the quality of the record. The vast majority of cases are poorly preserved and in these cases it is important that interpretation is not pushed beyond what the evidence will allow. It may for instance be clear from the overall shape of the print that it is human and if it is part of a bipedal trail then that may provide confirmation. We can infer from this that people were present and in what direction they were moving. Only if the dimensions of the foot can be accurately determined can we say anything about the age and height of the individual, the speed of walk etc.

There is obviously a level of uncertainty concerning the age of those represented. Present estimates of age as quoted from many studies earlier in this chapter are based on averages of modern population without consideration of the standard deviations of those averages, or how modern populations may have differed in terms of growth rates, height or physique from those of the past. We can, however, compare stature determined from footprints with that derived from skeletal remains. Scales (2006) did this for Mesolithic examples and found that the range of heights were similar. More problematic are uncertainties in establishing the sex of footprint makers. Identifying large males is perhaps possible with greater confidence, but distinguishing small males and females is problematic. Indeed Tuttle (2008), with an eye to the forensic and criminal applications of footprints, argues that, without knowledge of the range of statures and habitual footwear of an individual, it is probably not possible to establish age and sex. As footprint evidence starts to be found and used more in archaeology the uncertainties and problems of interpretation clearly need to be addressed. It remains to be established whether heightened observational skills, such as those applied by Bushmen trackers to interpretation of footprint-tracks in French Palaeolithic caves (Pastoors *et al* 2015), can facilitate more precise determination of age, sex and activity patterns than currently achieved by western metrical scientific methods.

Perhaps the most striking aspects of many of the sites noted in this chapter are the proportions of children represented by footprint-tracks. This is particularly marked in the case of the Severn Estuary, Formby, Monte Hermoso and the Palaeolithic French Caves. It may be contended that this evidence is put in question by the uncertainties of establishing the ages of footprint makers. Whilst that may introduce an element of doubt in some cases it does not undermine the overall point because in many of the cases the footprints are so small that they are highly likely to belong to young children and we have noted many cases involving children under ten and some as young as 3 or 4. This is important evidence because it casts light on a segment of the population which is generally very hard to recognise in the archaeological record, except in death (Moore and Scott 1997). Chamberlain (1997) makes the point that children (defined in his case as under 18) would have formed about 50% of prehistoric communities and the tendency for them to be ignored in archaeological discourse he sees as a result of an academic male hegemony.

The footprint evidence shows children actively engaged, particularly in the activities of hunting and gathering communities. It demonstrates that a range of age groups were involved in the seasonal camps of Mesolithic communities of the Severn Estuary, in  the foraging parties at Formby and in the seasonal pastoralist camp at Bronze Age Redwick. Nor of course should we ignore the possibility that the presence of children in some of these situations might reflect, not everyday activities, but special circumstances such as initiation rites, or rites of passage. Van de Noort and O'Sullivan (2006) have made the interesting suggestion that seasonal pastoral camps may have been significant contexts for adolescent rites of passage. This might also be an explanation for the predominance of child prints deep within some cave systems.

The involvement of children in activities is what we would expect from the ethnographic record which shows some as young as 3-5 as fully participating members in many activities of hunter-gatherer groups (Bird-David 2005; Hawkes *et al* 1995; Zeller 1987; Politis 2005). Meehan (1982) records that shellfish collection among the Anbarra aboriginals of Australia was largely done by woman, often accompanied by girls and children as young as 2- 4; it often incorporated family time and opportunities for play (Cläassen 1991). Turner (2005) writing about the First Nations communities of the Canadian North West Coast discusses the opportunities which logistical harvesting expeditions provided for children to observe, practise skills and learn the techniques needed for their future survival. In the Mesolithic cemeteries of Teviec and Hoedic , Brittany some child burials had rich grave goods and elaborate ritual (Cunliffe 2001a).  Likewise Mesolithic and early Neolithic child burials from Ukraine show that they were buried with status objects and there was no evidence of differential access to food resources (Lillie 1997, 225). This supports the footprint evidence that they were fully active participating members of their communities. Zeder (2012, 258) emphasises that the Broad Spectrum Revolution and the intensified process of niche construction which took place in the late glacial and initial Holocene, led to an increased role for women and children in the exploitation of a wider range of resources at a range of times of year from one site. Around such places, one supposes, a more clearly defined radial network of paths would develop.

Footprint evidence from Palaeolithic sites, most notably from Laeotoli, has made an important contribution to the study of hominid evolution and especially the development of bipedalism. It also contributes to the study of social behaviour, as illustrated for instance by the three Laeotoli individuals apparently walking together. There is also the evidence for patterns of human colonisation. Some footprints represent the earliest evidence for human presence in particular areas, for example the Tibetan plateau at a time when it was thought to be ice covered. Others are the Calvert Island evidence for human colonisation of the Americas down the coastal so-called 'kelp corridor' or the Monte Verde examples from Chile, so soon after the apparent date of the colonisation of the Americas via Alaska.

In many of the examples reviewed in this chapter footprints contribute to an understanding of the ecological context of particular deposits by providing evidence for the range of animals present. In this respect the footprint evidence is complementary to that provided by animal bones. Footprints have the advantage of providing information about animals actually present at a site, whereas bones may represent food brought from elsewhere. The ecological aspect was particularly well illustrated by Laeotoli where a stratigraphic sequence of contrasting assemblages of animal footprint-tracks established the seasonality of human activity.

Human footprint-tracks have also contributed to the investigation of seasonality in the British Mesolithic at Goldcliff by demonstrating that the most well-preserved examples were made in the height of summer when the finest sediments were deposited. This is the most conclusive of a wide range of seasonality indicators from these sites (Bell 2007a). As regards later agricultural communities, footprint-tracks contribute to an understanding of the animal economy and particularly the evidence for seasonal saltmarsh grazing in the Severn Estuary during the later Bronze Age and Iron Age.  We have also noted instances in which human footprint-tracks provide evidence of particular patterns or axes of movement  such as paths which have been identified at Lake Managua, Mojave and Goldcliff. The convergence points of trails indicate the location of lost, or buried, campsites or activity areas. It is clear from the sites which have been studied in the greatest detail, that when we have the opportunity to use footprint-tracks as part of a multi-proxy approach to interpretation, comparing animal and human footprint-tracks, sedimentary, pollen, macrobotanical, bones, molluscan and other evidence, then interpretations are notably rich and more robust.

Bennett and Morse (2014) whilst highlighting the importance of footprint-tracks in the Pliocene and Pleistocene to studies of human evolution, a particular strength of their book, imply that footprint studies are less significant in Holocene contexts to which they add ‘local colour’. It is hopefully by now clear from the foregoing examples that they offer far more in terms of evidence for social interaction, axes of movement, seasonality, interaction with animals, demographic composition of groups and the role of children in society, and even aspects of human perception etc. They reveal the small-scale patterns of movement by which people structure their daily lives and their relationships with animals.

Making ones Way in the World

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# Chapter 5: Early farmers: mobility, site location and antecedent activities

## Introduction

In the previous chapter we explored how the footprints of individuals can contribute to understanding of small-scale patterns of mobility. That was a form of evidence so individual, fleeting and personal that everybody feels they can relate to it. This chapter begins with a case study illustrating how the exceptional preservation of one individual, the Ice Man, can enhance our understanding of mobility in many ways. This is followed by evidence from skeletal and isotopic sources for human and animal movement as preludes to the body of the chapter which focuses on the first farmers in the British Isles, beginning with site-based and environmental evidence for their patterns of movement, and then briefly considering artefacts. Linking themes between the introductory sketches and the body of the chapter are the importance of remembering that we are dealing with people rather than sites, environments and things and that to understand people's patterns of movement we must necessarily integrate multiple forms of evidence and work on diverse spatial scales.

## Case Study: The Ice Man

The so-called Ice Man or 'Otzi' from the high Alps of the Austrian-Italian border illustrates the wide range of evidence for movement which may be preserved under deep frozen conditions in glacier ice (Spindler 1993; Fleckinger and Steiner 1999).

This formed in prehistory and is now melting for the first time in 5000 years as a result of global warming. The body was found at a height of 3210m and dates to 3365-3041 cal BC. His clothing and artefacts, which were superbly adapted to the harsh conditions, provide many clues to his origins. Charcoals, wood and pollen evidence shows him passing through a sequence of Alpine vegetation zones with mixed oak and hornbeam woods at lower elevations, then mature spruce forest pollen from higher elevations to the snowfields above the woodlands where he was found. He originated in an agricultural settlement; spikelets of cereals were found in his clothing, he had eaten cereals and the evidence suggests he was in the valleys as little as 12 hours before his death, which appears to have occurred in late spring or early summer. He carried a very early copper axe, for which the closest parallels are the Remedello culture of northern Italy, where carvings on menhirs also show similar axes. Pollen evidence and wood from his tools suggest he came from the Senales valley to the south, where there are Neolithic settlements (Bortenschlager and Oeggl 2000). Some of the plants present are also found to the south, the moss *Neckera* and hop hornbeam (*Ostrya carpenifolia*) (Dickson *et al* 1996). Well before the Ice Man, *c* 4300 cal BC, people were already engaged in niche construction at lower elevations around the tree line, *c* 2760m. Heather with dwarf birch was being burnt and replaced by meadows typical of Alpine grazing land. This is thought to reflect the activities of transhumant pastoralists, who even today take their animals across high Alpine passes to exploit seasonal pastures to the north. Spindler suggests that it was transhumance which brought the Ice Man to the High Alps. However, it is questionable whether he was directly involved in animal herding; had he been one would have expected abundant animal hairs in his clothing.

Also in the Swiss Alps melting ice patches are revealing organic artefacts such as clothing, shoes, bows and arrows as evidence of Alpine hunting expeditions some 5000 years ago (Suter *et al* 2005). In the north Italian Alps at Monte Bego, Neolithic and Bronze Age rock art most frequently depicts horned cattle (Figure 5.1) in a valley leading to Alpine passes between Italy and France. Above the tree line in those high mountain pastures animals are likely to have grazed for about three months of the year (Bradley 2009; Huet 2017); the sojourn of their herders would have provided opportunities for social interaction and exchange with groups from across the pass, which might help to explain the very many depictions of weapons. What we may be glimpsing in the case of the Ice Man and the Monte Bego art are the early origins of patterns of Mediterranean transhumance from lowlands in winter to upland pastures in spring and summer. Such practices are well-documented aspects of the economy in Classical, Medieval and up to recent times (Walsh 2013). It may be questioned whether at this early date grazing was in such short supply as to necessitate transhumance. Two points should be made in response to this. Firstly, that extensive natural meadows would have existed above the tree line and could have been extended by burning. Secondly, transhumant expeditions may well have been as much for social as stock management objectives; they presented opportunities to meet with people, and exchange goods, genes and knowledge with those from the other side of the mountains. This point is also pertinent to other areas where mobility with animals occurred, including Neolithic to Iron Age Britain.

**Skeletal, Isotopic and DNA evidence for Neolithic mobility**

Human skeletal evidence from the Neolithic enables us to identify the movement of individuals. Male burials from the Parc le Breos, a megalithic tomb in south Wales dated *c* 3800-3400 cal BC, exhibited musculoskeletal stress markers evidencing extensive leg exercise, suggestive perhaps of transhumant herding (Whittle and Wysocki 1998). Isotope evidence indicated the diet of these people was mainly terrestrial and meat-based with no significant use of marine resources despite their availability within 1km of the tomb. Isotopic evidence can also provide more specific evidence of patterns of mobility, as in the case of burials from a henge-like ritual site at Monkton-up-Wimbourne on Cranborne Chase (Budd *et al* 2003). These included a male aged 30 and a young girl who had previously lived in an area where there was a high lead content in the water; the nearest is Mendip, 34 km distant.

Later Neolithic cremated humans from Stonehenge also exhibit isotopic evidence for non-local origins, possibly including West Wales from whence the site's famous bluestones originated (Snoeck *et al* 2018). In the final Neolithic, evidence for animals such as cattle and pigs being driven to the great henges of Wessex at Avebury, Durrington Walls by Stonehenge, Marden and Mount Pleasant, from diverse isotopically distinct areas across the British Isles, points to previously unsuspected pan-British connectivity (Chan *et al* 2016; Madgwick *et al* 2019). Only relatively small proportions of these animals had been raised locally and they are interpreted as having been driven considerable distances for gatherings at particular times of year, in the case of the Durrington Walls cattle in late autumn and winter (Viner *et al* 2010; Parker Pearson 2012).

Isotopic evidence is likewise transforming our understanding of mobility patterns involving the first metal users in Britain who were buried with beakers. The earliest and richest of these, dated 2470-2280 cal BC, is the Amesbury Archer from

Wiltshire, 5km east of Stonehenge (Evans *et al* 2006; Fitzpatrick 2011). This adult male was accompanied by beakers, barbed and tanged arrowheads, copper daggers, a boar’s tusk, a tiny stone anvil for metal testing, 2 gold earrings and archers wrist guards. Strontium and oxygen isotope analysis of his teeth indicate mainland European origins; the Alps were initially proposed but subsequent work has suggested perhaps the Middle Rhine (Parker Pearson 2012). Three other Beaker burials near Stonehenge, known as the Boscombe Bowmen, all appeared to have originated from an area of older Palaeozoic rocks, probably in the west of the British Isles (Evans *et al* 2006). Isotopic analysis involving 360 burials of this period indicates that something like half grew up in an area different from that in which they were buried; however, a very small proportion (*c* 2%) produced detectable isotopic evidence of origins outside Britain (Jay *et al* 2011; Parker Pearson 2012).

The emerging picture seems consistent with significant pastoral mobility in the earlier Neolithic developing into longer distance ceremonially-motivated mobility in the final Neolithic henge period, with significant human mobility among early metal users. This is consistent with the paucity of evidence for permanent settlements through much of the Neolithic (Whittle 1997). Current opinion sees Beaker communities as semi-mobile cattle pastoralists, and micro residues in Beaker pots indicates some contained milk products (Soberl *et al* 2009). However, in parts of southern Britain at least there is evidence for arable activity and changed patterns of animal husbandry in the Beaker period (Allen and Maltby 2012), so perhaps we may be seeing a degree of spatial variation and specialism.

Work on ancient DNA (aDNA) is radically changing our understanding of patterns of connection between populations and movements associated with the spread of farming. The current view among most writers is that both indigenous and incoming groups made a significant contribution to Neolithisation, both being fundamentally changed in cultural terms in the process (Cummings and Harris 2011; Garrow and Sturt 2011). The early Neolithic Linearbandkeramik groups of Central Europe have been shown to have a connection with the Starçevo gene pool of the Balkans, which could point to population migration rather than the adoption of farming by indigenous communities of Mesolithic origin (Bickle 2016). Other studies infer that the female line of the present-day population of Europe is largely of pre-Neolithic genetic origin (Haak *et al* 2005), with the implication that overall acculturation (adoption of farming by indigenous groups) was more significant than population replacement. That the latter took place in certain periods is indicated by evidence from the Beaker period in Britain where the latest aDNA studies point to an almost total population replacement over a few centuries, as noted in Chapter 1 (Olalde *et al* 2018). The scene is clearly set for aDNA studies to totally transform our understanding of prehistoric mobility in the coming years.

**Neolithic Landscapes in Britain**

Growing evidence for the mobility of people and animals in Neolithic Britain requires a focused investigation of the routeways involved. With the advent of the Neolithic we have many more sites, including the creation of monuments some in alignments. These are potential clues as to how the early farmers moved around, although the interpretation of that evidence is frequently contested. Recent studies of the Neolithic have also given a greater emphasis to mobility by comparison with the prehistoric periods considered in other chapters. Two edited books in particular explore this theme: *Prehistoric Journeys* (Cummings and Johnston 2007) contains several Neolithic case studies and *Moving on in Neolithic Studies* (Leary and Kador 2016) is entirely focused on the period. Both are case study based, rather than focused on the general theme of how we can identify past routeways; they are also generally site and artefact-based studies rather than having the palaeoenvironmental dimension which is emphasised here.

The Neolithic is marked by the appearance of domesticated plants and animals, pottery and, within two or three centuries, the appearance of monuments. The chronology of the beginning of the Neolithic has recently been greatly refined due to the increasing availability of radiocarbon dates, the critical examination of the significance and validity of dates, and the Bayesian statistical analysis of sequences of dates on stratified sites (Bayliss and Whittle 2007; Whittle *et al* 2011). This indicates that farming first arrived in the British Isles around 4100 cal BC and rapidly spread to the west, reaching Ireland and Scotland around 3800 cal BC. The first long barrows were constructed from *c* 3800 and by 3700 there was a peak of causewayed enclosure construction. Between 3800-3700 cal BC the first rectangular buildings are represented; in Britain, and even more so in Ireland, rectangular buildings are very much concentrated in the early centuries of the Neolithic and later there are fewer domestic structures. Despite the rather dramatic changes which this chronology implies, it is generally considered that in many areas of the British Isles the Neolithic way of life was not totally settled, hence the paucity of domestic structures. In Ireland and Scotland where more structures occur, some with significant evidence of crop growing, there seems to have been less emphasis on mobile pastoralism (Cooney 2000), reminding us that regional variability is to be expected.

In much of the British Isles the Neolithic seems to involve mobility focused on animal husbandry (Whittle 1997; Thomas 1991; Bradley 1993; Pollard 2000b). Neolithic communities grew crops, but to what extent remains a matter of debate (Fairbairn 2000; Stevens and Fuller 2015). There is often evidence that crop growing was combined with the continued use of wild plant resources. There is little physical evidence of their fields. However, long accepted models of shifting Neolithic agriculture have recently been called into question as a result of the detailed analysis of weed seeds associated with crops, both in Central Europe and the British Isles, which points to longer established fields in which fertility was maintained by manuring (Bogaard 2004; Bogaard and Jones 2007). The agricultural activities of Neolithic communities have mainly to be inferred from pollen evidence for clearings and cultivation (Simmons and Tooley 1981). There has been a tendency to treat environmental and cultural evidence as separate categories in the Neolithic, whereas understanding requires an integrated perspective in which the woodland and other vegetation forms part of the 'architecture', as it were, of sites and landscapes (Noble 2017). Many pollen diagrams show distinct vegetation changes, a reduction in trees, and an increase in herbs and plants of disturbed ground soon after 4000 cal BC. Sometimes these changes are associated with small numbers of cereal-type pollen grains, which are generally interpreted as reflecting the activities of the first farmers. This interpretation is complicated by several factors. One is the increasing evidence for Mesolithic vegetation disturbance and burning discussed in Chapter 3. Another is the pronounced decline in elm pollen which occurs *c* 3800 cal BC across a wide area of western Europe. This was once interpreted as the result of Neolithic farmers using elm leaf fodder for animals; today it is widely considered to be an early outbreak of Dutch Elm Disease, although early farmers' movements and practices may have contributed to the spread of the disease (Parker *et al* 2002). The fact that the elm decline occurs at about the same time as the onset of the Neolithic means that these parts of pollen sequences tend to be subject to particularly close sampling, with the consequent likelihood of detecting more small-scale vegetation changes than have been recognised at other times by less high-resolution sampling. A further issue is that plants of disturbed ground have tended to be interpreted in terms of areas used for agriculture, although as emphasised in Chapters 2 and 3, they are often associated with the woodland edge and concentrated along routeways. Human and animal movement along routeways will have played an important part in the introduction, not only of crop plants, but also weeds, some introduced with seed corn. Plaintain (*Plantago lanceolata*) is an obvious example; it is associated with trampled ground and often taken to indicate grazing animals, yet it is particularly likely to be associated with paths. Many weed species are known to be introductions and often become particularly aggressive colonisers in their new environment. People and animals moving around disperse seeds, in animal coats, clothing, mud on feet etc. Herbivores also disperse seeds and Salisbury (1964) gives a list of those propagated from herbivore dung: cattle (42 species), horse (25 species), pig (6 species), goat (4 species). The significance of routeways in the spread of weedy species has been illustrated in recent times by successive waves of weedy invasions along the corridors created by the construction of canals, railways and motorways. These provide some indication of the much smaller scale and less dramatic introductions which must have been associated with the paths, trackways and roads in the past, especially since the introduction of weed species with crop plants. This is illustrated by the many Old World weeds introduced to the New World of the Americas and also by the case of New Zealand where the weed flora is largely of European origin; of 500 introduced species, 80% are from the Old World.

**Neolithic monuments in Britain**

Movement was evidently part of Neolithic life: seasonal movement with animals; the movement of rocks and other artifacts; and the emergence of ceremonial complexes which clearly served groups from wide catchments. It is inherently likely that ceremonial sites lay on significant routes. In a review of the distribution of Neolithic monument complexes in Scotland, Noble (2007) concludes that they are on natural routeways, and have an association with objects of non-local origin. For instance, he identified cross peninsula routes which avoid hazardous sea crossings.

Some monuments can be argued to mark, or respect, routes, stone avenues being obvious examples. Henges with opposed double entrances can also be convincingly argued to represent routes. Some other alignments such as cursus monuments are far more enigmatic although many people think they have something to do with movement through the landscape (Johnson 1999; Last 1999; Loveday 2006). Very often, however, we infer routes based on recurrent use of the same site, for instance in Mesolithic and then in successive Neolithic phases. In a largely wooded landscape it is reasonable to expect that recurrent activity will take place (as outlined in Chapter 3) at key points along paths, such as where the route overlooks tracts of landscape, approaches open water, or especially where paths intersect. Some intersection places may have achieved social significance as the places where groups moving in different directions met.

It is a reasonable, and generally argued proposition, that many of the paths on which Neolithic communities moved around the landscape will have been established earlier in the Mesolithic (Tilley 1994; Edmonds 1997). The creation of monuments of various types, but especially tombs, created fixed points in the landscape to which subsequent activities referenced. The making of monuments creates in Gosden's (1994) words 'patterns of recursiveness'. Barrett (1994) saw Neolithic sites such as megaliths, long mounds and causewayed enclosures, not so much as the centres of land territory, but at the beginning and end of paths, the intersection and meeting places in a wider seasonal cycle. Phenomenological approaches envisaged the monuments as drawing their significance in part from their relationship to specific topographic features, hills, mountains, prominent rock outcrops and the coast in relation to which they were positioned (Tilley 1994; Cummings 2002, Cummings and Whittle 2004; Cummings and Harris 2011). Certain outcrops and types of rock were attributed particular significance and this led to these being transported great distances, either as portable artefacts such as axes, or as huge stones which formed part of later Neolithic monuments. Perceptual and phenomenological perspectives have made a significant contribution to the study of prehistoric movement; however, the application of these approaches, for instance to Neolithic tomb location, has not always been sufficiently rigorous or evidence-based, as demonstrated by Fleming (1999; 2005b). Up to now phenomenological approaches have made little use of palaeoenvironmental evidence (Chapman and Gearey 2000). The extent of tree cover will have been a key factor in the visibility of landscape features and thus landscape perception, for instance routes themselves would open up a more distant vista in an otherwise wooded landscape. Bradley (2012) has further proposed that, for people living in a closed woodland, this may engender a linear perception of space, whereas for those living in an open landscape, the perception of space may be more circular, such perceptions perhaps being reflected in the form of monuments.

In seeking to identify ancient routeways, a rigorous and questioning approach is essential in order to avoid the pitfalls which waylaid Alfred Watkins (1925) almost a century ago (p000). Former routes will be more readily recognised where they follow a relatively straight course, but there can be no assumption that routes were straight, they are just as likely to be curved if following topography. Identification of curvilinear routes connecting sites can be aided by GIS approaches using least cost paths (Conolly and Lake 2006). Instructive as such tools can be, we also need to keep in mind that routes may be governed by non-functionalist, non-utilitarian factors such as ritual observance, cosmology etc.

***Megalithic tombs***

Neolithic tombs are often seen as fixed points in a landscape in which earlier Neolithic communities and their herds remained mobile. It is striking that many of those tombs excavated under modern scientific conditions have produced evidence of long histories of environmental disturbance and episodes of occupation, by both Mesolithic and Neolithic communities, before the period of tomb construction. Where environmental evidence is available, it generally indicates construction in grassy clearings. Thus, they were already places with a history.

On a terrace above the River Usk the tomb at Gwernvale, Wales, focused on a natural group of boulders, round which were early and late Mesolithic artefacts and a hearth dated to 5878-5714 cal BC (Figure 5.2; Britnell and Savory 1984). There was also an early Neolithic rectangular building with cereals and bones of domestic animals, all sealed by the tomb (Figure 5.2b-c). The coincidence of activity over such an extended timescale could well reflect a long-lived routeway with the boulders providing a focal point. Indeed, this is the route that Parker-Pearson (2012, 289) advocates for the later dryland transport of the bluestones from Preseli to Stonehenge. There are number of standing stones along the same route, which is a classic 'natural' routeway later taken by a Roman road and today by the A40T (Figure 5.2a).

Below the Neolithic chambered cairn at Hazleton, Gloucestershire there was evidence of late Mesolithic activity, then a midden dated 3900-3800 cal BC (Saville 1990). Micromorphological and environmental evidence indicates cultivation, then reversion to scrub, before construction of the tomb around 3600 cal BC (Meadows *et al* 2007). Below the chambered cairn at Ascott-under-Wychwood, Oxfordshire there were earlier and later Mesolithic artefacts and mollusc evidence for a phase of more open vegetation followed by closed woodland (Benson and Whittle 2006; Evans 1972). Clearance created grassland which was followed by occupation, a building and a midden in the 40th and 39th centuries BC, then the tomb was constructed *c* 3760-3695 cal BC (Bayliss *et al* 2007). Below a long mound at Raunds, Northamptonshire, constructed 3940-3780 cal BC, was evidence of repeated Mesolithic visits during the 5th millennium BC (Harding and Healy 2007, 47).

In each of these cases activity was periodic rather than continuous. As Thomas (J. 2013) says,  'it is hard to avoid the conclusion that particular places had significance maintained by social memory'. Trackways and especially their intersection points, and maybe the stories that accompanied the recurrent use of trackways, are likely ways in which this social memory was maintained.

***Tree-throw pits and causewayed enclosures***

Pits created by natural tree-throw are often revealed by excavations and can be recognised by their distinctive shape and fill: roughly circular with a banana shape of humic fill and the remainder of the fill redeposited subsoil weathered from the tree bole (Figure 3.5). Such pits often contain palaeoenvironmental evidence of former woodland. More surprisingly there are numerous examples containing artefacts, such as flint, pottery and charcoal, pointing to activity in the clearing created by tree throw. Sometimes it is evident that the artefacts have been deliberately deposited. Evans *et al* (1999) give an example at Barleycroft, Cambridgeshire where tree-throw features dated 3780-3650 cal BC contain artefacts and are cut by later pits *c* 3690-3530 cal BC, demonstrating recurrent visits. Deposition of artefacts has been interpreted as possibly relating to settlement closure and hiding of human presence, the fallen trees perhaps serving as settlement markers or foci for camps. Artefacts may sometimes have been cached (stored) in tree-throw holes pending scheduled return as part of seasonal mobility. Evans (1988) makes the very interesting suggestion that enclosures may have mimicked a concentric spatial principle presented by clearings and this resonates with the case developed in Chapter 10 at Bishopstone, Sussex (Figure 10.3) where a probable Neolithic clearing seems to have been bounded by a ring of pits including at least one tree-throw (Bell 1977). It was not a formal enclosure, but might have developed into one, had its development not been arrested.

Causewayed enclosures were created from 3800 cal BC with a peak around 3700 cal BC (Whittle *et al* 2011). They seem to have been communal gathering places, perhaps seasonal rather than permanent settlements. Surprisingly, those which have been subject to detailed palaeoenvironmental study appear to have been constructed in woodland or scrub, for example those at Windmill Hill (Whittle *et al* 1999); Hambledon Hill (Bell *et al* 2008), Knap Hill (Connah 1965); and the Sussex causewayed enclosures (Thomas 1982). The artefactual evidence certainly suggests that materials, pottery, axes, stones etc were brought to the site, sometimes from a significant distance, and may have been exchanged at the site.

***Cursus monuments***

Cursus monuments are among the most enigmatic sites in prehistory and some may wonder how they feature in a book on prehistoric tracks.  The origins of their name is no less curious. It derives from Stukeley (1740) who thought they were for chariot races;  that at least we can dismiss because they mostly date from 3650-3050 cal BC (Barclay and Bayliss 1999), some two and a half thousand years before the first chariots in Britain. They can be defined as long enclosures, sometimes several kilometres long, defined by parallel ditches; they may possess banks and sometimes a central mound; at least one end is closed (Loveday 2006). Lengths varies from 170m to 4km and the conjoined Gussage and Pentridge cursuses in Dorset together cover 9.8km. Related sites are defined by lines of pits or posts (Thomas 2006).

Around 110 convincing and possible cursuses are known in Britain (Loveday 2006; Barclay and Harding 1999). Some examples have an entrance gap at the middle of one end, encouraging the idea that they may have created processional space (Loveday 2006, Fig 56), which is how Atkinson (1955) interpreted the Dorset cursus. Other examples have opposed gaps suggesting that they may have been crossed by paths (eg Holywood north; Dorchester; Drayton; and recent discoveries at the Stonehenge cursus). They are often located on river terraces and roughly parallel to rivers, terminating near streams. A number cluster around confluences, for instance in the Thames valley at Lechlade and Dorchester, and elsewhere they coincide with historically important river crossings, for instance that of the River Welland at Maxey and the River Severn at Welshpool (Loveday 2006, 134).

The ditches of cursuses tend to produce very few artifacts but once established they, or the significant places which they represent, tend to become the focus of later Neolithic and early Bronze Age monuments such as barrows and sometimes henges, as demonstrated by extensive excavations at Drayton (Barclay *et al* 2003) and Dorchester on Thames, a site respected by other monuments for a thousand years (Whittle *et al* 1992).

The very nature of these long linear monuments is suggestive of construction in an open grassland environment and hints perhaps at openness resulting from movement of animals along a path, or clearance by people along a path. Where detailed palaeoenvironmental analysis has taken place it supports the idea of an open environment: in the Thames valley (Barclay *et al* 2003); round the Stonehenge Cursus (Richards 1990); and the Dorset Cursus (Barrett *et al* 1991). However, in the

Dorset case there is growing evidence that the chalklands of Cranbourne Chase may never have been fully wooded in the Holocene (French *et al* 2007). The 2km long cursus, or bank barrow, Cleaven Dyke, Scotland was in a landscape of heath and grassland with birch and hazel woodland; turves were used in construction and there was evidence of grazing before the monument (Noble 2017), which would be consistent with elaboration of an existing path. Some cursuses are in areas with preceding Neolithic activity; at Drayton, for instance, there are tree-throw pits with artefacts and charcoal (3960-3360 cal BC) which predate the cursus (Barclay *et al* 2003). A cursus at Stanwell (Lewis *et al* 2006) was 3.6km long along a break of slope between a Thames terrace and the floodplain of the river Colne. There was evidence of Mesolithic activity in the form of pits some 3000 years earlier and the excavators concluded that it was constructed along a pre-existing path of great antiquity. The Dorset Cursus incorporates an earlier long barrow in its construction and is so designed that a barrow at its end is illuminated by the midwinter sunset when observed from a position along the cursus (Bradley 1993). Johnston (1999) interprets that cursus as representing a pre-existing path which linked earlier monuments and may have also related to cosmological alignments. He sees earlier processions as defining the route but argues that the route was put out of use by the act of construction. The Stonehenge cursus (Figure 5.6) meets dry valleys at either end which might have formed part of a pre-existing route and also seems to reference a longer alignment with long barrows to east and west and the later Woodhenge further east. Whether that axis relates to a real or metaphorical route, cosmology, or some other factor remains a matter of debate (Bowden *et al* 2015).

Particularly striking in terms of the marks they made on the landscape are the four cursus monuments which converge / frame  a turning point in the Gypsey Race river at Rudston, Yorkshire where there is a huge standing stone at the end of the main cursus (Figure 5.3). Three of the cursuses run from the chalk uplands to the river valley and one crosses the valley between uplands.  Woodward (2000) sees the cursus as providing a connection between the lowlands and the uplands where barrows, some perhaps contemporary, others Beaker and Bronze Age, are located.

Most of those who have written about cursus monuments recognise some connection with movement through the landscape such as paths. Last (1999) sees them as monumentalised paths, Tilley (1994, 149) as a pathway for rites of passage, Barrett (1994,137) as formally demarcated paths, their relationship  to other monuments suggesting they were parts of a longer route. Bradley and Chambers (1988) speculate they may have been paths connecting the living and the dead. Many provided a focus for subsequent burials and some were preceded by earlier burials,  a mortuary enclosure in the case of Dorchester-on-Thames, and barrows in the case of the Dorset Cursus. However, there is little evidence of formal burial directly associated with the cursuses themselves, although fragmentary human remains sometimes occur.

Whilst many authors accept the idea that cursuses may reflect earlier paths, there is some ambiguity as to whether these preceding paths represent everyday paths, originating perhaps in the Mesolithic, as argued at Stanwell, or metaphorical paths for the ancestors, or the gods. Astronomical evidence from the Dorset cursus in particular does seem to point to actual physical movement by people because the cursus structures people's experience of landscape and encounters with specific monuments. Given wide recognition that cursus monuments may have originated in paths it remains unclear whether they served as active routes once they were demarcated as a cursus. For instance, Lewis *et al* (2006, 52) argue for the pathway origins of the Stanwell cursus but evaluate a list of possible functions which does not include a route, which may have been considered too functionalist an interpretation. However, we should at least consider the possibility that they continued to mark routes in some way,  perhaps the parts of routes which required a particular form or permission, ritual observance, or status. The clustering of later ritual monuments round many cursuses might support the idea that they lay on routes, as might the association of some with previously grazed areas, with river crossings and floodplain edges. It must also be acknowledged, however,  that the absence of artefacts in the ditches, and the fact that in no case, known to the writer, is there an obviously later path leading out of them may be  more consistent with the hypothesis of metaphorical paths, or the idea that they put paths out of use.

***Henges and avenues***

In the case of henges the relationship to movement and routes is often more tangible than with the cursus monuments. Henges are circular monuments, often with an external bank and internal ditch; some have circular arrangements of posts or stones in the interior (Burl 2000). Stone settings sometimes relate to a later phase in the history of the monuments. Henges were constructed in the later Neolithic with some modest examples before 2500 cal BC and large ones after that date (Bradley 2007). Some continued in use into the Bronze Age. A few henges are approached by avenues flanked by stones; some have two opposed entrances suggesting they were aligned on a route; some have four entrances, perhaps implying the intersection point of two routes;  some are aligned with other monuments which may imply an axis of movement. On mainland Orkney, the double entrance henge, the Ring of Brodgar,  is oriented with one other henge, many barrows and several standing stones along the axis of an isthmus between expanses of open water, so it is easy to conceive of this as a natural processional route.

The sequence at Thornborough Henges, Yorkshire (Figure 5.4) begins with a cursus on a north-east to south-west alignment, which was succeeded by three henges, each 0.5km apart, with double entrances all aligned south-east to north-west which is at right angles to the cursus which underlies the central henge (Harding 2013). A double line of pits 350m long stopped on the common axis between the two southern henges. More widely the three henges are roughly aligned with three other henges between 5-10km to the south-east, and also 15km to the south-east a line of 4 or 5 giant standing stones, the Devil's Arrows, at a crossing place of the River Ure.  The alignment may have related to the winter solstice perhaps legitimating the direction of travel which Harding likens to pilgrimage. Other henges, nine in all, may extend the hypothetical routeway along the lowland east of the Pennine upland to a remarkable 80km (Harding 2012). That may represent a long-distance route which led eventually through Wensleydale across the Pennines to Cumbria. Artefactual evidence at Thornborough suggests it was not a place of permanent residence but somewhere visited from time to time.

The relationship between henges and routes  will be further explored using the two best known henges at Avebury and Stonehenge where archaeological and palaeoenvironmental research over the last 40 years means that we have a spatial picture of environmental change which can be related to evidence for prehistoric routeways.

***Case Study: Avebury Henge, Wiltshire*** (Figure 5.5). This site is defined by an enormous encircling bank and interior ditch with huge stones forming a circle inside the ditch; within this are two stone circles and a recently discovered rectangular setting. The stones are sarsens, which are the silicified remnants of a Tertiary deposit which once covered the chalk. Four entrances define quadrants. The south and west entrances are approached by long avenues of standing stones. Land molluscs from below the bank demonstrate that the area had formerly been wooded, but by 3620-3350 cal BC, well before henge construction, the landscape was grazed grassland (Evans 1972; Evans *et al* 1985). Valley sediment sequences *c* 350m west of the henge show Mesolithic activity, early Neolithic clearance, grazing and some artefacts (Evans *et al* 1993). Thus, the henge was made *c* 3000-2600 cal BC in a grazed clearing at least 800m in diameter. The four henge entrances meeting at a crossroads provide a possible explanation for the location of the clearing and recurrent activity in the Mesolithic and early Neolithic. The site is at the intersection points of two 'natural routeways': it is at the beginning of the interfluve between the headwaters of the Kennet which flows east to the Thames and the River Avon which flows west into the Severn Estuary. This east-west route is crossed by a lesser northerly route along a valley.

Palaeoenvironmental studies on several sites in the immediate area show that it was wooded in the mid Holocene; there was a progressive opening up of the landscape from the early Neolithic, so that by the mid-Neolithic the landscape was perhaps half open; it was largely cleared by the early Bronze Age. These changes have been documented in the form of a sequence of landscape reconstructions (Allen 2005; Gillings *et al* 2008; Figure 3.7). The significance of routes into Avebury is emphasised by the great avenues lined by large sarsen stones which are thought to have been constructed 2600-2200 cal BC (Gillings *et al* 2008). The West Kennet avenue approaching the south entrance is the best preserved, 2.4km long curving down from the Sanctuary on Overton Hill. The sanctuary comprised successive circular timber circles, then two concentric stone circles. Significantly, or not, the end of the Avenue at the Sanctuary meets a hypothetical north - south route (the Ridgeway) which many have supposed is a prehistoric routeway, an hypothesis further discussed in Chapter 8. The east entrance to the Avebury also leads up onto Overton Down via an old trackway called Greenstreet, to cross the Ridgeway 2.1km away; it then continues along the downs to the east where it was a significant Post-medieval route. Here it is frustratingly not possible to identify one clear prehistoric line among the many well-preserved early fields and associated tracks which have been mapped in this area, perhaps because there was not one prehistoric route but many (Fowler 2000). This east-west route into Avebury is of special significance since it was probably down this that the huge sarsens forming the henge were transported from the Fyfield Down area, where even today sarsens litter the downland surface in their thousands.

The north entrance to the henge faces up a valley which was dry in the Neolithic but now carries the headwaters of the Kennet up to the chalk escarpment and a tributary of the Thames beyond. The west entrance to the henge was approached by a second avenue 1.2km long flanked by sarsen stones. Few now remain, though they were recorded in historical sources and have recently been relocated by a combination of geophysics and excavation.  That avenue led from Beckhampton where an earlier earthwork enclosure was levelled for its construction (Gillings *et al* 2008). One puzzling point is that where the two avenues approach Avebury they are are offset in relation to the entrances, leading some to argue that they were not processional routes but were set alongside processional routes (Gillings *et al* 2008).

In the surrounding landscape there are many other major prehistoric monuments, including the early Neolithic chambered tomb at West Kennet, which, as environmental evidence shows, was made in a grassy clearing, and the long barrow at South Street, another place with a long history. Here barrow construction *c*. 3660-3020 cal BC was preceded by a sequence of open woodland, clearance and ploughing followed by grassland (Evans 1972). Perhaps the most enigmatic of the neighbouring monuments is the huge mound of Silbury Hill, constructed c 2400-2300 cal BC, below which turves and exceptionally preserved biological evidence show it too was constructed on grazed grassland (Leary *et al* 2013).

***Case Study: Stonehenge, Wiltshire*** (Figure 5.6). Stonehenge is an iconic prehistoric site recognised worldwide, indeed it shares the status of a World Heritage site with Avebury. Understanding of this landscape has been greatly increased over the last 40 years by a programme of publishing previous excavations (Cleal *et al* 1995), and new fieldwork (Richards 1990; Parker Pearson 2012; Bowden *et al* 2015). Associated palaeoenvironmental research has facilitated development of a spatial picture of the changing environment in time slices between 8100-1600 cal BC (Allen, M 1997). As a result it has become clear that Stonehenge was a significant place long before erection of the iconic sarsen trilithon circle, or the arrival from Wales of exotic bluestones. In common with cases outlined earlier in this chapter, activity on the same site was over an extended timescale and was episodic rather than continuous, providing a clue that significant routeways lay behind recurrent use. That notion is persuasive because routeways became monumentalised in the Neolithic. The sequence starts in the early Mesolithic around 5000 years before the stone circle, when four or five large pits were dug 200m north-west of the later stone circle and dated 8800-6590 cal BC. At least two of the pits held enormous freestanding posts; there is no evidence of a domestic site and a ritual or symbolic function for the pits has generally been favoured; possible analogies have been suggested with the totem poles of the American North West coast (Allen, M 1995). Mollusc, charcoal and pollen evidence shows that they were in a cleared area within pine and hazel woodland. The recent discovery of a major Mesolithic site with dates between 7600-4700 cal BC at Blick Mead beside the River Avon 2.2km east-south-east of Stonehenge strengthens the case for significant Mesolithic activity in the landscape (Jacques et al 2018). Palaeoenvironmental evidence from the Avon Valley at Durrington Walls shows that here also there was vegetation disturbance in the later Mesolithic and Neolithic (French *et al* 2012).

Later in the Neolithic (*c.* 3800-3400 cal BC) the basin, later to be occupied by Stonehenge, was encircled by 13 Neolithic long barrows, marking an ancestral grassy clearing with some secondary woodland development and, beyond the basin itself, primary oak woodland (Allen, M. 1997). The evidence of a sizeable grassland clearing of some duration is strengthened by the laying out of the greater cursus *c*

3600-3000 cal BC (Parker Pearson 2012) which might be suggestive of some sort of axial east-west movement  across the plain.

Then *c* 3000-2920 cal BC the first phase Stonehenge I was constructed, a ditch with internal bank, and within this a circle of Aubrey Holes, which might originally have held bluestones (Cleal *et al* 1995; Parker Pearson 2012). This monument became progressively elaborated, first as Stonehenge II with timber settings, then Stonehenge III *c* 2620-2020 cal BC, with increasingly sophisticated settings of stones including the giant sarsen trilithons and the settings of bluestone brought from Wales for which the site is so famous. During Stonehenge III, 2480-2200 cal BC, the great embanked avenue was constructed, forming a curving processional way from the River Avon to the henge entrance (Parker Pearson 2012, 219). Its end at the river is interesting in two respects. Firstly, it is close to the main concentration of early Mesolithic activity at Blick Mead which might hint at a long established axis of movement linking river-side settlement to the ritual focus of putative totem poles. Secondly, and more tangibly, recent excavations at the end of the avenue beside the river Avon have revealed a further henge, perhaps the original site of a Bluestone circle, the West Amesbury Henge. This went out of use *c*. 2460-2190 cal BC, after which perhaps the stones were transported up the newly constructed avenue and erected at Stonehenge itself (Parker Pearson  2012).

The connection between the avenue and the River Avon very clearly demonstrates the significance of riverine movement in prehistory, a theme developed in Chapter 10. That significance is further highlighted by recent discoveries 6km up the meandering course of the River Avon at Durrington Walls.  Here recent excavations have revealed a sizeable settlement of many small rectangular houses covering perhaps 17ha and dating between 2505-2465 cal BC. There were also great wood structures of concentric rings of huge posts. A large enclosure was defined at first by a ring of large posts, then later by an internal henge ditch and external bank made *c* 2480-2460 cal BC (Wainwright and Longworth 1971; Parker Pearson 2012). That enclosure originally had four entrances so perhaps, as suggested above at Avebury, the site's original location reflected the intersection of two routes. The routeway running north-west to south-east predated the henge enclosure and was blank of houses, suggesting that route predates the earthwork entrances. Excavations found clear evidence of a road leading from the south-east entrance down to the river Avon, confirming the significance of the river as a key transport route in the Neolithic. The idea of an earlier routeway also gains a measure of support for evidence of woodland openings in the Mesolithic and early Neolithic (French *et al* 2012). It was argued, originally on the basis of analogy with monuments in Madagascar, that the river connected the world of the living represented by settlement and timber structures at Durrington Walls with the world of the dead, represented by stone structures downstream at Stonehenge (Parker Pearson and Ramilisonina 1998). Loveday (1998) makes the interesting point that one route through a crossing point of the Avon at Durrington Walls was still a significant route in the Medieval period.

The Stonehange landscape remained a particular ceremonial focus beyond the Neolithic and through the early Bronze Age: flat axes and daggers were carved on the sarsen uprights *c* 1750-1500 cal BC (Field *et al* 2015) and large numbers of round barrows were also constructed in a dry grazed grassland landscape. Some of the barrows are in very pronounced alignments. One of the clearest is parallel to and

120m south of the cursus. The possibility that some barrow alignments reflect former routeways is more fully discussed in the next chapter. At Stonehenge, however, supporting evidence for this theory is lacking and the main pattern which has been recognised is a loosely concentric arrangement of barrows, perhaps demarcating the sacred space of the Stonehenge basin (Woodward and Woodward 1996).

Though the development of the Stonehenge landscape is now very well known thanks to some outstanding recent archaeological work it must be acknowledged, that the interpretation of that evidence in terms of routes is in many respects highly speculative. We cannot be sure of any connection between early Mesolithic and Neolithic activity, or that routes later monumentalised as the cursus or avenue reflected pre-existing axes of movement. However, taken together the cumulative evidence does at least provide food for thought and one hopes may stimulate further work on routes in the future. The culmination of the recent archaeological work at Stonehenge has been the opening of a new visitor centre at the end of 2013. That includes some fine dioramas reconstructing the changing environment and landscape from the Mesolithic to the Bronze Age. These reconstructions include various paths linking contemporary monuments. Such things must obviously have been an important aspect of the way it was structured and encountered. The problem is that their precise location and form, whether curving or straight, is inevitably largely a matter of speculation, although it would be interesting to see if any traces have been detected in the recent comprehensive geophysical coverage of the landscape. The dioramas show the paths as curving, wavy and bifurcating; one suspects that may be a reaction to Alfred Watkins' continuing legacy (p00) in that archaeologists dare not depict a straight path in prehistory.

### ***Other henges and linear landscapes***

The case for an associated routeway is particularly clear at Thornborough, with three pairs of aligned entrances, routeways at Avebury and Stonehenge are identified by the avenues and by archaeological and palaeoenvironmental evidence. These sites are not alone; many other henges and related sites show patterns which suggest a relationship to routeways, highlighting the potential significance of this theme. At Stanton Drew, Somerset is a complex of three partially-preserved stone circles and two other stone settings, together forming at least two distinct alignments. The larger Great Circle was preceded by concentric circles of large posts similar to Durrington Walls (David *et al* 2004). Two of the stone circles have traces of stone avenues leading to the river Chew, reminiscent of the situation at Stonehenge and Durrington and highlighting the role of riverine transport (Darvill 1986; Burl 2000). Other henges approached by stone avenues include Broomend of Crichie, Aberdeen and Callanish, Outer Hebrides (Burl 2000). In the Milfield Basin, Northumberland there is a group of three henges and a routeway has been hypothesised passing through the opposed entrances of one and tangentially skirting the two others (Harding 1981). Waddington (1998; 2005) makes a case that this is part of a longer processional way which, from a sequence of vistas and monuments, he argues was approached from north to south. The northern part is marked by what he interpreted as a double-ditched avenue. South of this he suggests some pronounced changes of direction indicated by the alignment of entrances, pits and the disposition of monuments, thus demonstrating that in the identification of routeways from monument relationship we are not limited to straight lines. A prehistoric date for the double-ditched avenue has been questioned by Bradley (1993) in favour of an association with a later Anglian seventh century AD site at Milfield, the status of which he suggests was legitimated by association with the much earlier prehistoric monuments. If we accept the case for an earlier route linking the monuments, the double-ditched avenue, whatever its date, contributes to the case for legitimisation proposed by Bradley.

Around Dorchester, Dorset (Figure 5.7) there is a major complex of Neolithic monuments, which includes a large henge at Mount Pleasant with a recently identified hollow way, perhaps Neolithic in date, leading from its east entrance to the river Frome (Barber 2014). This is one of a sequence of monuments along the Allington Ridge (Smith *et al* 1997; Wainwright 1989). Activity on the ridge starts in the earlier Neolithic, *c* 3800 cal BC, with pits at Flagstones and some activity at Mount Pleasant. From this phase at Flagstones, and more widely on the ridge from the middle Neolithic, there was an open grassland environment. Then in the middle Neolithic, *c* 3300 cal BC, an enclosure was created at Flagstones and a long mound at Allington. Subsequently in the late Neolithic the Mount Pleasant henge was made and a site created at Maumbury Rings, where a great circle was defined by 45 shafts, some 10m deep (Bradley 1975). In the early Bronze Age barrows were constructed along the same alignment, in the centre of the Flagstones enclosure and at either end of the Allington long mound, forming an alignment of at least 7 barrows over 2km, or 4km if a more distant further group of four to the west are included. This linear monument complex evolved over an extended timescale, from the early Neolithic to the end of the early Bronze Age, some two millennia.

Another site where Neolithic monuments of contrasting character and date have a linear arrangement is at Fengate, East Anglia (Figure 5.8; Pryor 1991). The sites include an alignment of paired ditches, probably a long barrow, a rectangular ditched enclosure, a house/ ritual structure and multiple burials. Pryor made the reasonable inference that the alignment reflects a Neolithic path which is on a slightly different alignment (25° degrees difference) to a very prominent alignment of ditches and droveways laid out in the Bronze Age, as shown on Figure 6.10a. On a smaller scale the Neolithic ceremonial complex at Catholme in the west Midlands shows some similar traits (Figure 5.9; Buteux and Chapman 2009). It begins with a short cursus type monument of third millennium BC date. Then, aligned on a similar axis 200m east, is a radial 'starburst' of pits which evolved into a henge, and 200m east of that a structure (Woodhenge) comprising multiple circles of posts constructed *c* 2500 cal BC. What gives the aligned relationship between all three monuments added significance is that in the late Bronze Age or early Iron Age pit alignments were laid out on both sides *c*50m outside the Neolithic monuments. Buteux and Chapman favour an interpretation of the linear pattern and the pit alignments at Catholme as boundaries, a hedge or wood edge; however, such longevity again over 2000 years, may alternatively be explained as a routeway, a possibility they acknowledge (Buteux and Chapman 2009, 107).

Loveday (1998, fig 2.2) identifies 14 double entrance henges which are on the same alignment as nearby Roman roads at distances ranging from 0.5 to 5km (average 1.65km). That implies that double entrance henges were on, or close to, 'natural routes,' perhaps of wider utility rather than of a restricted ritual or ceremonial role.

Beside these somewhat speculative inferences of Neolithic routeways is one example of a hollow way at Oversley Farm, Cheshire (Garner 2007). It was a prominent feature, 7.5m wide and 0.5m deep, traced for 300m; the basal fill had early Bronze Age artefacts and a radiocarbon date c 2100 cal BC, so it is reasonable to infer that erosion of the hollow way occurred in the Neolithic. The site produced Neolithic structures and it is inferred that the hollow way was in existence from the Neolithic to the Iron Age and determined the orientation of some of the later prehistoric features. It was interpreted as a drove road leading to a river fording place. One suspects that the early origins for such features may often go unrecognised.

**Geological evidence for Neolithic mobility**

Physical evidence for routes is by no means the only way of looking at prehistoric mobility and there is thankfully a growing battery of scientific techniques which can contribute to this question. The most long-established is the technique of artefact sourcing of stone axes. Especially far travelled are the Jadeitite axes from the Alps which reached Britain, including an example ritually deposited below a plank of the Sweet Track 3807-6 BC (Chapter 6). The old hard rocks in western Britain were also the source of polished axes which were widely distributed. Thin-sections enable the identification of petrological groups, many of which can be attributed to specific outcrops, and in some of these places quarry traces, debris and roughouts from axe production have been found, as for instance, Group VI Langdale axes from the Lake District; and Group VII Graig Lwyd and Group XXI Mynydd Rhiw axes, both from north Wales.

The movement of rocks formed a key part of the most significant henges, particularly Stonehenge. The bluestones of Stonehenge are of spotted dolerite which has now been geochemically traced to specific outcrops in the Preseli hills of south-west Wales, a distance of 225km; other rocks of Welsh origin were also used (Williams-Thorpe *et al* 2006). Up to 80 Welsh rocks were moved, most weighing around 4 tonnes. How this was achieved remains a matter of speculation; probably a sledge and rollers and large numbers of people were involved. Generally it has been assumed that a large part of the journey was by sea, although experiments and Madagascan analogy suggested to Parker Pearson (2012) overland transport was more likely. Those parts of a journey by land would surely have involved careful preparation of the route, given the points made in Chapter 3 concerning the likely hummocky nature of the landscape before it was smoothed by millennia of agriculture. An equally impressive feat was the movement of the sarsen stones, the largest at Stonehenge weighing about 35 tonnes; they are thought to have come from the Marlborough Downs some 29km away. Huge sarsen blocks, 166 in all of up to 20 tonnes, were also transported the rather shorter distance c 3.5km down Greenstreet to Avebury henge (Gillings and Pollard 2016). Transported rocks also feature prominently in other great Neolithic monuments, including some very impressive examples in megalithic tombs. The greatest of all megalithic tombs, Knowth and New Grange in the Boyne Valley, Ireland, employed boulders brought from an offshore island on the coast some 75km away, and a huge quantity of small quartz boulders brought 60km from the Wicklow Mountains (Hensey 2015).

## Conclusions

We have considered mobility from the perspectives of skeletal and isotopic evidence and artefacts and geology; each implies greater mobility than is evident from the more enigmatic evidence of actual routeways. There are hints of these from the repeated and discontinuous activity preceding Neolithic tombs, the enigmatic cursus evidence and the more tangible evidence of henges and avenues. In lowland areas Neolithic routes may have been obliterated, or obscured, by subsequent arable agriculture, yet the question remains: why are Neolithic tracks so rare outside of ceremonial contexts and wetlands? A partial explanation may be that mobile pastoralists will not stick to rigidly defined routes along which grazing for animals would be rapidly depleted. Perhaps during this period we should think in terms of broad corridors of movement, which fits in with the evidence outlined for linear landscapes, for instance around Mount Pleasant. That concept gains strength in later chapters where extensive excavations of later prehistoric routeways have revealed Neolithic or early Bronze Age barrows, pits, postholes and activity areas clustered along roughly the same alignment, suggesting the possibility of much earlier origins. Examples illustrated by plans include the Yorkshire Wolds (Figure 8.6); Peacehaven (Figure 10.5), and Whitehorse Stone (Figure 10.11b). In some more open areas defined routes may not have existed and very broad corridors of movement will be more difficult to define, as for instance in the ethnohistorical case of the movement of Lapps with reindeer depicted in Figure 3.2d.

**Making Ones Way in the World**

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## Chapter 6: Wetland trackways and communication

### Introduction

The study of trackways in wetlands has, more than most aspects of archaeology, depended on the activities of a small band of pioneers working at different stages in the second half of the twentieth century: Hajo Hayen in Lower Saxony, Wil Casparie in the Netherlands, John and Bryony Coles in the Somerset Levels, UK and Barry Raftery in Ireland. A major expansion of wetland archaeology in the 1970s and 1980s is reflected in the publication of Coles and Coles 1989 and a succession of conferences, organised by the Wetland Archaeological Research Project which the Coles founded in 1986. Recently these pioneering studies have been followed by reviews of wetland archaeology by Van de Noort and O'Sullivan (2006), Menotti (2012), and Menotti and O'Sulllivan (2013). One of the primary arguments made in these recent reviews is that wetland archaeology should not be treated as a separate class of evidence but needs to be contextualised by consideration of its relationship with dry ground archaeology. It is also argued that wetland archaeology has a tendency to be descriptive and has favoured environmentally deterministic rather than cultural / social explanations. They suggest that the result has been limited engagement with archaeological theory; this contrast has been especially apparent in Britain and Ireland, where since the late 1980s social theory has been a much more dominant theme in prehistory than, for instance, in the German-speaking world (Menotti 2012).  The challenge is to demonstrate what may be achieved by the effective linking of both wetland and dryland perspectives by integrating wetland sites in theoretically-informed wider syntheses, a task just as much the responsibility of dryland as wetland archaeologists.

It might be anticipated that relating patterns of wetland and dry ground prehistoric activity would be relatively straightforward. However, as the critiques of Van de Noort and O'Sullivan (2006) and Menotti (2012) demonstrate this is something which has infrequently been achieved in practice. One problem is that the two types of environment present such contrasting forms of evidence. Frequently the wetlands have abundant evidence for particular activities such as trackways or fish traps, but there is very little known about settlement on the neighbouring dry ground. For instance, the wealth of trackways in the Mountdillon area of the Irish Midlands is seen in the context of very limited evidence for prehistoric dry ground sites (Raftery 1996). Where dry ground sites are present they may be just flint scatters disturbed by subsequent cultivation and containing little opportunity for dating or environmental analysis.

There are a surprisingly limited number of cases in which archaeologists have extrapolated from wetland tracks to make inferences about patterns of dryland movement or settlement locations. It has proved difficult to find continuations of wetland tracks on dry ground. Because of peat wastage the terminals of trackways are often poorly preserved and seldom investigated. Many wetland trackways are relatively ephemeral and short lived but often very well dated. Conversely some dry ground routes are clearly long lived but generally undated. The question is, however, have we really tried hard enough, and often enough, to make connections? The writer suspects not, furthermore suspecting that in certain cases, where there is clear evidence that wetland routes were in use for an extended period and continued onto dry ground, the significance and lessons of that relationship have been obscured by what may well be a false dichotomy between the functional properties of a routeway and its social and symbolic role demonstrated by the structured (eg ritual) deposition of artefacts. This case will be made with reference to the multiple post alignments / bridges of the late Bronze and Iron Age in Europe including the sites of Flag Fen, England and La Tène, Switzerland.

Wooden trackways in north-west Europe are mostly Neolithic to Iron Age, *c* 4700 cal BC to AD 500, a phenomenon of the peatlands in the Netherlands, North Germany, Denmark and the British Isles. By far the greatest number is in Ireland where there are an estimated 3500 of which 10% are dated (Brunning and McDermott 2013). The most substantial and longest trackways are in Lower Saxony and its border with the Netherlands where peat bogs once covered very extensive tracts between the rivers Elbe and Ems. In the eighteenth century AD one third of north-west Germany was peat covered and some 350 trackways are known.  Current knowledge suggests that long trackways are concentrated in north-west Europe, although shorter wooden routes approaching and around settlements are reported from various other parts of the world (Menotti 2012, 168). The distribution must reflect in part the distribution of peatlands where trackways were needed, the extent of peat cutting to reveal them, and also whether there has been archaeological monitoring leading to their discovery.

Wooden trackways display a considerable diversity of constructional techniques as Figure 6.1 shows. Some are simple discontinuous bundles of brushwood along the axis pegged in places at the edges (Figure 6.1i), others are corduroy (roundwood) or planks laid at right angles to the axis and held in place with pegs (Figure 6.1h). Some have a cradle-like construction of opposed diagonals to create a raised walkway of planks (Figure 6.1a) or brushwood (Figure 6.1f) over flooded areas. Some are made of woven hurdles (Figure 6.1b), others are of planks forming a range of types from simple pedestrian walkways (Figure 6.1 c-e), to very carefully constructed wide trackways in which considerable work has been invested and with quite complex forms of construction with multiple pegs, lateral timbers below (Figure 6.1j and k), and sometimes above, to help maintain a level surface for wheeled transport (Figure 6.1g). In many cases considerable woodland resources and communal effort must have been committed. There is no simple evolutionary sequence; the Sweet Track, although a pedestrian walkway, is both one of the most sophisticated in the UK and also the earliest. In Saxony there are substantial and wide examples suitable for wheeled vehicles in the later Neolithic, although those with the most carefully constructed level surfaces tend to be later Bronze Age and Iron Age, especially the eighth to sixth centuries cal BC (Menotti 2012, 166). The most sophisticated tracks tend to be the longest and of greatest duration but this is by no means invariably the case: the Sweet Track had a life of less than a decade (Coles and Brunning 2009) and other major trackways such as the Corlea road in Ireland have provided very limited evidence of use (Raftery 1996). The simplest brushwood track may only have been used for one season. There are only a few for which a century or more of use is indicated. Limited periods of use create limitations in trying to infer wider patterns of communication.

Wood trackways are of particular importance because they are so readily datable using radiocarbon, or dendrochronology, sometimes to the precise year, with all the possibilities that creates for correlation with other sites and environmental changes, Trackways stratified within peats provide independent evidence for the environment at the time of construction in the form of pollen, plant macrofossils, testate amoebae, insects, peat humification or isotopic composition.  In addition to wooden trackways there are also stone causeways in wetland and riverine contexts; examples have long been recognised in Denmark but short causeways are increasingly found in river valley contexts in Britain and Ireland where large scale excavations have exposed extensive tracts of floodplain. The more permanent character of these stone causeways means that some of them have proved of particular importance in establishing a connection between wetland and dry ground routes.

**Wheeled vehicles**

Wheeled transport would have been a huge advantage to past communities in moving bulk goods such as ore, wood and stone as well as in seasonal movements and military campaigns.  The use of the wheel depends on two things; first, knowledge of the technology of wheeled transport and secondly on a suitable landscape, or surface, for wheeled vehicles. Vehicles could have been drawn by people but would have been vastly more useful when draft animals were available. The wheel is first attested at about the same time *c* 3600 cal BC in the Near East (late Uruk period), in north west Europe (Funnel Beaker culture; Bakker *et al* 1999), the Ljubljana marshes, Slovenia (Gasser 2003) and the grass steppes of eastern Europe where many cart burials are known (Anthony 2007). By 3000 cal BC there are examples of wheels in north Germany, the north Alpine lake areas, Holland and Denmark (Fansa and Burmeister 2004) and apparent cart burials in Denmark (Johannsen and Laursen 2010). Of the 14 single piece disc wheels from peat bogs, all but one dates from a short period *c*. 2600-2500 cal BC (Fokkens 2005, 358). The wheel is represented in Egypt, India and China in the second millennium BC (Piggott 1983, 14). It was unknown in Africa south of the Sahara, south-east Asia and the Americas before historical contact. Wheeled vehicles are widely represented in the Bronze Age rock art of Europe in Norway and Sweden (Coles 2005), Val Camonica and Monte Bego in Italy, and on stelae in Iberia. Wheels are present on model carts of the Bronze Age of which the best known is the Trundholm sun wagon from a bog in Denmark dated *c* 1400 BC. Waggon graves are numerous in Urnfield and Hallstatt contexts (13-5$^{th}$ centuries BC) in central Europe north of the Alps (Pare 1992). In the British Isles evidence for wheels is more limited than in continental north-west Europe, and is apparently somewhat later. In Ireland there is part of a wheel from the Edercloon 45 trackway (1206-970 cal BC; Sands 2013) and an example from Blair Drummond, Scotland 1035 cal BC. There are also later Bronze Age examples from Flag Fen, Peterborough and Cottenham, Cambridgeshire (Pryor 2001) and two recent finds from a waterlogged settlement at Must Farm *c* 900-800 cal BC (Knight *et al* 2016).

The widespread evidence for various kinds of wheeled vehicles in Europe from *c* 3600 cal BC contrasts markedly with the very limited surviving evidence for roads on which they might have been used. In Germany and the Netherlands there is a clear association of wheel and other vehicle finds with wooden trackways (Figure 6.2; Both and Fansa 2011a), some of which are manifestly constructed to provide a level surface for wheeled transport. Such trackways often combine lateral planks overlying transverse runners and with a second layer of transverse runners above, mortised into vertical posts to maintain a level surface; a particularly sophisticated example is the IIIPr track in Lower Saxony (Figure 6.1g). Other trackways are thought to be for wheeled vehicles by virtue of their size, solidity and width, such as Corlea 1, Ireland (Figure 6.9). Beyond the north European wetlands, evidence for suitable routes is much more limited and tends to be found within excavated settlements. Wheeled vehicles could of course have been used in areas of open country such as the grass steppes of Eastern Europe, or the grazed grasslands established in western Europe as a result of agricultural activity (Behre 1988; 2008). However, in prehistory people moving around would have encountered much more uneven surfaces with hollows and gullies, boggy areas, the legacy of glaciation, solifluction, generations of tree throw, erosion, etc, which would have restricted the use of wheeled vehicles in many areas without the preparation of defined routeways. Where they have suitable surfaces, trackways in wetlands do at least provide us with some indication of the areas where wheeled vehicles may have been in use.

**Trackways dates**

Figure 6.2 illustrates the date distribution of trackways which are securely dated by radiocarbon or dendrochronology in north west Europe. Full details of sites and sources are given in Appendix 6.1. It has been compiled mainly using the data from Both and Fansa (2011a) for Germany; Casparie (1987) and van der Sanden (2002) for the Netherlands; Brunning (2007) for the UK; and for Ireland, Raftery (1996), supplemented by Moloney *et al* (1995), Brindley and Lanting (1998), Gowan *et al* (2005) and a data-base of dates compiled by Chapple (2016). Figure 6.2 is compiled in 250 year time slices; in the case of radiocarbon dates the mid-point of the calibrated range is taken. It should be emphasised that these are recorded trackways which will be a biased sample of those which once existed. Most have been found through peat digging. Later tracks are likely to have been cut away before archaeological recording began, and this may partly account for a paucity of tracks in the last two millennia. Some older trackways may still remain buried in peat. In order to avoid confusion in areas of Germany and the Netherlands where there are multiple trackways, in the following discussion they are numbered using a scheme developed by Hayen (1963), a Roman numeral number followed by 2 letters to designate the district.

**Mesolithic trackways?**

Movement through the landscape by hunter-gatherers has been discussed in Chapter 3 and the traces of their footprints in Chapter 4. This chapter concerns the physical construction and marking of routeways and here the evidence for Mesolithic trackways is perhaps surprisingly inconclusive. The most famous and intensively investigated British Mesolithic site at Star Carr, Yorkshire saw periodic lake edge occupation over some 800 years between 9300-8500 cal BC (Mellars and Dark 1988; Milner *et al* 2018). There were pit houses on dry ground and along the lake edge three distinct platforms of split timber made over about 175 years, each between 11 and 17m long. Two were roughly parallel with the shore and one at 45° to the shore. They were not interpreted as trackways, nor were they activity areas, but they seem to have been created to facilitate access to the lake shore where small discrete episodes of artefact deposition occurred between the timbers.

Lake edge platforms and settlement mounds are further attested on Irish sites such as Derragh on Lough Kinale (O'Sullivan 2007; Fredengren 2010). A possible Mesolithic track has been reported from Lullymore Bog, Ireland but its dating in the early sixth millennium BC cannot be regarded as secure (Brindley and Lanting 1998). Possible trackways of sand with some wood have been identified in the Federsee, southern Germany, leading to a small island with Mesolithic finds (Brindley and Lanting 1998). Mesolithic communities certainly had the capability to create trackways: the platforms noted, the evidence for wooden houses and fish traps and the quality of woodworking attested particularly from sites in Scandinavia makes that clear. However, given the abundance of Mesolithic discoveries in wetland contexts, particularly in Denmark and parts of northern Germany, it is striking that there do not seem to be any fully convincing examples of wooden trackways, which should perhaps lead us to question whether hunter-gatherers chose to mark their favoured routes in this way, just as, with a few exceptions (Chapter 3), they did not create the monuments which are such a distinctive feature of early farmers. It is tempting to see this in terms of the distinction which Ingold (1980) draws between the fluid and cooperative territoriality of hunter-gatherers as opposed to the tenure of land by agriculturalists. If so, the trackways of the latter might have as much to do with ownership as access.

## Neolithic trackways in mainland Europe

### ***Germany***

The earliest of the fully convincing wooden trackways is found in north Germany in the peatlands west of Lake Dummer at Campemour (XXXIPr) dated by radiocarbon to *c*4682 cal BC; dendrochronological evidence suggests it was in use for a century

(Both and Fansa 2011a). This is some 130km south of the North Sea coast, just beyond the loess lands occupied by the first Neolithic Linear Bandkeramik farmers. The trackway coincides with initial clearance and occurs at about the time of the earliest cereal cultivation and domestic livestock in the area (Hartz *et al* 2002). It is thus assumed to be Neolithic, although to its north hunter-gatherer communities persisted for up to 700 years later, so it may be unsafe to make assumptions about the economy of the people who built the Campemour trackway. That first trackway is quite substantial with a foundation of lateral runners and a surface of transverse corduroy roundwood between 2.5 and 5m wide. Two later Neolithic trackways are of particular note in having evidence of vehicles associated with them. A Meerhusener Moor trackway (XVLe) dated to *c* 2490 cal BC, was a substantial affair, 3.3m wide and 2.5km long; associated with fragments of six wheels, and other cart fragments, and there were many broken hooves of cattle between the track timbers demonstrating their somewhat hazardous employment as draft animals (Hayen 1987; Both and Fansa 2011a). The Grosse Moor north of Lake Dummer is crossed by a succession of prehistoric trackways including two Neolithic examples. One of these, VII (Pr), dated 2650 cal BC was of substantial corduroy construction, 2km long, 3.3m wide; part of an axle was also found here. It is very clear from these finds that in Germany wheeled vehicles were being used on these wooden tracks, presumably to transport bulk goods, from at least the later Neolithic, and probably from 3000 cal BC, when wheels are first found in peat bogs in the area. In the south German Federsee bog a wooden pathway was found within the Neolithic settlement of Seekirch Stockeiesen, dating to 3036-2894 cal BC, where disc wheels were also found (Schlichtherle and Strobel 1999).

### *Netherlands and Scandinavia*

In the Netherlands there is just one Neolithic trackway (XXI Bou) dated to 2610 cal BC; it is of transversely laid roundwood, 3m wide and 1km long. Casparie (1987) argues it was intended for wheeled transport and indeed a broken disc wheel was associated. It extends for 1km into the bog (see Fig 6.6) then ends, indicating that access to the bog rather than crossing it was the objective. By the time of its construction the dryland woods were already subject to localised clearance (Casparie 1982). A Neolithic track has also been found at Tibirke in the North of Zealand, Denmark dating to *c* 3000-2500 cal BC; it comprises a vertical stake-built causeway 3m wide, 150m long, which Schou Jørgensen (1988a) describes as suitable for waggons. It runs across what at the time was a tidal estuary to a settlement on an island. A wooden causeway was also associated with a large wood platform of Pitted Ware mid-Neolithic date at Alvastra, Sweden. This has been interpreted as a gathering place for votive activities as suggested by finds including human skulls, smashed battle axes and miniature axes but also numerous hearths and some evidence for agricultural activities (N. Hinders, pers comm).

## Neolithic Trackways in the British Isles

### *Somerset Levels*

The Sweet Track is the best known trackway in Britain (Coles and Coles 1986) and was once the earliest known trackway in the world; now predated by German examples. A recently discovered possible trackway at Belmarsh in London appears to be as early, maybe slightly earlier (3960-3710 cal BC) than the Sweet Track (Hart 2010). The Sweet Track (Figure 6.3) has the great benefit of precise dating by dendrochronology to 3807/6 BC and was preceded by the earlier, and fragmentary, Post Track dated 3838 BC (Hillam *et al* 1990). Repairs to the Sweet Track were made between 4 and 6 years after construction and it is thought that the trackway only lasted about a decade (Coles and Brunning 2009). The dates for the main Sweet Track are highly significant because the latest Bayesian modelling of radiocarbon dates suggests that the earliest Neolithic in western Britain is *c* 3800 cal BC (Whittle *et al* 2011). It is striking that trackways are present from the very beginning of the Neolithic in both Germany at Campemoor and in Britain. The Sweet Track also stands out by virtue of its length (1.8km) and the sophistication of its construction, which exceeds nearly all of the later British trackways. Construction involved a rail on the bog surface, stakes driven in at 45°from either side, a carefully fashioned plank with mortices laid in the V-formed and a peg through the mortice to hold the plank in place (Fig.6.1a) to create a raised single file pedestrian walkway.

Tree ring studies showed that the wood used for most of the trackway came from 400 year old mature oak woodland to the north, whilst that for the southern 200m was from secondary woodland 100-150 years old (Morgan 1988); the wood grew following clearance around 3950 BC, which might date or predate the arrival of farming in this area. Pollen evidence shows that the trackway was constructed at the time of the elm decline (see p 00), but there was evidence of woodland disturbance some decades before the trackway construction and some clearance herbs just after construction. Dung beetles suggest that parts of the wetland may have been grazed (Girling 1984; Thomas, J. 2013).

The Sweet Track is also exceptional in terms of the amount of associated material culture. This includes deliberate ritual deposition of many of the distinctive artefacts which we associate with the first farmers: 10-15 fine ware pots, leaf arrowheads and axes, as well as wooden tools. An axe of jadeitite had come from 1000km away in the high Alps (Pétrequin *et al* 2008) and was deposited below a trackway plank without ever being used; it was of a type produced between 6000-4000 cal BC and may have entered circulation before farming came to Britain (Parker Pearson 2012, 21). A flint axe beside the track apparently came from mines established at the very beginning of the Neolithic, 180km away on the South Downs. It appears that geological materials were moving around before the evidence for the first gathering places in the form of causewayed enclosures *c* 3700 cal BC (Whittle *et al* 2011). Such finds seem to underline the role of the trackway, not just in local communication, but in far more distant patterns of communication. Interpretation of the Sweet Track has tended to follow the fashions in archaeology. At first seen in largely functional terms, more recent writers have highlighted the social symbolism represented by the deposited artefacts without particularly focusing on the social significance of the act of communication itself (Bond 2004; van de Noort and O'Sullivan 2006). Bond (2004) styles it 'a place mediating culture and spirituality'. It might equally be interpreted as mediating people and nature or mediating between communities? Interestingly the Somerset Levels is not characterised by any great concentration of dryland early Neolithic activity. This could fit a model of relatively mobile communities for whom the creation and marking of connections, both local and long distance, was of special social significance.

In total there are 25 Neolithic trackways and platforms from the Somerset Levels and, as Figure 6.2 shows, this is a greater concentration than in the other key areas of trackway discoveries in Germany and Ireland. The main period of trackway construction 3600-3000 cal BC is marked by increasing clearance, demonstrating a connection between use of the wetland and agricultural activity on the islands and bedrock ridges within the Levels (Coles and Coles 1998). The trackways include substantial laid roundwood tracks such as the Abbot's Way, 2.2km long and dated *c* 2500 cal BC, and the woven hurdle trackways at Walton Heath and Rowlands, dated *c* 2800 cal BC, and made of coppiced hazel wood demonstrating woodland management.

***Other British Sites***

Elsewhere in the British Isles there are a number of wooden structures which are apparently trackways in the intertidal zone at Wooton-Quarr, Isle of Wight (Tomalin *et al* 2012). These are notable in running at right angles to the shore and thus apparently providing communication across the transition from freshwater wetland to saltmarsh. Neolithic trackways are also reported from the Thames Estuary with the already noted very early example at Belmarsh and a brushwood and roundwood trackway at Ebbsfleet (Bates and Stafford 2013). A corduroy track on Hatfield Moors, Yorkshire is dated 2950-2500 cal BC (Chapman and Gearey 2006). It ended in a small platform out in the bog and certain features of its plan suggested to the excavators that it may have had a ceremonial role. Eight Neolithic trackways are reported from the peatlands of Ireland, but this is a small number compared to those of the Bronze Age. Of particular note is a 400m long track at Cloonbony, Shannon, dated 2500BC; at one end it forks into two lines, which has been interpreted as suggesting a route leading to two distinct settlements (Raftery 1990).

**Bronze Age and Iron Age trackways in Northern Europe**

***Germany***

In Lower Saxony there are 15 trackways dated to the Bronze Age, with numbers peaking at the end of the early Bronze Age (Figure 6.2; Both and Fansa 2011a). This is largely accounted for by a great concentration of trackways on Ipwegermoor, just north of Oldenburg, where there are over 30 trackways, 11 dated and with the main concentration between 1770 and 1350 cal BC. These are essentially pedestrian walkways of brushwood, corduroy and planks (Hayen 1963; Both and Fansa 2011b). To the north at Jethauser Moor (XXXVIIp) a much more substantial trackway is dendrochronologically dated to 1358 BC. It comprises broad oak planks notched and fastened between rows of posts and carefully constructed lateral timbers to maintain a level surface. Hayen (1987) is of the view that such trackways were for faster, more sophisticated vehicles with spoked wheels and a pivoting front axle to facilitate steering. A late Bronze Age trackway (XPr) dated 790 cal BC in the Grosse Moor is associated with a wheel, though not spoked (Both and Fansa 2011b, 183).

In the Iron Age and Roman Iron Age there are 18 well-dated trackways in Germany. Ten of these are more than 2km long and one (XII Ip) is 6.4km long. It is dendrochronologically dated to 754 BC. It is a particularly sophisticated trackway of substantial planks held level with lateral timbers and its clear suitability for wheeled vehicles is underlined by a wheel find. There are six of these particularly sophisticated trackways, three dated to the 8$^{th}$ century BC. A later example is on Wittemoor (XLII Ip), dendrochronologically dated 135 BC. This trackway seems to have been particularly associated with the transport of bog iron from a dryland settlement to a navigable river, but was abandoned soon after construction. It is especially well known for two large carved wooden objects which are interpreted as highly stylised male and female human figures; they were placed in an area where there was also evidence for fires, apparently marking a particularly treacherous part of the route (Figure 6.1k; Coles and Coles 1989).  That trackway encapsulates two key themes: the use of trackways as a means of practical communication, and as places of special ritual and symbolic importance. The same point is made by the wheels. Altogether seven of the dated trackways have associated wheels or axles and they are mainly associated with the more sophisticated, or substantially constructed, trackways which were clearly intended for wheeled transport.

In the southern German peat bog of Federsee (Schlichtherle and Strobel 1999; Heumüller 2000), a major track at Bad Buchau comprised three successive plank-built walkways, the first made in 1505 BC, the others made over a period of 170 years. They connected the dryland to a gravel ridge in the bog. Another track, dendrochronologically dated 1767-1481 BC, led from the entrance of the palisaded settlement at Sielung Forschier and a further example is dated dendrochronologically to the early Iron Age, 721-621 BC.

***Scandinavia***

This area has much less evidence of trackways. In Norway a single prehistoric example at Båsmyr, in Vestfold dated from 500-800 BC crosses a shallow coastal sound at high water (Smedstad 2001). From about 900 AD there are more trackways near the coast of central Norway and many of these are on ‘natural’ communication routes. Short paved causeways across wetlands are also found in southern Sweden in the Bronze Age and Iron Age (Westerdahl 2006). Denmark has an early Bronze Age track at Speghhoje (Schou Jørgensen 1988b) and a wooden trackway at Tibirke

(Kunwald 1984; Schou Jørgensen 1988 a and b) overlying an earlier Neolithic track; this is in turn overlain by a paved road of 200 BC, thus demonstrating the longevity of routes in key topographic locations. The emergence of stone paved causeways in Denmark from the late Bronze Age is of special interest, the more so because some are associated with settlements, fields etc. At Borremose, Jutland a substantial stone causeway leads across a bog to a small island with a defended Iron Age settlement of rectangular houses comprising living accommodation and byres for animals (Figure 6.4; Martens 1990). The settlement has every appearance of an agricultural village but the discovery of four bog bodies, one strangled with a rope, highlights the recurrent association of everyday activities and ritual behaviour in wetland contexts. The point is further highlighted just 4km north of Borremose; in a small bog at Gundestrup was a great bronze cauldron, which is one of the greatest art works of the European Iron Age; it is decorated with strange animals, warriors and scenes of sacrifice, and wheels (Klindt-Jensen 1979).

At Broskov, in southern Zeeland, Denmark successive stone trackways, some 60m long, cross the narrowest point in a bog valley (Figure 6.5; Kunwald 1962). The first is dated to the Danish Iron Age, *c* 300 AD, and comprises flat stones with larger stones forming an edge. This was succeeded by a later trackway of smaller stones in the twelfth century AD. Thus, the route had a duration of around 1000 years. What makes this site of special note is that hollow ways converge from the neighbouring slopes on the trackway at its ends. To the north is a series of three distinct hollow ways, 4-14m wide, some sunken up to 4m. The hollow ways partly delimit fields, represented by lynchets of the type which Nielsen (2010) has shown formed from the late Bronze Age to the Roman Iron Age, in landscapes first intensively cleared in the middle Bronze Age (Rasmussen 2010). Also of note is a prominent stone with many cup marks at the southern end of the road (Figure 6.5); such stones are shown by Nielsen (2010) to be particularly found in wet places at the edges of fields, highlighting the symbolic, as well as functional, aspects of these routes.

***Netherlands, Bourtranger Moor***

Key themes which have emerged in Denmark in terms of ritual associations and dryland connections can be further explored in the context of evidence from the Netherlands. The vast Bourtranger Moor on the border between the Netherlands and Germany is some 13km across and here most of the known Dutch trackways are located (Figure 6.6). This area is one of the few where direct connections between dryland and wetland archaeology can be made, likewise between categories of the wetland evidence, such as trackways and ritual deposition, which, even in this area, have generally being discussed separately. The tracks lead across the moor from the Hondsrug sand ridge, which in prehistory was surrounded to east, west and south by bog and riverine sediments; here a seemingly complete prehistoric settlement pattern has been reconstructed. There are clear indications from alignments of barrows etc for a main communication route down the axis of the Hondsrug ridge (discussed in Chapter 7). Discrete areas of 'Celtic fields' have been mapped from the air (Brongers 1976, plates 23 and 25); there are farmsteads, each associated with one, or sometimes two, successive urnfield cemeteries enabling the approximate territories of each grouping to be defined (Louwe Kooijmans 2005).

The vegetation history of Bourtranger Moor has been established by a series of pollen diagrams linked to trackway investigations, coupled with analysis of peat stratigraphy and the wood used for trackways (Casparie 1982; 1984; 1986). By the time trackways were constructed in the middle Bronze Age, *c* 1300 cal BC, the dryland of the Hondsrug was substantially deforested, settled and used for agriculture as the distribution of prehistoric sites and fields shows (Figure 6.6). Woodland was quite limited and the construction of trackways would have represented a very considerable investment, both of woodland resources and social capital. This highlights the importance which would have attached to trackway construction. Six are known, covering 2000 years, and several seem to have been short lived. XV Bou may have been dismantled soon after construction because of a bog burst. The trackways lead east from the sand ridge, one, already noted (XXI Bou), is Neolithic, the others are Bronze and Iron Age in date, thus broadly contemporary with the sand ridge landscape. It is tempting to see each trackway as providing access to the bog for individual settlement territories, thus implying the extension of territories out into the bog. However, the trackways are by no means all contemporary and most of them seem to have had a short life before they were engulfed by peat. Casparie (1987) argues that several of the trackways went part way onto the moor because they provided access to areas rich in bog iron. Interestingly one of these (XVII Bou) is middle Bronze Age in date (*c*1410 cal BC) which may indicate precocious local iron working, as seemingly confirmed by the discovery of an iron pin on the trackway surface (Casparie 2005).

There is another side to this bog, however, which belies any purely functionalist explanation for the trackways, whether in terms of communication, or bog iron winning. This is the evidence for ritual deposition in the wetland. On the peat at Barger-Oosterveld is a cult site, a ring of boulders surrounding a four post structure with horned lintels, dating to the middle Bronze Age (van den Broeke 2005). In the surrounding bog, although not closely associated with the cult site, were a wide range of objects which had apparently been ritually deposited in the peat (Figure 6.6b). These include bog bodies, some close to a trackway (XV Bou) dated 690 cal BC. Other deposited items include bronze weapons, wooden artefacts, bracelets, beads, 2 wheels and pottery. The Valtherbrug trackway (I Bou) is particularly substantially constructed of transverse planks and roundwood on a substructure of longitudinal roundwood; its construction required 60,000 logs from 10,000 trees (Casparie 1987). It crosses the moor for a distance of 12km and is 2-3m wide. There are a wide range of dates between 390 BC and AD 112 suggesting the track may comprise more than a single structure. It is thought to be associated with the ritual deposition of bog bodies, parts of carts and querns in the bog (van der Sanden 2002). It seems that the wetlands were of special significance for ritual purposes, and the trackways may therefore have provided processional routes for these purposes, although it should be noted that many of the deposited artefacts suggest small-scale domestic acts rather than major ceremonies, a theme to which we will return later in the case of Flag Fen (p00).

Also notable among the Dutch trackways are two at Smilde (I and II Sm), near Assen. The wooden trackways of *c* 220 cal BC cross two narrow bog depressions (280 and 170m wide) but they also form part of what Casparie (1987) identifies as an 11km long routeway along sand ridges. At the end of the wooden trackway it continued as a sand route and the mottled sand surface shown in Casparie's photographs (1987, fig 24) looks as if it may be created by cattle footprints.

**Bronze Age and Iron Age trackways in the British Isles**

***Case Study: Somerset Levels***

In the Somerset Levels there are thirteen trackways of Bronze Age date, three in the early Bronze Age and ten in the middle and late Bronze Age from 1400-800 cal BC. These principally traverse the area between the Polden Hills and the bedrock and sandy islands, especially Meare and Westhay, to the north (Figure 6.7). Coles and Coles (1986) made the highly significant observation that Bronze Age trackways north of the Polden Hills converged on points which they suggested represented the locations of Bronze Age wetland edge settlements spaced at intervals of *c* 1.2km. The most sophisticated and substantial is the 2.5km long Meare Heath Track, made of oak planks laid on transverse sleepers held in place by vertical stakes through mortices (Figure 6.1c; Coles and Orme 1978a; Coles and Coles 1986), this is dendrochronologically dated 1530-1503 BC (Brunning 2013,68). It is one of a group of trackways converging on the same point and spanning most of the Bronze Age from *c* 1790-830 cal BC. It is difficult to escape the conclusion that there must have been a dryland track upslope. The Shapwick project revealed traces of Bronze Age settlement along the north edge of the Polden ridge and it was further hypothesised by Aston and Gerrard (2013) that coaxial field systems (see p 00) at Shapwick may have their origins in the later Bronze Age. The longevity of one boundary was demonstrated by a later Bronze Age ditch on the same alignment as Roman and later boundaries and a modern hedge. If elements of the field layout originated in the Bronze Age then the same may be true of routeways. This is not to imply continuity of the Meare Heath track route, which would surely have left greater traces in the wetland. What it could mean is that existing routes on dryland imposed a structure on wetland during those episodes when particular routes were passable, or socially important. This is no more than a hypothesis sketched to illustrate the type of field investigation necessary in order to establish links, or the lack of links, between dryland and wetland routes. Techniques for dating routeways within field systems are explored in Chapters 8 and 10.

The Tinney's Trackway complex is another of these radiating groupings, in this case of multiple successive, mainly brushwood, trackways, perhaps at times replaced almost annually (Coles and Coles 1986). One was reinforced with oak planks dendrochronologically dated 1703-1478 BC (Brunning 2013, 68), others are later, *c*1400-1000 cal BC. They radiate from a point north of the Sharpham Peninsula where it is probable that a settlement was located: pollen shows quite intensive clearance and cultivation, with dung beetles indicating grazing animals. Drawing on environmental evidence from the wetland it has also been possible to infer locations of settlements on the dry islands to the north (Coles 1989), including Meare island where there was clearance at the time of the Meare Heath Track and this continued well after (Beckett 1978). The Somerset Levels is an area where, drawing on a combination of trackway orientations, spatial evidence from multiple palaeoenvironmental studies, and retrogressive map analysis as part of the multi-period Shapwick Survey, we may be beginning to approach an understanding of a complete landscape, wetland with dryland, and how communication routes through it *may* have developed through time.

***Case Study: Severn Estuary***

Just to the north of the Somerset Levels, prehistoric peats and associated archaeological sites are extensively exposed in the intertidal zone of the Severn

Estuary. Mesolithic and later footprint-tracks from the same area were discussed in Chapter 4. Twenty-nine years of monitoring sites revealed by erosion has led to the identification of two settlement sites of rectangular buildings at Redwick and Goldcliff, the first middle Bronze Age, *c* 1500-1000 cal BC, the second Iron Age c 400-100 cal BC (Bell *et al* 2000; Bell 2013). The occupation evidence is at the interface between peat and overlying estuarine sediments showing that on both sites activity occurred in the early stages of marine transgressions. These sites are interpreted as seasonal settlements, mainly used in spring and summer for animal husbandry on saltmarsh. One of the strands of evidence supporting this hypothesis is the animal footprints (Figure 4.15). Peat surfaces which were inundated by the transgressions are covered by a pattern of curvilinear depressions, just a few metres across, which drained the saltmarsh. Many of these channels have traces of short, very simple trackways; a few bundles of brushwood were laid across the channel and held in place at the edges with pegs; generally only a few pegs and a little brushwood remained. Rather more substantial tracks crossed a few larger palaeochannels. The Bronze Age trackways are generally parallel to the shoreline suggesting that this was the primary axis of movement during spring tidal periods of maximum tidal inundation. This suggests movement from settlements to river and stream channels where evidence has been found for fish traps. Similar patterns of trackways parallel to the shore and crossing channels have been noted by Van de Noort (2004) in the Humber Estuary, eg at Melton during the Bronze Age.

At the Iron Age seasonal settlement at Goldcliff there is rather more to go on in detecting patterns of local movement. Eighteen trackways (shown in Figure 6.8d) have been exposed by erosion on the foreshore. All are pedestrian walkways but they are of a wide range of types: some simple brushwood; some brushwood with the edges held in place by pegged round wood (Figure 6.8a); some V-shaped formed of opposed diagonal stakes with brushwood and planks between; some roundwood and planks with pegs (Figure 6.8b-c). The differences may partly reflect the different environments in which they were made: reedswamp, fen woodland and raised bog. One trackway (1108) is dendrochronologically dated 336-318 BC; other radiocarbon dated examples are between 500 cal BC and 100 cal AD. Trackway 1130 (Figure 6.8b) could be traced for 100m across the foreshore. Some trackways converged; Trackway 1108 led directly to excavated Building 4, while discontinuous brushwood Trackway 1311 led between Buildings 6 and 8. Since some of the tracks lead to, and between, buildings, it can be argued that they link activity areas and thus provide clues to patterns of habitual movement. On Figure 6.8d the lines of the trackways have been projected. This is a speculative exercise, as not all trackways will be straight as Figure 6.9a shows, but many are, and the exercise has possible predictive value. Several trackways converge on three locations to the north, perhaps the locations of still buried buildings or activity areas. Three trackways converge to the south, perhaps the location of some activity now lost to erosion. What is striking is that many of the trackways are not aligned east-west to the bedrock island of Goldcliff, where incidentally no evidence of Iron Age activity has been found. The orientation of communications is more north-south and that suggests perhaps the importance of channels for boat communication and other estuarine resources such as fish traps.

***Thames Estuary***

From the Thames Estuary east of London there is also growing evidence for trackways, mostly found in development led excavations. They span the period from the late third millennium to the late second millennium cal BC with a peak *c* 1500 cal BC (Stafford *et al* 2012). One example at Hayes Storage Depot was a 4m wide track of gravel, flint and sand with evidence of animal trample (Bates and Stafford 2013). The trackways were made at a time when the palaeoenvironmental evidence points to intensified land use on the neighbouring dry ground with creation of extensive coaxial field systems, some with droveways leading towards in the river (Yates 2007). The East London trackways are comparably situated, running from the edge of gravel river terraces onto the floodplain wetland and are thought to be associated with seasonal grazing of animals on the floodplain (Meddens 1996; Meddens and Sidell 1995).

**Later Prehistoric trackways in Ireland**

In the Midlands of Ireland, where peat bogs cover such a large area that, even today, they are extensively milled as fuel for power stations, trackway finds are more numerous than anywhere else. Archaeologists did not take much notice of them until the discovery in 1984 of the most impressive example at Corlea led to the instigation by Professor Barry Raftery of a programme of wetland research which has transformed understanding. Some 97 of the trackways have now been scientifically dated (Figure 6.2). A few, as noted above, are Neolithic but the vast majority (73%), are Bronze Age; there is a very marked dropping off in the Iron Age (except in the Derryville area; Cross *et al* 2001) and none from 0-500 cal AD (Raftery 1996, plate 51). Even allowing for the probability that earlier trackways may still be buried, and later examples are more likely to have been milled away, this suggests a particular focus on bog-related activities during the middle and late Bronze Age (Figure 6.2). The trackways are of a great diversity of types: most are of simple brushwood, often short lengths designed to get across a particularly wet patch, others are much more substantial, providing a defined path across extensive bogs. Some areas, such as the Mountdillon Bogs, Derryville and Edercloon, have produced great concentrations of trackways. At Edercloon 45 individual structures, including 26 trackways and several platforms, have been recorded. Some tracks were repeatedly rebuilt and used throughout the Bronze and Iron Ages. They were not orientated to cross the bog but apparently provided access to the wetland for activities (Brunning and McDermott 2013). Of the Edercloon tracks no 5 is dated 1206-970 BC and was associated with a range of wooden artefacts apparently deliberately deposited in the foundations (Sands 2013). The objects included a disc wheel, which was unfinished and deposited as part of a trackway wholly unsuitable for wheeled transport (Brunning and McDermott 2013).

Corlea 6 was a 750m long construction of split timber on roundwood laterals and brushwood, dated by dendrochronology to 2259+/-9BC. It is of particular note because the timbers were worked with a metal axe, providing a secure date for early metal use in Ireland. This highlights the significance of trackways in wider material cultural studies, as well perhaps as hinting at the high status association of the more substantial structures from the earliest Bronze Age (Raftery 1996). Some other more substantial trackways are of the late Bronze Age and comprise mortised oak planks and split timber as at Derroghill 1, a 650m track dendrochronologically dated 938±9BC, and Annaghcorrib, Galway, a 1.5km route from dryland to the River Suck dendrochronologically dated 892±9 BC. Very extensive excavation of bog and bog margins was occasioned by the construction of a mine at Lisheen (Gowan *et al* 2005) leading to the discovery of 34 trackways and two stone causeways dating between the early Bronze Age and Iron Age. Only two of the trackways crossed the bog completely: Killoran 18 of stone and wood dated dendrochronologically to 1400±9BC, and Cooleeny 31, a substantial and well-constructed route destroyed by a bog burst in 600-595 cal BC, perhaps as a result of drainage being blocked by track construction (Casparie 2001). This track is thought to have connected high status regional sites. The other tracks were short lengths in what was described as a vernacular tradition. They were mostly located in areas of settlement and *fulachtafiadh* (cooking places) on the bog edge. Repeated use of the same sites was considered to be because they lay at the end of dryland routes, some of which were continued into the bog by short tracks. The middle Bronze Age period of most intensive trackway construction equates with a period, between 1550 and 1350 cal BC, when greater activity is attested by pollen analysis. However, the Bronze Age clearances are small, evidence for agriculture limited and the economy was mainly pastoral. Some trackway construction also took place at times when woodland was regenerating and there is little other evidence of activity (Caseldine *et al* 1996).

Of particular significance among the Irish trackways is Corlea 1 (Figure 6.9), the discovery of which in 1984 sparked the subsequent campaigns of wetland research. It is a road so impressive and out of scale with the other Irish examples, that it has been dubbed by its excavator 'the colossus of roads' (Raftery 1996). Corlea 1 runs for 1km from uplands to a small island and it is clearly part of a longer routeway since the contemporary Derraghan 1 trackway, extends west of the island.

Altogether they form a route of 4.7km (Figure 6.9b). Corlea 1 is dendrochronologically dated 147/148 BC. It is built of large oak planks and split logs on lateral runners pegged in place through mortices (Figure 6.1j). The scale of the trackway made Raftery confident that it was built for wheeled transport, although careful examination produced no evidence of wear, leading some to question, on the basis of areas of disrupted timber, whether it had ever been completed and used, though in places repairs were made as a pedestrian walkway (Raftery 1999). The heavy timbers mean that its life would have been limited as Casparie and Moloney (1996) have estimated that it would have sunk into the bog within a decade. Construction of the Corlea trackway is very close in time to that of other major constructions in Ireland (Raftery 1996, 420), such as a dendrochronological date for part of a defensive earthwork, The Dorsey (150BC), and other radiocarbon dated linear earthworks are of similar date. A huge building at the Navan Fort is dendrochronologically dated a little later to 95BC. It appears therefore that Corlea coincides with a period of great communal works in Ireland.  Its surrounding area contains few Iron Age sites and finds suggesting, as does the scale of the trackway, that it has more to do with regional communication than local exploitation. Raftery (1990) has made the fascinating suggestion that the trackway may have been part of a longer route connecting two ceremonial foci, Ulsneach 22km to the south east and Cruachain  35km to the north west,  via the major historical fording point at Lanesborough at the head of Lough Ree (Figure 6.9b).

**Bridges, post alignments and associated ritual deposits**

This brings us to a group of sites of later Bronze Age and Iron Age date which are arguably central to the theme of movement but for which current interpretations generally emphasise associated ritual deposits of artefacts, particularly weapons, in wetland contexts (Bradley 2016). The question is whether these two aspects of communication and ritual are really so separate. The issue is especially highlighted by the site of La Tène, Switzerland where the artefact assemblage was so spectacular that the site gave its name to the later Iron Age culture in Europe. Interpretation is made more difficult by the fact that the main finds were in the second half of the nineteenth and first two decades of the twentieth century (Servais 2007). Finds came to light when drainage works and lake level changes revealed at least two separate alignments of large timber piles crossing a former river channel at the north end of Lake Neuchatel. Between the two was a substantial deposit representing many episodes of metalwork deposition, mostly weapons (swords, shields, spears, tools) with human skeletons. Dendrochronological dating indicates construction of one alignment 278±6 BC and with a continuance of activity in the area to 65 BC (De Navarro 1972). The most economical interpretation is that it represents a crossing point utilised by successive bridges where ritual deposition took place. Pryor (2001, 434), in the context of discussion about Flag Fen in the UK, highlights the ritual deposition role. He questions whether the alignments were functional bridges rather than ritual demarcations.  But are these two roles incompatible, or have we privileged one aspect of social communication, ritual deposition, over another, the physical act of movement, in ways which may have made us play down some of the best evidence for axes of movement in later prehistory?

In the UK the adjacent Flag Fen and Fengate sites pose similar questions. The sites were the subject of an outstanding campaign of excavation and research led by Francis Pryor over a period of forty years (Pryor 1998a; 2001). This site complex is central to the theme of this book, particularly in terms of the relationship between fields and trackways as developed in Chapter 8. At Flag Fen the connection between dry and wetland sites is very clear (Figure 6.10a) but there remain questions of interpretation. The dry ground of Fengate comprises a series of prehistoric settlement areas set within a system of coaxial fields established *c* 1800 cal BC and abandoned about 1000 cal BC. Through the fields run five parallel drove roads which lead down to a wetland embayment. One of those droveways leads to an alignment of multiple posts (Flag Fen) which runs for 1.2km across the wetland with a timber platform part way along the alignment. At the east end of the alignment at Northey there is crop mark evidence of other, more fragmentary, fields. The hypothesis is that the Fengate fields served a largely pastoral function, with animals being driven down the droveways to pasture on the wetland during the summer. Cattle footprints were found at the end of the drove by the post alignment (Pryor 1998a, fig 46). The post alignment was made at a time of marine transgression and was at about the tidal limit. It is dendrochronologically dated between 1300-924 BC. Near its west end the ritual deposition of 275 metal artefacts took place, including weaponry, many broken, axes, as well as smaller items brooches, pins and rings. Finds included part of a wheel and axle (Pryor 2001). The artefacts are largely late Bronze Age but there are also items deposited in the Iron Age (Pryor and Bamforth 2010), including some well after the post alignments would have decayed. Careful excavation and recording of the artefacts indicated that they were not sacrificed in large-scale ceremonies but in small, sometimes domestic scale, acts of deposition (Pryor 2001). The post alignment comprises five rows of posts and five levels of horizontal wood. Interpretation of the structure has ranged from a symbolic barrier against marine transgression, to successive post alignments mainly related to ritual acts of deposition. The final report (Pryor 2001) makes it clear that during at least some phases of its development a trackway formed part of the structure, initially of laid roundwood and later planks or other wood laid along the axis. The fact that a clear droveway leads to the alignment surely suggests that it is primarily a trackway/ bridge where the ritual deposition of artefacts also took place. It is thus perhaps our clearest physical demonstration of direct wetland and dry ground relationships in later prehistory. The significance of this place as a crossing place is further emphasised by the fact that a similar route was taken by the only Roman road to cross the Fenland, the Fen Causeway (Pryor 2001).

Close to Flag Fen (2.4km south; Figure 6.10b), and very close in date to the construction of that post alignment, is another alignment recently excavated at Must Farm (Gibson *et al* 2016; Knight *et al* 2016). It was a simpler structure, a raised 2m wide walkway supported on large squared paired posts and incorporating some large planks (Figure 6.11). It is dated 1290-1250 cal BC and crossed a palaeochannel. Earlier footprint-tracks indicate that the causeway may have formalised an existing path. The causeway is interpreted as part of a routeway across the Fens, part of what, with Flag Fen, seems to be an emerging network linking dryland areas within the wetland. As at Flag Fen there was deposition of metalwork nearby in the river channel, mainly weapons (spearheads, a dirk, rapier) and pins. After the causeway had gone out of use the routeway to which it was connected may have determined the location of a settlement on the same site. This comprised five roundhouses dated *c* 900-800 cal BC destroyed by fire very soon after construction; the complete organic and inorganic artefact inventory of this Bronze Age community, including two wheels, was preserved in the waterlogged sediments of the channel.

Other possible Fenland trackways or causeways are associated with approaches to the Isle of Ely, one to its south-east at Stuntney, the other to its south at Barway dated 530 cal BC and Bronze Age artefacts are reported near both (Godwin 1978; Hall and Coles 1994, 84). Excavated droveways on dry islands are also thought to approach causeways and areas of metalwork deposition (Evans 2002). This Ely evidence has echoes of Flag Fen but the similarities with the latter are particularly strong in the case of Fiskerton, in the Witham Valley of Lincolnshire where, since the eighteenth century, metalwork and 19 log boats have been found during river canalisation, the finds covering a long period from the Bronze Age to medieval period (Field and Parker Pearson 2003). The main concentrations of metalwork correspond to river crossing places still in use in historic times. At Fiskerton a double row of 195 large posts was erected, with limestone metalling between; dendrochronology showed that this took place in 10 episodes over a period of 150 years between 457 and after 321 BC. The structure crossed what at the time was a reed swamp. It was associated with deposition of metalwork: swords, spears, and axes as well as pottery, amber, jet objects and fragments of human bone. Some 250 years later in the Roman period this was the site of a causeway, that too being associated with artefact deposition: bronze bowls, a bracelet and pottery. There are also medieval causeways in the area (van de Noort and O'Sullivan 2006). The published monograph concludes that it is uncertain as to whether the site is entirely ceremonial, or served as a crossing point or jetty (Field and Parker Pearson 2003).

Despite its being 467 years later than the latest date of the Flag Fen alignment, the similarities are striking even to the extent of the same route being followed by Roman causeways in both cases; this raises some interesting issues about the extent to which Roman roads formalised existing routes, a point developed by examples in Chapter 8.

Causeways or bridge-type structures also occur more widely. On the south coast of England at Shinewater on the Willingdon Levels, Sussex a substantial trackway was recorded, with three rows of vertical posts and horizontal beams and rails (Greatorex 2003; Jennings *et al* 2003). The inclusion of sand and fine gravel along the alignment might be part of the construction, but might perhaps relate to trample by animals. It crossed a freshwater fen with saltmarsh to seaward. Along the trackway was a wooden platform on which hearths and evidence of cereal processing may indicate occupation. Here again ritual deposition is indicated by axes, a bracelet, a sickle, amber beads and human bone. Shinewater, which is dated 900-800 cal BC, may represent a route from the Bronze Age agricultural landscape of the chalk in the south west to the seasonal wetland pastures of the Willingdon and Pevensey Levels. Also on the south coast, inland of the Solent in the Test Valley, excavations have found lines of posts and planks representing 3 bridges dating between 1700 and 1400 cal BC; one is associated with a fragment of boat cleat and there is also a middle Bronze Age rapier from the site (Fitzpatrick *et al* 1996; Van de Noort 2011).

In the Severn Estuary/ Somerset Levels region there are three further sites which invite comparison with those under discussion. Of these the most fully investigated is at Caldicot, south Wales where palaeochannels contain a series of Bronze Age structures and stone scatters (Nayling and Caseldine 1997). Most notable is a double line of large posts, dendrochronologically dated 990-989 BC, crossing a river channel at about the limit of tidal influence. Artefact deposition is indicated by two sword chapes, a tin strip, pottery and wooden objects. In the Somerset Levels are two similar structures built at much the same date. At Greylake there are earlier reports of alignments of posts at a natural crossing point between two projecting areas of dry ground. This may be associated with recent finds of oak posts, dated dendrochronologically 963-952 BC, found with bones of humans and animals and a broken axe (Brunning 1997; 2013). The structure crossed a freshwater fen. Horizontal planks and some cut roundwood was found but the small excavation did not produce clear evidence of a superstructure and Brunning argued that it may have related to ritual deposition and demarcation rather than communications. Also on the Somerset Levels at Harter's Hill (Figure 6.12) two parallel rows comprising at least 34 large posts, associated with plank fragments and cut roundwood, run from the hill slope out into Queen's Sedgemoor (Brunning 2013). The earliest pile is dendrochronologically dated to 1076-5 BC and the structure was in use for at least 30 years. Conditions were getting wetter at the time and previous alder woodland had been replaced by sedge swamp and shallow open water. The previous discovery of a bronze sword from the same field is likely to be associated. Although the sword and the substantial posts of the alignment shows similarities with the others discussed in this section it must be acknowledged that unlike the others it is not positioned at a natural crossing point but heads more or less to the middle of the Moor.

In the Thames valley there are a number of finds of post alignments which appear to be bridges or jetties (Stafford *et al* 2012). Beside the modern Vauxhall Bridge, London 25 oak posts occur in two parallel rows dated to 1750-1285 cal BC and were at about the tidal limit at the time (Cohen and Wragg 2017). Pottery and spear heads have come from the area. Another probable bridge at Freemasons Road is dated c 1600-1750 cal BC. At Ebbsfleet in the Lower Thames (Figure 6.13) a double post alignment may represent a walkway or bridge dated 1410-1220 cal BC; this is particularly significant because a continuation of this route seems to be indicated by small brushwood tracks, clusters of pits and barrows. This hypothetical route is not across the wetland but along the edge of the Ebbsfleet Valley which at the time was saltmarsh (Bates and Stafford 2013, fig 86). Upstream on the Thames at Eton Rowing Lake a succession of six later Bronze Age and Iron Age bridges were constructed across river channels. They were made with roundwood uprights and mortised planks (Lambrick and Robinson 2009). They form part of a Bronze Age landscape of pasture, settlements and fields which has been extensively excavated. Gravel and limestone causeways across the flood plain have been found at Thrupp, Abingdon dated to the middle Iron Age and at Yarnton where stone for the causeway (Figure 6.14) was transported from 4km away. Metalwork finds suggest this had been a significant crossing point from the late Bronze Age and wheel ruts are reported from the causeway. Lambrick and Robinson (2009) observe that there is little evidence as to how the bridges, trackways, causeways etc found in riverine contexts in the Thames valley link to wider dry ground routes. It is clearly a task for the future to extrapolate beyond the clues provided in riverine contexts.

Bronze and Iron Age metalwork was found in the Thames during dredging, including many finds from the Eton area and further downstream in London. It seems probable that some of this deposition took place from the bridges / post alignments which are increasingly being found along the Thames. The possibility should also be considered that what appear, to this writer at least, as bridges or causeways may also have served as territorial boundaries or barriers to upriver movement, or they may have combined multiple functions. Acts of ritual deposition, such as bog bodies, metalwork and other artefacts occur in Ireland on what were later recorded as minor kingship boundaries (Kelly 2006). Ritual deposition is not necessarily taking place in remote locations but in wetlands which, in some cases, the environmental or field archaeological evidence shows were close to agricultural land and settlement. This again highlights the importance of trying to join up the landscape, the tracks, fields, environmental evidence, settlement and ritual places and to avoid treating these as separate categories.

**Conclusions**

Wooden trackways are present from the very beginning of the Neolithic in north Germany and the Somerset Levels (Figure 6.2), but only in the latter are Neolithic examples particularly well represented. It is during the middle and late Bronze Age that trackways are frequent in each of the main areas, implying that some characteristic of Bronze Age life made trackway construction especially prevalent. Indeed Kristiansen and Larsson (2005) draw on quite different evidence from material culture and wheels to contend that mobility was a particularly distinctive trait of the Bronze Age. Numbers reduce in the Iron Age especially in Ireland and Somerset but not in Lower Saxony. Overall there are far fewer in the last two millennia. However, early trackways are likely to remain buried in some areas and later ones will have been removed by peat digging before archaeologists came on the scene.

The factors that occasioned trackway construction have been much debated. Often trackways have been interpreted as maintaining communications in the face of wetter conditions. In other cases, it has been suggested that they reflect drier episodes when routes, previously impassable, became accessible. In Ireland evidence of testate amoebae and peat humification, testifying to temporal changes in bog surface wetness, have been compared with radiocarbon and dendrochronological dates for wetland structures, including trackways (Plunkett *et al* 2013). Wetland activity was shown to be clearly episodic, with six pronounced episodes of wetland activity identified in the last 4500 years, separated by five lulls in activity lasting between 100 and 400 years. However, no correlation was found between activity and lull phases and the changing patterns of bog surface wetness. Instead, the episodes of wetland activity show greater correspondence to phases of clearance and activity on dryland during which the landscape was being more intensively used. In Ireland the concentration of tracks in the middle and late Bronze Age coincides with increased clearance and agricultural activity and for Raftery (1996) in the Mountdillon bogs this was the main factor prompting trackway construction. Similarly, in Somerset there is a good correspondence between the temporal concentrations of trackway construction and palynological evidence for clearance on dryland in the middle Neolithic and middle to late Bronze Age (Coles and Coles 1998, fig. 4). However, several trackways, such as those at Meare Heath, are also associated with periods of increased wetness, notably *c* 1500 cal BC

(Brunning and McDermott 2013; Brunning 2013). The Bourtanger Moor tracks in the Netherlands can also be related to pollen and settlement pattern evidence for activity on the neighbouring Hondsrug dryland.

There can be no assumption, however, that trackway construction had the same driver in each case or region. In North West Germany detailed comparison of dendrochronologically dated trackways and the deaths of trees growing on bog surfaces indicates that trackway construction frequently corresponded to a rise in bog surface wetness (Achterberg *et al* 2015). Not only may wetland environmental changes have affected patterns of human activity, but people also influenced the wetland environment itself. The very act of trackway use created an artificial linear depression and Casparie (1986;2001) has argued that at Derryville, Ireland and Bourtranger, Netherlands, the disruption of drainage by the creation of a substantial track may have triggered bog bursts, fundamentally changing bog hydrology and putting trackways out of use.

As a generalisation it seems that social factors were more significant drivers of trackway construction than has often been assumed. Many trackways seem to have been built to facilitate fairly local movement from dryland onto the edge of bogs, thus providing access for activities at the wetland edge, eg the Derryville examples, or activities on the bog surface at Edercloon. For a few in The Netherlands and North Germany they appear to have had a role in the extraction of bog iron ore. Only in a minority of cases are trackways presently understood as part of wider communication systems. Corlea 1 is clearly an example; similarly two trackways crossed Derryville bog and of these Cooleeny 31 is interpreted as a high status regional route. In the Netherlands only two tracks crossed from one side to the other of the vast Bourtranger Moor. Also fragments of much slighter tracks elsewhere at Smilde have been identified as part of a longer route linking sand ridges. In north Germany there is a greater concentration of substantially constructed trackways and they have been seen by Hayen (1987) as part of regional communication networks. Where bogs are especially extensive, as in Lower Saxony, they often formed natural barriers between cultural groupings (Hayen 1987). We have identified other examples where communication routes persisted over long timescales. However, these tend to be the exceptions. It is striking that many trackways, including some of the more substantial and carefully constructed examples such as Corlea I and the Wittemore track (XLII Ip), seem to have been abandoned not long after construction. This might be explained in environmental terms, but the possibility should also be considered that they reflect social relations such as alliances, trade connections, or periods of religious observance etc which were of a short-lived nature.

Wheels and other parts of vehicles are associated with trackways in Saxony and the Netherlands from the late Neolithic and those areas have more examples of substantial trackways suitable for wheeled vehicles. In Lower Saxony sophisticated trackways have upper lateral timbers to maintain a level surface suitable for vehicles; these appear in the middle Bronze Age and are especially marked in the eighth century BC. In Britain and Ireland only the Corlea 1 trackways seems clearly intended for vehicles. Perhaps the more substantial double post alignments / bridges and especially the stone causeways that occur in lowland England mainly in the late Bronze Age were intended for vehicles. However, aside from the wheel at Flag Fen, where the post alignment does not seem obviously suitable for wheeled transport, and wheel ruts on an Iron Age causeway at Yarnton, there is no direct evidence.

Trackway construction and use cannot be seen in purely functional terms because there is so much evidence for ritual deposition and symbolism associated with them. This is highlighted by the wooden outlines of human figures at the Wittemoor XLII Ip trackway, wooden human figures from Irish trackways (O'Sullivan 2007, 186), and the many other objects associated with some trackways such as Sweet Track and Edercloon 5. In the case of the British double post alignments, particularly of late Bronze Age date, the ritual deposition of artefacts is very clearly evident at Flag Fen and seen also to a lesser extent at most of the other sites. It has been argued here that the ritual deposition evidence has tended to eclipse evidence that these structures also served as communication routes and may therefore have obscured their full social significance. For the purposes of this study of prehistoric routeways, wetland tracks possess the huge advantage of being well dated and associated with a wealth of environmental evidence. In all but a few cases the real challenge remains to relating the wonderfully detailed local picture they provide to the wider patterns of communication.

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# Chapter 7: Barrow alignments as clues to Bronze Age routes

## Introduction

In Chapter 6 we have looked at some relatively clearly-defined evidence for wetland tracks but only in a few instances could those be related to dryland routes. In Chapter 5 we reviewed rather more tentative evidence for dryland routes used by the first farmers, concluding that quite often these related to bands of movement rather than closely demarcated paths. The clues that were suggested as significant in relation to these Neolithic dryland routes included recurrent patterns of activity on the same site separated by centuries, sometimes millennia, as for instance below megalithic tombs. A second key feature was the construction of monuments on the same alignment, again often over extended timescales. Alignments are not easy to interpret because, whilst they could indicate routeways, they have also often been interpreted in terms of cosmology (eg astronomical alignment), not that one needs necessarily to exclude the other. Recurrent patterns of activity and significant alignments may also provide clues to patterns of movement in later prehistoric periods such as the Bronze Age. Not infrequently patterns that emerge in the Bronze Age also incorporate some Neolithic monuments, suggesting that the alignments may be of earlier origin. In the early Bronze Age we have a much larger number of monuments, particularly barrows, making alignments clearer and we can also begin to detect relationships to defined routeways which become formalised and demarcated in the agricultural landscapes of later periods, particularly the middle and late Bronze Age and Iron Age, which are considered in Chapters 8 and 10. However, the case is not simple. The evidence for barrow alignments on routeways is far stronger, and accepted as orthodox in Denmark, north Germany and the Netherlands, but less so in the British Isles, although it will be argued that even in Britain there are convincing cases and probably more which are deserving of detailed investigation.

**Denmark**

In Denmark there is far more evidence for ancient dry ground trackways than in any of the other areas considered. This is partly because a national inventory of these sites has been created for heritage protection purposes. Figure 7.1a shows the 2300 sites on that inventory with evidence of ancient tracks including hollow ways (Bang 2013). Three major long distance routes can be identified. These are in a sense 'natural' topographically-determined routes, related to watersheds and crossing places over water. Each is supported by the evidence of trackway traces, alignments of barrows and other evidence. Linear arrangements of barrows have, since the work of Müller (1904), and subsequently by Bakker (1991), been recognised as routeways. The most prominent of these routes runs north to south from Viborg down the watershed in the centre of Jutland and is known as the Haervejen, or 'army road'. This is considered to be, not so much a closely demarcated line, as a broad communication corridor, the course varying seasonally according to weather conditions (Schou Jørgensen 1988b). The evidence is strengthened by the discovery at historical fording places of Bronze Age ritual deposits, wheel ruts below a few of the barrows and alignments of cooking pits corresponding to that of barrows. The evidence is assembled by Lovschal (2013) who contends that the barrow alignments should be seen, not just in functional terms, but in terms of the cues and prompts to genealogy and ideology created by the patterns of monuments, physical movement being related to paths of thought and recollections of social significance.  This resonates with the ideas of Bradley (2000) who, in discussing acts of ritual deposition in natural places such as bogs and rivers over extended timescales, suggests that this relates to some memory of past acts. Such an explanation becomes more tenable if they were linked to stories attached to particular routes through landscape. The second major route in Denmark the Oldtidsvejen is an east-west route just south of the Limfjorden which is picked out by the curvilinear grouping of barrows shown in Figure 7.1b. Another north-south route, the Ravvejen, is marked by a barrow alignment down the west coast of Jutland.

**Case Study: Kilen, a Bronze Age cross roads in Jutland**

Travelling from the north coast of Thy, where Bronze Age settlements and fields are preserved below blown sand and where amber was collected for transport south (Bech and Mikkelsen 1999), travellers would have taken a 'natural' route via a narrow strip of land across the Oddessund. At the head of another inlet of the sea at Kilen was a natural crossing point where two routes converged. The north-south route known as Ravvejen crossed with the east-west route, the Oldtidsvejen,  both marked by prominent alignments of barrows (Figure 7.1-2). A particularly large barrow (Figure 7.2b) occurs where the west-east route begins its descent to the Bredkaer valley. Here four alternative routes spread like the fingers of a hand down into the valley. Each is deeply incised into highly erodible Pleistocene sands and gravels.  In their present form they are hollow ways formed by the passage of people, animals and carts, natural erosion processes have also contributed to their morphology (Figure 7.2c). Numerous prominent hollow ways (Figure 7.2d) mark alternative routeways from the plateau into the valley on both sides and these have been mapped in the surrounding area using LiDAR (Bang 2013, fig. 4). The alternatives may reflect the changing extent of the inlet and where the Bredkaer Baek was most easily crossed. On the south side of the valley two prominent hollow ways ascend to the plateau. On either side of these routes are spurs on which, within 100-200m of the routes, are two Neolithic causewayed enclosures (Molbjerg I and Molbjerg II; Klassen 2014). From here the main route is marked by a prominent barrow alignment which includes two Neolithic long barrows and many Bronze Age round barrows (Figure 7.2e), marking a clear line which was originally identified as a prehistoric routeway by Muller (1904); part of this route is still followed by a historic road. The evidence in this area is particularly clear because it represents the crossing point of two important routes, clearly marked by barrow alignments and by multiple deeply-incised hollow ways. The multiplicity of hollow ways and alternative barrow alignments at Kilen is something often seen in prehistory, the result perhaps of changing local conditions as some routes became impassable. The hollow ways and barrow alignments in this area are marked by display boards informing walkers of their relationship to prehistoric routes.

Klassen (2014) drawing on evidence from Kilen and other Danish sites has observed regular relationships between routeways marked by barrows, river crossings and Neolithic enclosures. Based on these relationships he used GIS to build predictive models of routeways and Neolithic enclosure locations in the Dyursland peninsula, east Jutland, testing these predictions by air photography, fieldwalking and geophysics. This led to the discovery of several new Neolithic enclosures, thus validating the predictive model and the inferred routeways.  Fieldwork appears, however, to have been limited to the individual enclosure sites and did not include actual physical evidence for the inferred routeways such as the hollow ways which Bang (2013) recognised at Kilen. A further complicating factor in the Djursland peninsula is that marine inlets  were very extensive in the Neolithic and much communication might be expected to be by water.   Klassen (2014) has identified several other cases where routeways can be inferred from alignments of Neolithic graves and barrows, at Vroue Hede, Jutland and at Haslov, Sweden, where a TRB (Funnel Beaker Culture) road of 0.7km is delimited by palisades and standing stones adjoining tombs along the edge of a wetland (Klassen 2014; fig.19).

**Germany**

In the Uelzen area of north Germany between Hannover and Hamburg abundant *hunebed* (megalithic tombs) of the TRB (*c* 3500-2800 cal BC) also show evidence of pronounced alignments, many of which correspond to existing routes, often on higher terraces and watersheds, as distinct from the mainly riverine distribution of contemporary settlements (Bakker 2008, fig 23.2). It is notable that two settlements in this area are on *hunebed* alignments at probable fording points in river valleys. The Uelzen evidence may point to a complementary system of dryland tracks on watersheds and higher terraces and a transport system which may have been mainly river based.  South of Kiel at Flinkbek in Schleswig Holstein, a major alignment of barrows extends over 4km along the ridge of a seemingly ‘natural’ route which may have extended to the head of the Kiel Fjord to the north. It was flanked by wetlands to the east and the valley of the River Eider to the west (Bakker *et al* 1999; Klassen 2014). The barrows span some two millennia from the early Neolithic to the Bronze

Age. Cultivation preceded some of the barrows, as ploughmarks and pollen evidence for agricultural activity showed (Diers *et al* 2014). Below one Funnel Beaker culture barrow dated *c*3420-3385 cal BC were wheel ruts, providing some of the earliest evidence for the use of wheeled transport in Europe (Fansa and Burmeister 2004; Mischka 2011).

**Netherlands**

***Case Study: Veluwe barrow roads***

On the sandy soils of the central Netherlands, in the Veluwe area between Epe and Vaassen, there are very distinct alignments of barrows which have been interpreted as marking one axial and two divergent side roads (Figure 7.3; Bakker 1976; 2008). The main alignment runs for 6km and comprises 35 barrows; the earliest date to the third millennium BC, and there are many Bronze Age and a few Iron Age burials. Further alignments of barrows to the west of the mapped area may hint at the existence of other routes (Fokkens 2005, fig 16.7). Much of the heathland is now farmland, or forested, with the barrows in small clearings. Some of the barrows are marked by geocaches so that those walking along the prehistoric route can lift a handle raising a cylinder in which are models and information about the prehistoric barrows and the routeway they marked (Figure 7.3c). The alignments are thought to have created landscape structures representing, perhaps, lineages, or dynastic successions of those buried, animated by movement along the axis (Bourgeois 2013). Many of the barrows have been excavated and were constructed of turves; pollen analysis demonstrates these were cut from heathland. This led Doorenbosch (2013) to infer that linear corridors of heathland existed from the Neolithic since pollen analysis showed that heath had developed well before barrow construction.

Some woodland remained, but away from the alignments and settlement seems not to have been near. Doorenbosch calculated the numbers of animals, the burning and de-turfing activities which would have been required to maintain these heathland corridors. She appears to envisage acts of deliberate clearance to maintain linear heathland tracts. A more economical explanation might be that the linear heathy tracts reflect regular patterns of animal and human movement, perhaps to seasonal wetland pastures. Continuing burials may indicate that these routes remained to some extent active into the Iron Age when ‘Celtic fields’ were laid out beside parts of the alignments, but without disturbance to the barrows (Brongers 1974). Cart tracks have been identified alongside some barrows but predating the fields (Bourgeois 2013). The field patterns do not incorporate identifiable trackways running alongside the alignments, so perhaps the inferred patterns of movement had lost at least some of their significance by the Iron Age.

In north Holland the Hondsrug is a ridge of Pleistocene glacial origin which stretches for 70km south east of Groningen to Emmen forming a natural routeway between peat bogs and riverine wetlands. Its significance, in terms of the relationship between wetland and dryland routeways, was discussed in Chapter 6. In the northern part of the ridge Jager (1984) has mapped a pronounced linear pattern of megaliths, barrows and urnfields which, from the date of the monuments, he argues indicates a route in use from the period of Funnel Beakers to the late Iron Age. Excavations along this line have uncovered trackways and wheel ruts beside, rather than below, the barrows; on one site a hollow way was sectioned. The tracks were abandoned by the early medieval period when axes of communication changed and earlier routes were buried by plaggen (man-made manured) soils of medieval date. In the southern part of the Hondsrug around Emmen the distribution of Bronze Age and later settlements, fields and urnfields has been illustrated in Figure 6.6 in relation to the wooden trackways which run across peat east of the Hondsrug.  Bakker (1976, fig 10) maps the distribution of *hunebed* megalithic tombs in the same area; they are mainly down the centre of the sandy ridge, and track ruts are again found on the same axis. This alignment corresponds approximately to the hypothetical territorial boundaries down the axis of the sand ridge shown on Figure 6.6. This suggests firstly the possibility of a routeway going back to the Neolithic and secondly that it provided the boundaries between hypothetical settlement territories in the Bronze Age.  Bakker (1976, 79) also notes that cart tracks in some Bronze Age urnfields are often aligned on the grave field and sometimes as at Sleen (4km west of the area mapped in Figure 7.3), with a reserved space for a road.

**North European connections**

Bakker (1976) argues that despite the obstacles to communication created by extensive coastal wetlands, some extending 150km inland, there are considerable similarities between the TRB in Denmark, North Germany and the Netherlands. These he explains by evidence for the movement of lithic raw materials, for instance axes, from the Limfjord in northern Jutland, to north west Germany where the distributions fan out from crossing points on the Elbe (Bakker 1976, fig 13). Later in the Bronze Age the routes south from Denmark are considered to have played a part in movement of amber which was gathered in settlements such as Bjerre in northern Jutland and traded, or exchanged, as far as southern Europe.  In the TRB period, artefact distributions highlight the importance both of north-south routes from Denmark and east-west routes inland of the coastal wetlands in northern Germany and the Netherlands. In the Iron Age from *c* 500 cal BC there seems to have been an interdependence between the *terp* (artificial settlement mound) sites on coastal saltmarsh in the Netherlands and north Germany, where the farmers were engaged in cattle husbandry, fishing and salt production, and the settlements inland on sandy soils with evidence of Celtic fields which produced crops, wood and iron (Brongers and Woltering 1973). Such interdependence assumes an effective system of communication routes of the type demonstrated along the Hondsrug ridge and probably by the network of wooden trackways traversing the wetlands of Lower Saxony discussed in Chapter 6.

**England and Wales**

In mainland north-west Europe we have seen some convincing evidence for the positioning of barrows on trackways. However, the impression should not be given that all barrow alignments indicate trackways. In Britain (site locations on Figure 8.1) alignments of barrows are common, but usually without any convincing evidence that they had anything to do with tracks. Some follow topography, or may relate to cosmology, or lineages of those interred.  However, even here there is evidence that sometimes barrow alignments do relate to routeways. One such is at Bishopstone , East Sussex where a line of Bronze Age barrows was aligned on a track of Iron Age and Romano-British date, this is outlined in more detail as a case study in Chapter 10.  In the highland zone of Wales, Bronze Age monuments have been observed to cluster along mountain trackways (Lynch 2000). One such example is the extinct volcano at Penmaenmawr, a dramatic situation with panoramic views of the coast of north Wales (Figure 7.4). Here a curving trackway, in places a hollow way, is marked by Bronze Age cairns. The track passes a stone circle, the early Bronze Age Druids'

Circle (Figure 7.4b-c), which is flattened on the trackway side apparently respecting the earlier trackway line (Griffiths 1960). 200m north of the trackway is the rock outcrop of Graig Lwyd which was a Neolithic axe factory site. The axes from here, most likely given special significance not just because of the properties of the stone but the dramatic upland from which they originated, can be shown by petrological analysis to have been distributed widely in southern Britain (Clough and Cummins 1988). A standing stone also marks a continuation of the track at Penmaenmawr. Roughly parallel and 3km south another routeway is marked by three stone circles, standing stones and cairns and a much later Roman road on the same line demonstrates the longevity of that route. Williams (1988) observed that standing stones sometimes mark the positions of ancient tracks.

Lest we get carried away with the notion of an inevitable association between barrows and routes, there are many more examples where arrangements of barrows seem to have a rather different landscape role which might for instance reflect cosmological alignments, genealogies, or territorial divisions. In Ireland, Cooney (2009) identifies linear arrangements of barrows of Bronze Age to Iron Age date interpreting them in terms of lineages of the people buried, although such a sequence might also imply an axis of movement. Bakker (1991, 518 ) from the position of his considerable experience of prehistoric trackways in mainland Europe, says that he has never understood why the barrow alignments around Stonehenge were not interpreted as following routes. There are indeed very prominent barrow alignments, most obviously 2km west of Stonehenge at Winterbourne Stoke cross roads comprising a Neolithic long barrow and fourteen, early Bronze Age round barrows (Figure 5.6). Other prominent alignments are on Normanton Down 1km south of Stonehenge and on King Barrow ridge 1km to the east of Stonehenge. These, and the other Stonehenge barrow alignments, do not have any clear association with routes, they do not lead to Stonehenge, or other monuments, which might be expected if they perpetuated routes of the Neolithic, or Beaker period. Rather they are, as it were, tangents, or curvilinear arrangements, framing and enclosing the basin within which Stonehenge lies. It has been argued that barrows may be so positioned that they are skylined from routes rather than being on routes themselves (Watson 2001). The King Barrow alignment cuts across the Stonehenge Avenue which is the one really clear prehistoric route in this landscape (Figure 5.6).

Perhaps we should not exclude completely that they could represent routes tangential, or concentric, to Stonehenge by channelling access around, rather than directly to, Stonehenge (Woodward and Woodward 1996). That may not be not too fanciful if there was one correct way to approach the great monument as the avenue implies. However, in response to Bakker's point one must acknowledge that there are none of the distinctive clues to the former existence of tracks associated with the Stonehenge barrows that are convincing in the case of some of the continental alignments, or the Yorkshire Iron Age barrows discussed in the next chapter. It is, however, rather intriguing that there is a line of eleven barrows 130m to the south of the Neolithic Stonehenge cursus. Cursus monuments and their very enigmatic relationship to movement through the landscape were discussed in Chapter 5. On Salisbury Plain east of Stonehenge some barrow groups of the early Bronze Age were linked by later Bronze Age linear ditches suggested that the barrows may have lain on territorial boundaries (Bradley *et al* 1994), an interpretation which is also proposed for curvilinear barrow groups in the South Dorset Ridgeway (Woodward and Woodward 1996).

On the North York Moors barrows define the watersheds and are thought to reflect seasonal grazing lands linked by deep hollow tracks to the valleys where there is evidence of Bronze Age settlement (Spratt 1982; Woodward 2000). That introduces us to another aspect of movement in the landscape relating to seasonal movement and transhumance. In the Brenig Valley of upland north Wales there is a complex of Bronze Age round barrows (Lynch 1993). Some barrows can be shown by pollen analysis to have been constructed, not just of local turves but of turves with more evidence of cereals and weeds of arable land, which are thought to have been brought from lowland agricultural landscapes. This establishes a direct connection between the seasonal pasture on the upland, where barrows were made, and the lowland of the parent settlements where farming took place. The great late Neolithic mound at Silbury Hill in Wiltshire likewise had turves at its core which came from several contrasting soil topographic and vegetation locations. Although in that case they were available relatively close to the hill, they do nonetheless provide biological evidence for the movements of people and materials in the landscape (Leary *et al* 2013).

**Conclusions**

In Chapter 5 and this chapter we have seen there is clear evidence of distinct alignments of monuments in Neolithic and Bronze Age landscapes. In continental Europe the evidence mainly relates to barrows and the alignments seem generally to be of Neolithic origin and continue into the Bronze Age. In Britain the alignments are most clearly defined in the Neolithic in relation to ritual monuments but they sometimes include barrows. In the British Bronze Age barrow alignments are frequent but not as long or with the numbers of barrows seen in Denmark and the Netherlands. In Britain there is no consensus as to their significance. In Britain and to a less pronounced extent in continental Europe many ideas have been proposed for the origins of these alignments, they may relate to routeways, cosmology, sequencing of monuments may be related to religious practice or genealogies of those buried, or some combination of these factors. In the Netherlands, north Germany and Denmark it is widely accepted that the barrow alignments often mark routeways, although it is not argued that all, or even most, barrows are on routeways. There is persuasive evidence to support this hypothesis, including the evidence for linear grazed landscapes preceding barrows on the Veluwe where there are also aligned pre-Iron Age cart tracks. At Flintbek, Germany there are wheel marks associated the barrow alignment. In Britain we have noted cases where barrows do seem to represent routeways, but there is not such clear evidence as in continental Europe. However, we will return to this question in Chapter 8 which looks at the very much more abundant evidence for routeways in middle Bronze Age to Iron Age agricultural landscapes with fields in Britain. Where trackways are defined by flanking ditches or field banks it is possible to identify many more examples of earlier barrows on the same alignments which suggests that some of those routes are of earlier Bronze Age or in some cases Neolithic date.

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# Chapter 8

## Trackways in later prehistoric agricultural landscapes

### Introduction

We have seen in earlier chapters how hints and fragments of prehistoric routeways can be reconstructed from various sources, such as recurrent use of the same locations, alignments of monuments and palaeoenvironmental traces. Only in wetlands are routes clearly archaeologically visible and datable and only in rare cases can those be related to what was happening on dry ground. The situation is very different in later prehistory when we have extensive agricultural landscapes with droveways and fields, which makes it easier to identify routeways. As regards longer distance routes it has generally been assumed that prehistoric travel was mainly along the hill crests, the so-called ridgeways (Fox 1923). A particular challenge is to establish whether ridgeways do actually represent early routes, and in many cases, as we will see below, the evidence remains quite ambiguous.

An additional problem is that in dryland situations we have very little evidence for purposeful construction involving deposition of stone, sand, gravel etc to form a hard surface which would have created stratified sequences with potential for dating. Often early trackways are negative features formed by the erosion of bedrock by traffic. When deeply incised these are called hollow ways, or sunken ways. They were created by the erosive effects of travel along the route by people, animals, wheeled vehicles etc. Hollow ways, once established, also become accentuated by the erosive effects of rainfall runoff, and incision may often cut away any evidence of earlier routes along the same line. Over 50 years ago Bowen (1961, 61) identified the urgent need to establish how hollow ways can be dated and what light they throw on the possible existence of ridgeways; that challenge has, until now, gone largely unheeded.

In Britain, Neolithic and early Bronze Age landscapes are characterised by funerary and ritual monuments, particularly barrows. A more domestic landscape of settlements, fields, trackways and linear boundary ditches is widespread from the middle Bronze Age. After this there is more direct evidence for trackways associated with settlements and fields, sometimes as surviving earthworks where there has been little or no later ploughing.  Where later ploughing has occurred these patterns can sometimes be recovered by air photography, geophysics or open area excavation. Recent large-scale, developer-funded excavations, often related to infrastructure projects and aggregate extraction, reveal great tracts of prehistoric landscape in which spatial and stratigraphic relationships between datable features, such as ditches and banks, provide evidence of the existence and date of routeways. Problems of dating may also be overcome by careful retrogressive landscape analysis, the observation of morphology, spatial relationships between features and strategic excavation. Examples will be outlined to demonstrate that the study of early routes is not as intractable as the sparse literature suggests. This chapter considers how tracks in prehistoric agricultural landscapes can be recognised and dated and develops this by examination of examples from various parts of the British Isles. Chapter 10 develops this picture with more detailed consideration of routeways in and around the Weald in South East England. Figure 8.1 shows the locations of the trackway sites discussed in Chapter 7 and this chapter.

***Recognising tracks in agricultural landscapes***

Before considering individual case examples it is helpful to consider some of the ways in which trackways in agricultural landscapes may be recognised and to define some key terms. This is a basic first step towards a typology of trackways in agricultural landscapes without stone walls. Those with stone walls are clearer and more generally understood. The types are shown on Figure 8.2, which illustrates archaeological examples in isometric plan and below this in section. Table 8.1 provides reference to actual examples illustrated in this chapter, Chapter 10 and in other publications.

| | Type of track | Site example | Figure no | Published example |
|---|---|---|---|---|
| a | Droveway between ditches or walls | Heathrow T5<br>Dartmoor<br>Peacehaven | 8.8<br>8.6<br>10.5 | Lewis *et al* 2010<br>Fleming 1988<br>Hart 2015 |
| b | Track marked by strip without features (eg in settlement) | Danebury | | Cunliffe & Poole 1991, fig 4.1 |
| c | Terrace Way | Wilmington<br>Ports Way | <br>10.6-7 | Curwen 1954, Plate XXXII<br>Curwen & Curwen 1926 |
| d | Hollow way (shallow, d1; buried d2) | | | |
| e | Hollow way (deeply incised) | Saddlescombe<br>All Cannings<br>Rother Valley<br>Shepton Beauchamp &<br>East Coker | 10.7c<br>8.5<br>10.10 | <br><br>Boardman 2013<br>Boardman 2014<br>“<br>“ |
| f | Double lynchet trackway | Thundersbarrow<br>Plumpton Plain | 10.8<br>10.2a | Curwen 1933<br>Holleyman & Curwen 1935 |

| | | | | |
|---|---|---|---|---|
| | | Bullock Down<br>Ports Way<br>Itford Bottom<br>East Dean Woods | 10.4<br>10.6-7<br>10.2b<br>10.9 | Drewett 1982<br>Curwen & Curwen 1914; 1926<br>Bell 1983<br>Manley 2016 |
| g | Hollow way flanked by double lynchets | Lyminge | 10.13 | Bell *et al* forthcoming b |
| h | Terraceway on lynchet | Saddlescombe | 10.7d | Curwen & Curwen 1914 |
| 1 | Droveway succeeded by linear ditch boundary | Yorkshire Wolds<br><br>Danebury | 8.7 | Stoertz 1997; Fenton-Thomas 2005<br>Palmer 1984 |

Table 8.1. Hypothetical types of later prehistoric trackways in Figure 8.2 linked to illustrated examples in Chapters 8 and 10 and other publications.

Tracks are often delimited by two parallel ditches, or in upland areas stone walls, marking a droveway, the ditches designed for drainage and both ditches and walls to keep animals on the track away from fields (Figure 8.2a). Occasionally a metalled surface may be present, but usually this has been eroded by later cultivation; it is more likely to survive in environments of alluvial or colluvial deposition. Trackways may also be defined by linear strips free of other archaeological features; in the hypothetical example on Figure 8.2b definition is by the edge of quarry pits on the right and buildings aligned at right angles on the left. Trackways may also be represented by relatively slight linear hollows, the result of small-scale erosion (Figure 8.2c). Sometimes a hollow track may be buried by later sediment (Figure 8.2d1) and sometimes traces of earlier buried routes may survive at the sides (Figure 8.2d2). On steep slopes and on more easily erodible bedrock much more dramatic hollow ways are created, sometimes many metres deep (Figure 8.2e). Hollow ways are often enhanced by the erosive effects of rainfall demonstrated by observations during storms and meandering erosion gullies on their floor. Where there were ploughed fields alongside a trackway, cultivation often gave rise to erosion and deposition processes within a field which create linear features called lynchets (Bowen 1961) along the trackway edge. A positive lynchet is an accumulation of eroded soil called colluvium at the downslope edge of a field, in this case abutting a track. Positive lynchets can be easily recognised because there is a more level terrace-like strip along the top of the bank interrupting the general slope of the topography. A negative lynchet is formed by the erosion of soil on the upslope part of a field. This occurs where, as soils thinned, the plough cuts into subsoil, or bedrock, again producing a more level terrace strip, in this case running along the downslope edge of a trackway. Where a trackway is marked by a positive lynchet upslope and a negative lynchet downslope, it is known as a double-lynchet trackway (Figure 8.2f). Far more frequently than is generally appreciated, hollow ways are enhanced by positive and /or negative lynchets as shown on Figure 8.2 g. Tracks may also utilise level surfaces created by earlier field terraces (Figure 8.2 h). Figure 8.2i illustrates a more complex example where a droveway defined by parallel ditches has been succeeded by a larger linear bank and ditch representing a land allotment boundary.

Figure 8.3 further illustrates relationships between routeways, fields, landscape topography and colluvial sediments. In addition to lynchets bounding individual fields, the writer’s observations on the ground have identified linear colluvial deposits which are associated with specific topographic contexts where cultivation perennially ceased and sediment accumulated, because, for instance, land became too steep or wet. It is not unusual to encounter such contexts where little or no trace of associated fields has survived subsequent agriculture. Two such contexts were originally identified by the writer at plateau edges and alluvium / floodplain edges (where sometimes they can be mistaken for, or mask, river terraces;  Bell 1981, fig 5.1). In the present context a third type should be added, Trackway edge colluvium: where soil has accumulated on the uphill side of a linear boundary created by a track. Where such deposits have the previously noted level step on their surface, extend lineally well beyond individual fields, and the track is not itself on either a positive or negative lynchet, it may reasonably be inferred that the trackway is contemporary with, or earlier than, the colluvial terrace, rather than something slotted into a landscape of existing fields.

Observation suggests that in the case of hollow ways cross section sometimes provides clues to their origins. A V-shaped hollow is formed by people or animals in single file, perhaps shepherd's tracks; a wider U-shaped form perhaps represents larger herd animals, maybe cows or pigs; and U-shaped forms with a flattish base and sometimes wheel ruts are those produced by the passage of vehicles. Many of course served multiple purposes.

***Dating tracks in agricultural landscapes***

But how *might* we date these tracks? As noted in Chapter 1, attempts to date trackways have been rather few and too often there have been an assumption they are undatable. On the contrary, provided we are sensitive to the problems of interpretation and the precise meaning of the dates obtained, there are dating techniques we can apply.  Retrogressive landscape analysis using old maps unaffected by recent changes can provide important evidence for the relative dating of trackways. Relationships between routes may show, as in Figure 8.4a, that one route (A) is continuous whilst others dog-leg (B) and are likely to be later, provided there is no evident topographic explanation. Figure 8.4 b shows an early oval woodland enclosure at Rowfold, West Sussex round which a routeway and a long linear landholding curve suggesting both are later features (Chatwin and Gardiner 2005). Figure 8.4c shows a more complex case in Hertfordshire in which east-west coaxial tracks from higher ground to the River Lea are cut across by and predate Roman Ermin Street. Cheshunt Park is later than both and within the park a pre-Roman ditch has been excavated on the same alignment as the coaxials, which may therefore be prehistoric (Bryant *et al* 2005). Continuity of land boundaries may be suggested where, for instance, excavated Romano-British boundaries align with surviving boundaries (Rippon *et al* 2015). There are many cases where the spatial relationships between trackways and sites of various types may indicate date but the strength and significance of those relationships requires critical evaluation.

Also applicable to dating trackways are a range of methods that have been previously applied to the dating of fields. First two concepts need to be introduced: '*terminus post quem'* (TPQ or date after which), meaning in this context that the trackway is later than the date obtained. Secondly, '*terminus ante quem'* (TAQ or 'date before which'), meaning in this context the trackway is earlier than the date obtained. Perhaps the most straightforward means of dating is when a trackway is integral to a settlement or a field system which has been dated, either typologically, or by excavation. For instance, a trackway may be integral with a hut circle, a hillfort, or a field system or, as in the case of Figure 8.2b, be delimited by datable features such as quarry pits. Artefacts such as pottery and metalwork can also assist with dating. In these contexts one has to be aware that some artefacts might be residual, or reworked. However, colluvial deposits often contain large numbers of artefacts, many probably derived from manuring, and if each of these objects is plotted on a section then a good indication of the periods when the colluvium accumulated can be obtained; this is especially so in areas where the sequence of pottery types and fabrics is well understood because sites of many periods have been investigated. This technique has been successfully applied to the dating of many colluvial valley sediments (Bell 1983; Allen 1992) and in a few cases noted below it has been used to date double lynchet trackways. Radiocarbon dating is applicable where organic material such as charcoal or bone is found in a functional relation to a stratigraphic context, ie there is clear evidence that it is not residual or reworked. An example would be a defined patch of burning in the fill of a hollow way or below an associated positive lynchet. Also applicable is Optically Stimulated Luminescence dating (OSL; Duller 2008; Rhodes 2011). OSL has been very successfully used to date prehistoric and historic colluvial sediments derived from agricultural fields in Germany (Fuchs and Lang 2009; Lang and Wagner 1996). The writer is not aware of its previous use to date lynchets delimiting or overlying trackways, but an example of this application is provided in Chapter 10 by a case study at Lyminge, Kent. That example also illustrates the application of molluscan evidence derived from apparently known introduction dates (or in other cases extinction dates) and the application of Uranium Series dating of shells (Walker 2005).

On Figure 8.2 stars mark contexts from which dating evidence may be obtained. In (8.2a) artefacts or OSL from ditch primary fills, or within metalling, may provide a date for trackway use. Artefacts or a radiocarbon date from below metalling or below a bank associated with the ditch will provide a TPQ for the track. In (8.2d) artefacts, OSL or biota in the fill of a track hollow will provide a TAQ. Hollow ways (8.2c) are a particularly tricky case since they are negative features formed by erosion and lacking datable contexts. However, in the hypothetical case illustrated in Figures 8.2d and e there are earlier phases of hollow way which have filled with eroded sediment and this could be dated using the various methods outlined. Tracks and hollow ways flanked by double lynchet trackways (8.2f and g) can be dated by using the techniques appropriate to colluvial sediments, ie artefact distributions and OSL; radiocarbon dating and biota may also contribute. In applying these approaches, we need to keep in mind that the dates obtained may in any case be a TPQ for the trackway. For instance, an earlier track may later be flanked by ditches or fields as a landscape becomes more intensively used. It will often be the case that trackways have been used in multiple periods, and field systems may likewise exhibit complex histories, as for instance co-axial fields on Salisbury Plain; some of Bronze Age date were slighted by later linear ditches, then re-established in the later Iron Age and Romano-British periods (Bradley and Fulford 2008). Effective dating will be based, not on one technique, but a combination of field survey, excavation and scientific dating.

Whilst trackways may be well-preserved in places, all too often their survival is over a limited distance. For this reason, identification of longer distance routes in the later Bronze and Iron Ages can be just as challenging as it was in the preceding periods. They may be clear within, or close to, a settlement, or within a group of fields, but then disappear away from the foci of activity. Settlement contexts help to identify trackways where there are linear feature-free areas illustrated in Figure 8.2b. An example is within the extensively excavated Iron Age hillfort at Danebury, UK where internal roads radiating from an elaborately fortified entrance were clearly identifiable from linear strips free of pits and structures (Cunliffe and Poole 1991, fig 4.1). Outside the hillfort a route continues from the main entrance for some 2.3km marked in part by a linear ditch which later formed part of a trackway (Palmer 1984). This illustrates a case where, if we start in settlement context where routes are datable, it is sometimes possible to project the evidence onto a wider landscape scale.

**Agents of transformation: horses, carts and chariots**

Horses, which were present in Pleistocene landscapes, are thought to have become extinct in Britain in the early Holocene. They were domesticated in the Pontic Caspian steppes *c* 4800 cal BC (Anthony 2007) and seem to have been introduced to Britain much later in the middle Bronze Age *c* 1500 cal BC (Bendrey 2012; Bendrey *et al* 2013). Antler cheek pieces suggest that horses were being ridden, and winged sword chapes indicate mounted warriors from the 8$^{th}$ century BC in Britain. Thus it was, from the final Bronze Age that the greater speed and distance facilitated by horse riding transformed communication. That this is likely to have been of some significance in the development of trackways is suggested by the effects of horse introduction in the American North West *c* AD 1720 which brought about a marked change in communication routes because it became easier to ride along ridge tops and upland slopes than to traverse valley bottoms (Turner 2014, 207). Perhaps this was a significant factor in the development of ridgeway routes in Europe?

In the context of the medieval period, Fleming (2010) has discussed the significance of horse-borne communication as an instrument of elite control, identifying characteristics of routes in Devon which he sees as associated with horse elites (2012). In mid-Wales he identifies a long-distance route, the Monks Trod, which he traced for 36.5km across the Cambrian Mountains linking Cistercian Abbeys. On grounds of historical context he deduces that the route was probably established by *c* AD 1170 (Fleming 2009a). A characteristic of the route adopted was that it represented good going for horses with, in places, longer alternatives for use under less favourable winter conditions. Just as Fleming shows communication by horse was an important element of elite control in the medieval period, so the same argument might be applied to the increased evidence of horse riding in the final Bronze Age and Iron Age. This topic has barely been considered in Britain, although an approach which could be adopted is demonstrated by a GIS based landscape approach in Burgundy, France, which convincingly identified the routes of pre-Roman roads linking hillforts (Madry and Crumley 1990; Crumley and Marquardt 1987).

A second transformative agent in communication is the wheeled vehicle. As we saw in Chapter 6, wheels are more common and earlier in continental Europe. The earliest surviving examples in Britain are middle and late Bronze Age. Cart burials are known from the late Bronze Age in Europe and there are cart fittings of this date from Heathery Burn, Yorkshire (Piggott 1983). Some 20 chariot burials are known from the third and second centuries BC, all but two from the Arras culture of Yorkshire (Stead 1979). There are recent finds of an earlier chariot, *c* 536-382 cal BC, well to the north at Newbridge near Edinburgh (Carter *et al* 2010) and a very late Iron Age example in Pembrokeshire (Dyfed Archaeological Trust pers. comm 2019). Wheel ruts also point to the existence of vehicles in the late Bronze Age at Welland Bank, Lincolnshire (Pryor 1988b, plate 11), and in the Iron Age and at Cherbury hillfort and on a limestone causeway at Yarnton, both in Oxfordshire (Lambrick and

Robinson 2009). Wheeled vehicles would have increased erosion in hollow ways, where deep wheel ruts are often seen. Mottershead *et al* (2008) employed a geotechnical and geomorphological approach to demonstrate that deeply incised and extensive cart ruts on soft limestone in Malta were produced by two wheeled carts of gauge 1.4m. They formed at a time of active soil erosion but are essentially undated. By the close of the Iron Age classical writers provide accounts of great battles between Britains and Romans involving many chariots, a perhaps debatable, figure of 4000 in the case of the Iron Age leader Cassivellaunus (Piggott 1983). A single farm site at Gussage-All-Saints, Dorset produced moulds from the casting of an estimated 50 sets of chariot fittings (Foster 1980). If the Cassivellaunus figure is anywhere near numerical accuracy it has major implications for the later Iron Age, both in terms of the availability of horse transport and the existence of viable routeways along which large numbers of vehicles could be marshalled (Spratling 1979, 149).

**Hollow ways**

Hollow ways (Figure 1.7) have fascinated many writers who recognise them as ancient routes, their origins lost perhaps in the mist of time. Some have totally gone out of use and represent lost ways of life. One such abandoned way was chosen by Geoffrey Household (1939) as the hiding place for a fictional fugitive in *Rogue Male*. That mysterious place so fascinated the writers Roger Deacon and Robert Macfarlane that they went in search of the track of Household’s inspiration and found it in the Chideock valley in Devon (Macfarlane *et al* 2012). A question to be addressed in this chapter and the next is whether hollow ways are condemned to being places of perpetual mystery, or whether we can find ways of investigating their origins. There are positive signs because increasingly hollow ways are exciting interest from a range of disciplines and internationally. Their study occupies a fertile interface between landscape archaeology and geomorphology. Even so, there are significant challenges, especially in terms of dating, due to their erosive origins.

On bedrocks which were particularly erodible such as chalk, limestone, sandstones and loess, hollow ways can be deeply incised leaving a significant mark on local topography. Frequently, as one route became deeply gullied, or muddy, alternative routes were adopted, so that one finds a cluster of parallel hollow ways descending steeper escarpment slopes (Figure 8.5). They can act as channels for temporary streams and eroded soil from arable fields during high rainfall events, as Boardman (2013; 2014) has demonstrated for some particularly deeply-incised hollow ways in the Rother valley, Sussex, which now act as drainage channels in storms.

Interest in these features is developing in several parts of Europe. In Denmark, where routeways on lowland plateaus descend steeper slopes into valleys, there are fine examples, such as those illustrated at Broskov on Zeeland in Figure 6.5, where the multiple ways are both integral with a field system on the plateau and lead to successive excavated causeways across the valley (Kunwald 1962). Similarly, at Kilen in Jutland and elsewhere, Bang (2013) has used LiDAR to document multiple hollow ways in the form of deep V-shaped incisions in the plateau edge representing routes down to river crossing places. Several examples in Sweden are illustrated by Westerdahl (2006), some converging on river crossings. In the Ljubljana marshes of Slovenia, Cresnar (2016) has identified multiple hollow ways around the wetland basin, one leading to a crossing place of the wetland where there is evidence of Bronze Age ritual deposition. Although the hollow ways themselves are undated, some examples go through the entrances of Iron Age sites. Where areas of European loess support ancient forests, such as the Meeerdaal Forest in Belgium, Holocene erosion gullies are preserved; some are hollow ways and their distribution relates to sites of the Iron Age and Roman period (Vanwelleghem *et al* 2003; 2006). It is also probable that earlier routeways determined the location of some of the large-scale erosion gullies which have been documented by Bork *et al* (1998) on the Central European loess. It follows from this that disentangling the role of routeways and large-scale gullying may, more often than imagined, require a combined geomorphological and archaeological approach. On the loess of eastern Austria there are deeply-incised hollow ways (Wiesbauer and Zettel 2014). They are mapped historically and the assumption has tended to be that they date to the Middle Ages. However, Lidar survey of these wooded landscapes has provided a fuller picture of their distribution and relationship to sites, demonstrating that some ways lead to Iron Age hillforts (Doneus *et al* 2011).

**Coaxial fields and tracks in moorland**

During the later Bronze Age extensive systems of fields, some coaxial, were established in areas of Britain. There is also increasing evidence for coaxial fields on the continental side of the English Channel (Bradley *et al* 2015). The coaxial plan has one clearly defined long main axis, formed by parallel boundaries, from which fields are divided on a secondary axis at right angles, rather like the face of a brick wall. Figure 8.6a shows a part of the extensively preserved coaxial fields on the moorland edge Dartmoor. Such systems are often terrain oblivious, ie the main axis does not follow topography (Fleming 1988, 112). This is opposed to aggregate field layouts characterised by more piecemeal development.

The fringes of Dartmoor exhibit the most extensive survivals of prehistoric fields in Europe; they were discovered and extensively investigated by Fleming (1988), with recent survey by Newman (2011). Extensive surveys of past field systems have also taken place on Bodmin Moor (Johnson and Rose 1994) and west Penwith (Herring *et al* 2016). Moorlands are today areas of open and rough grazing with impoverished, acidic soils on the higher and wetter parts on which peat has accumulated. Soil acidification followed the loss of woodland, but in the middle Bronze Age the moors were less marginal than today and more intensively used. In the moors, above the present-day limits of farming, low stone banks form parallel coaxial systems with a terminal reave (stone bank) at the moorland edges (Figure 8.6a). The parallel reaves are divided to varying extents by cross banks which define smaller fields and enclosures, particularly around hut circles which are in neighbourhood groups, as illustrated by the example on Holne Moor (Figure 8.6a). The reaves were originally constructed *c* 1700 cal BC and appear to have mainly gone out of use by the end of the Bronze Age *c* 800 cal BC, when climate deterioration may have contributed to a reduction of the intensity of land use. It is clear from the palaeoenvironmental evidence that the reaves relate to an open environment which was mainly used for pasture, indeed footprints of cattle and sheep in a reave ditch on Shaugh Moor were noted in Chapter 4. There was some small-scale arable activity attested by pollen analysis and lynchet accumulations against some reaves (Balaam *et al* 1982).

Despite the extensive traces of prehistoric fields of coaxial form on moorlands, they seldom exhibit the clear evidence of multiple parallel tracks noted below in lowland contexts. The moorland tracks which are visible have not been a major theme in previous surveys which focus more on the fields. Lengths of parallel walls frequently occur, particularly in relation to hut circles representing settlements, but they are often frustratingly short lengths. Occasionally longer lengths of track represented by double walls can be identified. An example highlighted on Figure 8.6a running west-east (A-B) is roughly parallel to the Venford Terminal Reave which was the edge of the open moor in the Bronze Age. Other shorter lengths of parallel walls at right angles to the Venford Reave probably represent tracks from settlement clusters to the open moor.  A rather longer track leading from settlement huts to the open moor is illustrated on Throwleigh Common, where short tracks, also leading to earlier positions of the moorland edge, are highlighted (Figure 8.6b). Beyond the parallel reave system on open moorland other reaves along watersheds define great tracts of grazing on the open moor, for instance in the Plym valley, where, beyond the coaxial reaves, there are many enclosures and hut circles (Balaam *et al* 1982). It seems probable that these related to seasonal grazing. Seasonal transhumance characterised Dartmoor in the Medieval period (Fox 2012). The multiple moorland fringe routes associated with this practice were called by Fox ‘multiflex routes’. Fleming (2012) has established that some of the lanes used as transhumance routes go back at least to the immediately post-Roman period, since there are inscribed stones of that date on the routes. This has also been demonstrated in West Penwith, Cornwall where parts of today’s landscape of irregular small curved fields can be shown to originate at least as early as the Romano-British period (Herring *et al* 2017). Probably later in origin are the Trods, or narrow flagstone paths, on the North

York Moors (Evans 2008). Some lead to bridges of known medieval origin, some have monastic associations and one leads to a monastic grange; others have a relationship to Post-medieval markets. In their present form most seem likely to be medieval or later but the possibility that some formalise earlier routes should be considered.

**Yorkshire Wolds**

Air photography on the chalk landscapes of the Yorkshire Wolds has revealed very extensive evidence of prehistoric landscapes in which it is possible to trace early routeways over greater distances than in most other areas (Stoertz 1997). Extensive excavations in advance of quarrying have also contributed significantly to the understanding of landscape history of this area. Figure 8.7a shows part of this landscape. A linear feature, which can be traced for more than 12km, approximately follows the 100m contour at the boundary between lowland to the south, which is closely divided by many ditches and fields, and, to the north, open upland grazing with some linear ditch divisions. The form of the long linear feature in places is clearly that of a trackway, indicating that at some stages in its life it was a significant routeway. It was followed by later linear boundary ditches *c* 1000 BC (Fenton-Thomas 2005); this is the type of sequence which is illustrated in Figure 8.2i. Other stretches appear more like a linear boundary ditch, demonstrating a rather ambiguous relationship between tracks and linear ditches, which is seen elsewhere, for instance at Danebury and other Wessex sites (Palmer 1984; Bradley *et al* 1994). Less ambiguity attaches to a trackway which winds from south-east to north-west for 7.5km. Early origins are suggested by a band of Neolithic and Bronze Age barrows along this line. By the Iron Age it is delimited in part by double ditches with land allotment boundaries laid out at right angles. The track delimits the extensive middle Iron Age cemeteries at Garton Slack and Wetwang Slack, the latter encroaching in places on its line (Figure 8.7b; Dent 1982). Notable in both cemeteries is the occurrence of cart burials dated *c* 450-200 BC (Figure 8.7 d) providing evidence of the vehicles which used these routeways. Perhaps it is not by chance that some of the longest clearly traceable prehistoric routeways in the British Isles are so closely associated with the very localised distribution of Iron Age cart burials of the Arras culture (Stead 1979, fig 9). It also indicates a relationship between mobility and status in the Iron Age of this specific area (Giles 2012). On the eastern side of Figure 8.7a there are a series of shorter parallel trackways running through enclosed settlement and field areas towards the higher ground, perhaps associated with the seasonal movement of animals from enclosed lowland to open upland grazing. Droving practices are further attested by funnel-shaped entrances leading to trackways, as illustrated by Figure 8.7c.

**Coaxial fields and droveways in lowland Britain**

Drawing on a wealth of evidence from developer-funded excavations, Yates (2007) has demonstrated that later Bronze Age coaxial fields are widespread in lowland areas along the Thames Valley, in coastal areas flanking the Thames Estuary and along the south coast of England. Yates has shown convincingly that these lowland fields are associated with intensive animal husbandry. Where excavation has been on some scale, droveways often lie between fields and are flanked by ditches. Often the droveways are aligned towards rivers such as the Thames, suggesting that animals were being driven down to seasonal pasture on the floodplain and saltmarshes. Gravel causeways and wood trackways carried routes of this type onto the wetland itself (Meddens 1996). An important example of coaxial fields at Fengate dated to the earlier Bronze Age has been discussed above, in the context of dryland-wetland communication routes (Figure 6.10). An example of aligned droveways was found at South Hornchurch, Essex where a droveway flanked by fields is beside a late Bronze Age ringwork of the eighth to ninth century BC (Guttman and Last 2000). The scale of these Bronze Age field systems is apparent from the very extensive excavation of an area 1.3 by 1km in advance of construction of Terminal 5 at Heathrow Airport, London (Lewis *et al* 2010). Here 12 trackways were identified, the most prominent seven were oriented north-south, and spaced at intervals of between 270m and 100m. The trackways formed the main axis of an extensive area of coaxial fields (Figure 8.8). Twelve farmsteads lay within the fields and there were 48 watering holes, which are very much a feature of the Thames valley fields, and, together with environmental evidence, such as dung beetles and pollen, these strengthen the view that the landscape was mainly associated with animal husbandry. The river Thames is 2km south of this site and it is probable that animals were being driven down to floodplain pastures, just as has been suggested at Fengate and sites in the Severn Estuary (Chapter 6).

**Survival of co-axial field systems**

There is also evidence for extensive coaxial field systems surviving in some areas in the pattern of fields today. Whether some of these originate in the previously described coaxials of the later Bronze and Iron Ages remains to be established. One of the clearest examples of surviving coaxials is in the Scole-Dickleburgh area of East Anglia where a landscape of fields and tracks documented from early maps appears to be cut across by the Roman road from Colchester to Norwich (Williamson 1987). Environmental evidence from the adjoining Diss Mere indicates extensive clearance and agriculture from the Iron Age (Peglar 1993). In the Lea Valley, Hertfordshire coaxial fields are bounded by long east-west tracks running down to the River Lea and predating Roman Ermine Street. Excavation of a ditch suggested the system originated in the pre-Roman period (Figure 8.4c; Bryant *et al* 2005). Identification of a coaxial pattern of roads and tracks on the Chiltern Hills (Bull 1993) may have early origins as suggested by the discovery of an Iron Age track at Aston Clinton below a later parish boundary (Lambrick and Robinson 2009). At Shapwick, Somerset the boundary of a surviving coaxial field system was shown to directly overlie medieval, Roman and Bronze Age ditches (Aston and Gerrard 2013). Whilst not directly related to documented coaxial systems, parallel droves have been mapped connecting the chalk downs and lowland in south east Hertfordshire and Cambridgeshire (Harrison 2003) and extensively in the Wealden landscape investigated as a case study in Chapter 9. The first detailed synthesis of the extent to which Romano-British field orientations survived into recent landscapes came to the very significant conclusion that 64% of the excavated Romano-British field systems studied shared a common orientation with medieval landscapes, though the proportion varied regionally (Rippon *et al* 2015). Furthermore, pollen analysis showed that the oft postulated abandonment of agricultural land and woodland regeneration at the end of the Roman period was far less than generally assumed, in the south east of England, attested by only a 5-6% increase in woodland.

To date, discourse about coaxial landscapes has been largely framed around the fields themselves, but there are signs of an emerging view that it is not so much the individual fields that demonstrate continuity, as the systems of parallel droveways connecting environmental zones which are the key to landscape structuration (Williamson 2008). Within these patterns some individual field boundaries show continuity and there are others which clearly do not (Rippon *et al* 2015). What is emerging as controversial is the extent to which continuity of tracks and fields may be interpreted in terms of social continuity of land-use practices, such as common property rights, commons and field system organisation, for which Oosthuizen (2011; 2013) has argued. Rippon *et al* (2015, 320) do not accept the arguments for long-term continuity of social practices. It could be argued that the existence of bands of landscape offering complementary resources, connected by droveways, in places deeply incised as hollow ways, created structures within which similar practices of resource connectivity and lesser transhumance might have been practised, whether or not there was any actual continuity in the social arrangements which articulated these practices.

**Ridgeways**

This brings us to perhaps the most contentious topic in the study of prehistoric routeways, the so-called ridgeways. These are supposed routes along the crests of escarpments and ridges, particularly those of chalk and limestone, in lowland England. They were regarded by early prehistorians as routeways. Some were marked on the Ordnance Survey maps of Iron Age and Roman Britain (Ordnance Survey 1956; 1962) on the basis that they were ‘natural routes’ marked by concentrations of sites (Figure 8.1). Those marked were: the Wiltshire/ Oxfordshire Ridgeway and its continuation into East Anglia to the Wash as the Icknield Way; the North Downs Way to Dover; the Jurassic Way, shown as running from the Cotswold

Hills to the Humber; and a route called the High Street along the Lincolnshire Wolds. Many of these are now long-distance walking paths of great recreational importance. In Chapter 1 it was emphasised that routeways play a seminal role in how people encounter and perceive particular landscapes, so it follows that the long-distance ridgeway paths are an important aspect of a twenty-first century walker's encounters with landscape, whatever the history of their origins. Many have acquired a sort of iconic status providing a veneer of great antiquity and were beloved by many of the landscape writers celebrated in Chapter 1. The poet Edward Thomas (1916) wrote on the Icknield Way. Stroud (2017) has described the magnetic attraction of the Oxfordshire Ridgeway and its Uffington White Horse. Hilaire Belloc (1904) wrote lyrically of the North Downs Way; illustrations in his book include a map of six ridgeways which in a very general way he saw as converging on Stonehenge. Their assumed prehistoric origins are, however, open to debate. Sherratt (1996) regarded them as a myth, proposing instead the significance of riverine transport, a theme returned to in Chapter 9.

A key factor which originally led to their identification as routes was that they seemed to be associated with concentrations of prehistoric monuments such as barrows, hillforts and other settlements along the ridges. At the time it was assumed that the lowlands and clay vales remained wooded and impenetrable. The situation changed when air photography, and increased archaeological survey and excavation, demonstrated there were equally dense concentrations of barrows, prehistoric ritual sites and settlements in the surrounding lowlands, such as the Thames valley north of the Oxfordshire Ridgeway (Hey *et al* 2011). Grimes (1951) discussed the Jurassic Way across England from Mendip to the Humber but frankly does not produce any convincing evidence for its former existence. Taylor (1979) showed that the part of that route which crosses Northamptonshire was neither a ‘natural’ route, since it is crossed by multiple wet valleys, nor one that was associated with a particular concentration of prehistoric sites, once the many newly discovered sites in the lowlands and valleys were taken into account; consequently, the existence of the Jurassic Way in prehistory seems especially questionable.

Where we have environmental evidence from barrows, both long (Neolithic) and round (mainly Bronze Age), they were constructed in open short grassland environments with little evidence for scrub and woodland (Evans 1972). For such an environment to have been maintained, active grazing must have occurred. Thus, environmental evidence strongly supports Fleming’s (1971) view of the ridge crests as upland pasture and it seems reasonable to infer that concentrations of barrows are found in ancestral grazing lands.

***Case Study: The Wiltshire and Oxfordshire Ridgeway***

Two recent landscape archaeology projects have contributed to an understanding of the history of the Ridgeway: one in Oxfordshire, the other in Wiltshire. The Oxfordshire project was focused on the Iron Age hillfort of Uffington Castle which is right next to the present Ridgeway as Figure 8.9a shows (Miles *et al* 2003). Two kilometres west of Uffington, beside the Ridgeway, is the Neolithic tomb at Wayland’s Smithy (Figure 9c), which has often been cited as evidence for the route’s early origins. Dominating the Vale below the escarpment and just 160m from the hillfort is the giant hill figure of the White Horse of Uffington which OSL dating showed originated in the late Bronze, or early Iron Age (Miles *et al* 2003). The hillfort originally had two opposed entrances, so any route along this line may have passed through that axis; however, one entrance was blocked *c* 400BC. The landscape south of the escarpment is dissected by a series of north-south dry valleys with the result that the Ridgeway can be seen as a 'natural route'. Acceptance of the Ridgeway as a route gains support from computer modelling of least-effort paths of movement, which did nonetheless involve certain assumptions about sticking to higher ground (Bell and Lock 2000). The computer model shows that the least cost path passes through three of the four hillforts on the ridge and within 80m of the fourth, that at Uffington Castle.

However, early origins for the Ridgeway are called into question by a linear ditch of probable later Bronze Age date which runs up to the hillfort from the south at right angles to the Ridgeway (Figure 8.9a). Excavation showed that the ditch was infilled by the Romano-British period and that the present Ridgeway, which crosses it here, is not earlier than this date (Miles *et al* 2003). The project concluded that there was no certain evidence for the prehistoric origins of the Ridgeway; however, a route could have taken somewhat different line in some periods, eg through the hillfort, or to its north. Other prominent features of this landscape are the hollow ways, which descend the steep escarpment and form north / south routes to the clay vale below; these are undated. Multi-isotope studies of herbivore teeth from sites on the Ridgeway and the clay vale to the north demonstrate that sheep were mainly raised on the chalk, whilst cattle spent their first two or three years in the isotopically-distinct vale but subsequently spent time on the chalk (Schulting *et al* 2019). That could be consistent with a model of seasonal movement of older cattle up the hollow ways to the downs in summer but if so they were not accompanied by sheep.

One hollow way curves round the slope behind the back and tail of the White Horse (Figure 8.9b) raising the intriguing possibility that what inspired the horse image were the curving lines of an early chalky hollow way showing up against the green of the escarpment. Either way, the horse symbolism is highly significant given the transformative effect of horse riding in facilitating far greater mobility from the late Bronze Age. It has furthermore been proposed by Pollard (2017) that the white horse, which is clearly running from east to west, reflects the mobility-related sun horse imagery, depicted on razors and rock art, which is such a feature of Bronze Age Scandinavian cosmology (Chapter 9).

The second project which has proved important for an understanding of the Ridgeway is on Overton Down, Wiltshire. Here the Ridgeway runs along the top of the escarpment 1.7km east of the great late Neolithic henge at Avebury (Figure 5.5). A detailed survey based on air photographs of the field systems and settlements of Overton and Fyfield Down, and selected excavation of settlements and fields, though not the Ridgeway itself, enables the Ridgeway to be seen in the context of its wider landscape (Fowler 2000; Fowler and Blackwell 1998). The Sanctuary on Overton Hill lies beside the Ridgeway and along it running north for 800m is a line of barrows. However, detailed mapping of the early landscape shows that the present Ridgeway line overlies ‘Celtic’ fields and must have been established after these went out of use in about the fifth century AD. The present line appears to have been established by about the tenth century AD when the Ridgeway formed the boundary of several parishes. Four kilometres to the south of Overton the Ridgeway was in existence when the long distance defensive dyke, Wansdyke, was laid out in the post-Roman period (5th to 10th centuries AD), because there is a defended gateway in the Dyke where the Ridgeway crosses at right angles (Fowler 2000; Reynolds and Langlands 2011). The Ridgeway as currently defined does not accord with the track systems of the prehistoric and Romano-British landscape which Fowler (1998; 2000) identified, at Overton and Fyfield, but he argues that rather than one ridgeway route, landscape analysis reveals multiple, roughly parallel routes forming an axis of movement. He suggests that this is of at least Romano-British date and probably had its origins in later prehistory with the seasonal movement of animals from the lowland to the south up to the high downland in summer (Fowler 1998).

The relationship between the Ridgeway and the great Neolithic Henges remains enigmatic. The West Kennet Avenue (Figure 5.5) leads from Avebury to the Sanctuary on the present ridgeway, but there is no obvious connection (eg entrance) linking the two. The east entrance to Avebury leads up the Herepath crossing the Ridgeway and continuing along the north flank of the Kennet Valley. The great sarsens used to construct Avebury are likely to have travelled down this route from Fyfield Down where the greatest concentration of sarsens is found today. It has also been assumed that the sarsen stones used at Stonehenge may have come from the Overton and Fyfield areas. If so, they are likely to have been transported 30km south along a continuation of the Ridgeway across the Vale of Pewsey to Salisbury Plain. Figure 8.5 shows one of two places where multiple incised hollow ways descend into the Vale of Pewsey in the general direction of Stonehenge. The other hollow way route descends from a prominent col between the Neolithic tomb of Adam's Grave and the causewayed enclosure on Knap Hill.

***The Icknield Way***

The Wiltshire-Oxfordshire Ridgeway continues east through Buckinghamshire, Cambridgeshire and into East Anglia as the Icknield Way, a name sometimes applied to the entire route. Together the Ridgeway and the Icknield Way are probably Britain's most widely acknowledged 'prehistoric' route. Fox (1923) described it as a superb 'natural' routeway with many barrows and other archaeological sites along its line. Today, however, it is appreciated that archaeological sites are also very abundant in the surrounding lowlands, for example along the Fen edge to the north (Taylor 1979, fig 17). In Norfolk the Icknield Way runs to the east of the Fenland; it is paralleled by another route, the Pedders Way, which was a road in the Roman period (Figure 8.10a). Neither has been the subject of very detailed field investigation. The Icknield Way and Pedders Way converge on the North Norfolk coast close to Holne-next-the-Sea which is a natural crossing point by sea over the Wash (Figure 8.1). At Holne two circular wood structures known as 'sea henges', together with trackways and other wood structures, have been revealed by coastal erosion on the foreshore (Figure 8.10b). Both are dated dendrochronologically to 2049 BC (Brennand and Taylor 2003; Robertson 2016). The henges were erected in a saltmarsh environment. It seems possible that the location of the sea henges reflects the landward end of a significant routeway, but whether this represents the long-distance route envisaged by previous generations, or a more localised route is open to question.

Recent writers have grown more sceptical of the Icknield Way's prehistoric reality. In Buckinghamshire cross dykes of the first millennium BC cut across the ridge (Bryant and Burleigh 1995). In Cambridgeshire the bundle of Ridgeway routes seem to postdate apparently defensive dykes of the Post-Roman period and Harrison (2003) calls into question the very existence of a long distance route in prehistory. Post-medieval maps suggest an escarpment foot route of the Icknield Way was at that time more significant and at Aston Clinton that route has been shown by excavation to postdate features of Iron Age to Anglo-Saxon date.

**The origins of Roman roads in Britain**

The Roman roads of Britain were comprehensively reviewed in a pioneering study by Margary (1955). They were mapped on the *Ordnance Survey Map of Roman Britain* (1956) and the network is constantly being extended by new discoveries. They are one aspect of past routeways which has long been the subject of quite lively archaeological research, in contrast to prehistoric routes. Roman roads are readily recognisable since they run more or less straight between towns and other sites, are generally flanked by ditches and have well-constructed metalled surfaces. The more important routes are described in written sources: the Antonine Itinerary, the Tabula Peutingeriana and the Ravenna Cosmology (Jones and Mattingly 1990). The general assumption is that they represent a radical, efficient and entirely new imposition on the British landscape, an imposed system of elite control.

Roman roads themselves are outside the prehistoric scope of this book but a pertinent aspect, which has received little attention, concerns the extent to which some of those routes may have appropriated pre-Roman antecedents. Bishop (2014) in reviewing the Roman roads of Britain argues that although we know virtually nothing of the pre-Roman road network, it is inherently likely that the invading Romans made at least some use of existing routes on arrival. The last two decades of research have been notable in demonstrating the extent to which some of the trappings of a Roman way of life were introduced as a result of contact and trade in the century before the conquest in AD 43 (eg Creighton 2005). Oppida settlements developed and were defended by systems of ditches. Excavations have revealed that within the oppidum at Silchester a system of laid roads and buildings was established from the last two decades BC (Fulford  2012). A series of oppida existed in lowland Britain and, given the importance of trade and continental contact in the genesis of these sites, it seems probable that they would have been connected by roads which are likely to have been on a similar line to the Roman roads which connected towns that developed from oppida. The dykes round the Silchester oppidum seem to have had entrances in the same position as the later Roman gates, suggesting roads radiating in the same directions. A late Iron Age mirror burial dated 75-25 BC 2km south of Silchester (Fulford and Creighton 1998) lies close to the point where roads to Winchester and Chichester, both pre-Roman foundations, diverged. At the Winchester end of one of these roads, 48km to the south west, the Roman road enters the town through an entrance which was also that of the Iron Age defended site of Orams Arbour which was on a different plan to the Roman town (Cunliffe 1965). Within Orams Arbour a hollow way has been excavated linking this entrance to another. It is argued that the site originated in the middle Iron Age to control a network of routes at a point where there was a river crossing (Ford and Teague 2011; Ottaway 2017).

The Roman road between Colchester and Verulamium, which both originated as Iron Age oppida and became Roman towns, has been argued to be a development of a late Iron Age route (Witcher 1998). Copeland (2009) reviewed this question in the case of the Roman Akeman Street between the late Iron Age oppida at Verulamium and Bagendon but without identifying any conclusive evidence that the road had Iron Age origins. Roman roads also meet at Iron Age hillforts, at Badbury Rings and Old Sarum, suggesting the possibility of earlier origins (Bishop 2014). Rackham (1986) advocates a pre-Roman origin for many routes in areas of ancient British countryside, in support of which he draws particular attention to Wool Street which, close to Cambridge, is a typical Roman road, whereas 14km out it no longer has a typically Roman form and its route is less direct; this, he maintains, is suggestive of an earlier route, only part of which was adopted and improved by the Romans. In cases where the end points of a late Iron Age road appear to be known it should not be impossible to identify by survey or excavation traces of an early route between them.

Evidence for the pre-Roman origins of a Roman road is most clearly demonstrated by excavation in advance of quarrying at Sharpstone, west of Wroxeter Roman town (Malim and Hayes 2010). Several phases of earlier tracks were dated using a combination of radiocarbon, Optically Stimulated Luminescence and Bayesian statistical analysis of the stratified dated sequence (Figure 8.11). The phases of road construction in the last two centuries of the Iron Age from about 200 cal BC involved initially brushwood and later sand, pebbles and gravel. The Iron Age road was straight, had been carefully engineered and was well maintained. Phases of road construction were interleaved with colluvial sediments. On the surface of one phase were wheel ruts, and another phase had spherulite particles indicative of herbivore dung and dung beetles, indicating that animals were moved along the route. Cattle footprints below the earliest brushwood phase indicated it originated with animal droving. An underlying post was dated to the Bronze Age suggests the possibility of still earlier origins.

Whilst Sharpstone was perhaps unexpected in terms of its remoteness from the main late Iron Age elite centres, there is evidence that it is not an isolated example. In this and earlier chapters we have identified several cases where earlier routes appear to be succeeded by Roman roads. In some cases, these may justifiably be described as ‘natural’ routes, because they are by far the most suitable way to access an area. One example is the Roman road linking forts up the Usk Valley, Wales which we have suggested originated as a Neolithic route (Figure 5.2). The presence of Roman forts also carries with it the implication that it was also a significant route in the Iron Age.  Another example is the main east-west Roman road across upland in north Wales at Tal-y-fan which follows a route marked by Bronze Age monuments (Figure 7.4). There is also the Roman Fen Causeway which crosses the Flag Fen embayment at the same natural crossing point as the Flag Fen late Bronze and Iron Age post alignment (Figure 6.10). Other examples are less obviously ‘natural’ routes. A Roman road descending the North Downs escarpment at Whitehorse Stone has been argued to be on the same alignment as a probable Neolithic route (Figure 10.11).

**Conclusions**

With the appearance of extensive agricultural landscapes of fields and settlement in the middle Bronze Age evidence for trackways becomes far more extensive. So much so that in this chapter we have had to focus down and concentrate on the evidence from Britain with only occasional references to elsewhere in Europe. The various ways in which trackways may be preserved, recognised and dated in relation to fields have been identified. The potential transformative effects on routeways of the horse and wheel have been suggested but this is a topic awaiting investigation in prehistory. Two types of routeway have been given special emphasis in this chapter. One is the hollow way, important because once deeply incised they are virtually permanent features of the landscape and are likely to have influenced subsequent long-term human mobility. The second main topic has been coaxial field systems which in lowland and river valley areas provide evidence for multiple parallel routes linking areas of contrasting landscape. These survive in the present-day landscape and some may have had prehistoric origins.

As for the Ridgeways, on which archaeologists pinned their faith for generations, we have seen there is surprisingly little evidence of prehistoric use. Burials and historical sources show that some, such as the Wiltshire-Oxfordshire Ridgeway and the Pilgrims Way in Kent were established routes by mid-Saxon times (Reynolds and Langlands 2011). Notwithstanding these uncertainties there remain grounds for anticipating longer distance routes from at least the later Bronze Age, as the evidence for wetland causeways / bridges discussed in Chapter 6 suggests. Evidence for wheeled vehicles from the late Bronze Age and Iron Age strengthens that inference. However, to date there is surprisingly little evidence for prehistoric routes covering any distance in Britain, compared with the evidence reviewed in Chapter 7 from the Netherlands, North Germany and Denmark. That this is a puzzling conundrum is highlighted by growing evidence for the movement of artefacts, people and animals, the last two especially attested by recent isotopic evidence. The next chapter argues that riverine and maritime communication provides a partial solution to this conundrum.

# Chapter 9

# Maritime and riverine connectivity and the allure of the exotic.

## Introduction

Preceding chapters have found limited evidence for long-distance prehistoric communication routes on dryland, particularly in the British Isles. Long accepted prehistoric origins for the ridgeways have been shown to be limited and questionable. Thus far the focus has been on movement and routes in terrestrial landscapes, but that is only part of the story. Terrestrial routes will have been linked by boat on rivers and the sea and may often only make sense when considered in that wider context. In some areas, and during some periods, it is likely that most journeys were by water. Archaeologists have tended to treat movement on land and by water as separate specialist categories whereas the two must often have been complementary as Westerdahl (2006) has argued in a Scandinavian context. Most early journeys would have been along the coast and people would have navigated using many of the markers which we considered in a terrestrial context: cairns, standing stones, local clearings, modified trees; all, along with natural features, are likely to have played a part and connected maritime with terrestrial routes.

The purpose of this chapter is to complete the story by highlighting the complementary role of transport by water. The comparatively brief treatment here is justified in two ways. Firstly, in relation to riverine transport, although many log boats are known, there has been comparatively little synthetic treatment of the role which rivers and lakes played in movement. This is a challenging topic beyond the scope of this book.  However, one or two case studies provide pointers to possible ways forward. Secondly, in relation to maritime transport, the situation is almost the opposite; there has been much recent research and synthesis which has advanced understanding significantly, so what is required here is to signpost this work and consider how it may have linked to patterns of riverine and terrestrial movement.

The advantages of water in facilitating rapid movement over distance are evident; however, such practical issues are not the only reasons prehistoric communities were interested in watery places. They were also sometimes places of ritual and symbolic significance, liminal places where ritual deposition took place in many periods from the Mesolithic to the Iron Age and later. Certain rivers are particularly associated with the deposition of selected artefact types such as weapons and also human skulls, as for instance in the Thames during the Bronze Age and Iron Age (Bradley 1990; 2016). The deposition of metalwork in association with bridge and trackway crossing places has already been noted in the context of Flag Fen and several similar sites in the UK and La Tène in Switzerland (Chapter 6; Schulting and Bradley 2013). On the Atlantic fringe and the Baltic travel by sea was the connecting factor. In much of continental Europe the major river arteries such as the Danube and the Rhine would have served as the main conduits. Thus there is a need to extend recent advances in the understanding of maritime connectivity to riverine environments.

**Riverine transport**

Riverine movement is not particularly easy to identify. We have to consider the character of the river and its suitability for transport at relevant periods in the past.

Many channels may have been very different prior to the human modifications in recent centuries. Increasingly their past character can be reconstructed using geoarchaeological techniques (Brown 1997). We can be reasonably confident of the major rivers being navigable at most times, whilst minor rivers may only have been seasonally navigable. In some cases it may be the river valley itself which acted as corridors of movement rather than riverine transport. Where drainage was disrupted by the effects of glaciation, or the activities of beavers (Coles 2006), extensive early Holocene water bodies would have facilitated local movement, although, in the more minor rivers and streams, beaver dams may have blocked routes, so that easily carried lightweight canoes were more suitable than dugouts fashioned from trees. There are finds of dug-out canoes demonstrating water transport but only rare occurrences of artefacts in them providing evidence for their purpose, or where they came from.

This highlights the importance of making the connection between dry ground and wetland landscapes. Such links have been most effectively demonstrated in the Stonehenge landscape, as discussed in Chapter 5. The Avenue at Stonehenge leads down to the river Avon leaving no doubt about the relationship here between a route and riverine movement. This case has been significantly strengthened by the recent discovery of a short avenue leading from the entrance to Durrington Walls henge down to the same river. It has generally been considered that the bluestones at Stonehenge completed their journey from west Wales on the Wiltshire River Avon; the much larger sarsen trilithon stones could also have completed their journey from the Marlborough Downs on the same river. Both journeys would also have involved overland tracts and, in the case of the bluestones, transport by sea, probably up the

Bristol Channel, then the Bristol River Avon as the least risky route (Parker Pearson 2012).

The recent evidence from the Stonehenge landscape demonstrates the perspicacity of an earlier paper by Sherratt (1996) which encouraged prehistorians to consider the role of rivers as arteries of communication in prehistory. Sherratt argued that the rivers were much more important than the ridgeways which archaeologists had previously emphasised, but which he regarded as a myth. Sherratt particularly emphasised the role of the Wiltshire and Bristol Avon rivers in providing a key communication route across southern Britain. He also suggested that both rivers may share the name Avon, the Celtic word for river, because the corridor that they together provide was seen as part of one conceptual entity. Coles (1994) has extended this argument by proposing that other river names such as Trent and Tarrent, also of Celtic derivation, may point to their role as routes in later prehistory; several such names occur on the Avon/ Severn route. The distribution of amber artefacts of early Bronze Age date particularly highlights the key role of maritime connections into the Poole Harbour area and riverine transport up the Wiltshire Avon to Stonehenge (Figure 9.5).

**Log boats**

Many types of boat will have proved suitable for river and lake transport under certain conditions. Log, hide and bark boats can be inferred to have been used in the Mesolithic and Neolithic periods, though only log boats are represented in the prehistoric archaeological record and these are likely to have been used principally for riverine and lacustrine travel, as indeed the findspots of most examples indicate

(McGrail 1978; Mowat 1996; Gregory 1997). More sophisticated forms extended, or improved, the shape with separate fitted transoms, bows and plank extensions at the side to create larger, more complex craft. A database of European log boats compiled by Arnold (1995; 1996) comprises some 2400 examples. Many are old discoveries of the nineteenth and twentieth centuries and do not survive. Scientific dating programmes provide radiocarbon dates for 571 examples and dendrochronological dates for 58 (Lanting 1997-8). The earliest dugout in Europe seems to be from Pesse, Netherlands dated 8010-7510 cal BC (Menotti 2012). Excavations of a major waterlogged Mesolithic site on the edge of a river dune at Hardinxveld-De Bruin, Netherlands revealed a dugout at the dune edge and dated *c* 5400 cal BC (Figure 9.1; Louwe Kooijmans 2001b). The greatest concentration of Mesolithic dugouts is in Denmark where they are known from 15 sites, all of them later Mesolithic in date; wooden paddles are also recorded from 14 sites (Figure 9.2b-c). This distribution suggests that the dugouts were important not just in riverine communication but along the coast and between the mainland and islands of the Baltic. A dugout from the submerged settlement at Tybrind Vig (Andersen 2013) had a clay hearth, which recent folk practice suggests was used in night fishing to attract eels. Tybrind Vig also produced richly decorated wooden paddles (Figure 9.2c) highlighting the role which boats are likely to have played in social communication both within and between communities. Excavations in advance of the fixed link bridge and tunnel across the Storebaelt, Denmark revealed fragments of 19 dugouts in a mass of drifted wood, much of it derived from fishtraps, at Magrethes Naes, Zealand; these dated between *c* 5440 and 4950 BC (Pedersen *et al* 1997).

From the British Isles the evidence for early logboats is much more limited. There is an early Mesolithic paddle from Star Carr but that could have been used on a boat of hide or bark.   Two Mesolithic logboats are know from Ireland, at Brookland dated 5407 BC and at Lough Neagh dated 5490-5246 BC, and there are three Neolithic examples from Ireland (Gregory 1997; McErlean *et al* 2002). In the rest of the British Isles there are no certain Mesolithic dugouts, although two old finds from Scotland at Friarton on the river Tay and the river Carron were described respectively as coming from under, and within, a Carse clay deposit which was laid down in the Mesolithic. However, without direct dating this remains uncertain. Three Scottish logboats are dated to the Bronze and Iron Ages. No Neolithic logboats are known from England where the earliest is early Bronze Age.  Several British early Bronze Age log coffin burials are boat-shaped and interpreted as either metaphorical, or reused, dugout boats, for example the burial of Gristhorpe Man (Melton *et al* 2013). Boat-shaped stone settings and graves also occur, mostly close to the coast in Scotland with some round the Bristol Channel; these are argued to highlight the significance of connectivity by water in the early Bronze Age (Bradley forthcoming). Six log boats dated between 1300-700 BC have recently been found in a palaeochannel at Must Farm in the English Fenland, near a timber platform settlement and with evidence for some very well-preserved basketry fish traps (Gibson *et al* 2012; Knight and Murrell 2012).

Although experiments have shown that log boats can be used at sea under certain conditions (Dunkley 2014), in practice their use is likely to have been restricted to the more sheltered locations. We may suppose logboats were the general workhorse of communication in many inland waters.  At Shardlow a logboat dated 1430-1190 cal

BC was used to transport large blocks of sandstone and was found beside a causeway of wood and sandstone in a palaeochannel of the river Trent (Garton *et al* 2001). An especially magnificent dugout, which provides some pointers to its use, is the Hasholme boat from Yorkshire (Millet and McGrail 1987). It was of sophisticated construction and was fashioned from a 800 year old tree, 14m long and 1.4m in diameter. It was capable of carrying a crew of 20, or, with a crew of five, could carry 5.5 tonnes of cargo. Its final cargo included sides of beef and timber. The boat had a carved oculus or eye, a feature seen on boats of many periods especially in the Mediterranean.

**Hide boats**

Sea-going boats are described in written Classical sources relating to Iberia, Brittany and Britain from the later first millennium BC (McGrail 2004, 181; Cunliffe 2001a); they were of wooden frames covered with animal hides. Representations in the form of artefacts dated to the Bronze and Iron Ages mean we can be confident that such craft existed. The Caergwrle bowl is a wetland find from north Wales; it is an elaborate oval bowl fashioned from Kimmeridge shale, decorated with sheet tin and gold apparently depicting shields or sun motifs along the side, with oars and a wavy sea; it is dated *c* 1200BC (Green 1985; Rednap 2011). Though the boat attribution may seem speculative, a clinching piece of evidence is the presence of pairs of oculi at either end. These eye motifs, seen also at Hasholme, are found on boats of many periods. A second artefact, the Broighter sheet gold boat from Ireland, is dated by associated objects to the first century BC. This certainly represents a boat which, from its oval shape and curved profiles, was hide and probably seagoing. It was propelled by nine oars on either side and a steering oar is also represented; of special significance is the presence of a mast demonstrating the use of a sail (McGrail 2004). Its proportions suggest a boat maybe 12-15m long. Hide boats known as currachs have been used in areas such as the Aran Islands in the west of Ireland into recent times, demonstrating their suitability for challenging sea conditions (Synge 1979). McGrail (2004) is of the view that hide boats were more seaworthy than the types of prehistoric plank boats discussed below. From Nors in north-west Jutland, Denmark there are 100 miniature gold leaf canoe-shaped boats, some decorated with solar symbols.  Their form is suggestive of skin rather than log boats (National Museum, Copenhagen, Denmark). A much more modest type of hide boat, which has survived to the present day in Wales, is the coracle, traditionally a bowl-shape of woven wickerwork with a hide covering and seat for one person, which was used on rivers for fishing (Jenkins 1988). One such fisherman, Mr Edward Thomas, crossed the English Channel in a coracle in 1974 in 13.5 hours (Dunkley 2014), but their historical use was in riverine and very sheltered estuarine locations. A key point is they were light weight, easily carried on a person's back, and are thus illustrative of the intimate connection between dryland and water mobility. An oval, bowl-shaped burial with traces of organic lining from Fife, Scotland has been interpreted as a hide coracle reused for burial in the early Bronze Age (Watkins 1980).

**Sewn-plank boats in the British Isles**

In the Bronze Age and Iron Age, the one boat type which is very well represented in the archaeological record is the sewn plank boat. In all probability, these were the vessels which provided the connections between cultural groups both in north-west

Europe and the Baltic, the means by which metals and other commodities of great social significance were obtained. The archaeological evidence for these boats contrasts geographically: in England and Wales there are finds of the boats themselves mainly of Bronze Age date, while in Scandinavia there is very abundant evidence for Bronze Age boats in rock art and images on metalwork but the only boat finds are of Iron Age date. We will consider first the boats themselves, then the Scandinavian iconographic evidence.

The sewn plank boats are typified by the most complete example found at Dover in 1992 and now magnificently displayed in its own galley in Dover Museum (Clark 2004a). There is another group of finds from the river Humber, especially the discoveries from Ferriby made by the pioneering boat archaeologist Ted Wright from 1937 onwards (Wright 1990). These boats are sophisticated and complex pieces of carpentry (Figure 9.3a and b) which demonstrates the importance of maritime communication during the Bronze Age. The boats were made from hewn planks sewn together with withy ties (twisted thin roundwood) through individual holes on the planks. The ties were generally rebated into the wood to reduce abrasion on beaching.  The planks have internal raised ridges and semi-circular cleat bosses which were perforated for transverse timbers providing lateral strength. The joints between planks were caulked with moss and covered with laths to create a more effective seal between planks. None of the sewn-plank boats have produced any evidence for a mast, sail or fitments for oars and they are presumed to have been paddled.

Eleven or twelve sewn plank boats are known in the British Isles (Figure 9.3c): 4 or 5 from Ferriby, 1 from Brigg and a fragment from Kilnsea, all in the Humber wetlands; 3 fragments of 2 or 3 phases from Caldicot, and 2 planks of the same date from Goldcliff, both in the Severn Estuary; the two-thirds complete boat from Dover; and a fragment from Testwood Lakes inland of the Solent. The dates of these finds are shown on Figure 9.3d which demonstrates they are mainly Bronze Age, with fragments from Ferriby of Iron Age date. The earliest are very close to the beginning of the Bronze Age. Van de Noort (2011) has argued that such complex carpentry became possible with Bronze Age technology and that the sewn plank boat was of Beaker origin, associated with accelerated maritime contacts which occur at this time, although the earliest radiocarbon dates are a few centuries later (Figure 9.3d). As reconstructed Ferriby 1 is the largest of the sewn plank boats, 15.4 by 2.6m and 0.7m high, a boat capable of carrying about 3 tonnes including a crew of up to twelve.  When complete the Dover boat would have been c 11m long and was 2.2m wide and capable of carrying 2 tonnes. It was calculated that with 16 paddlers it could travel at 5 knots and cover up to 56 km a day.

There have been conflicting views as to the environment in which the sewn plank boats were used. McGrail has argued that they were boats for river and estuary use but not seagoing, a purpose for which he favoured the use of hide boats. The locations in which they were found are mostly estuarine, with Dover, Brigg and Testwood being riverine (Van de Noort 2011, fig 40), but the finding of a boat in a river, need not indicate where it was habitually used. Environmental evidence showed that the Dover boat lay in freshwater conditions yet the presence of glauconitic sand and beach-rounded marine shells within the boat suggest it travelled along the coast (Green 2004), whilst a fragment of Kimmeridge shale from the boat may indicate longer sea journeys some 220km west as far as Dorset. The river Dour on which it was found is such a minor drainage of *c* 6 km that it scarcely seems to have justified such a boat and the same can be said of the Nedern Brook where the Caldicot fragments were found, at the tidal limit in this inlet of the Severn Estuary (Nayling and Caseldine 1997).

Understanding of the capability of these boats has recently been significantly advanced by the making of two experimental reconstructions. A half scale replica of the Dover boat was launched in 2012 (Figure 9.3b) and has been trialled in waves in the outer harbour at Dover (Lehoërff *et al* 2012). A full-size replica of a Ferriby boat (Figure 9.3a) was made in 2012 at the National Maritime Museum, Falmouth and has undergone trials in Falmouth Harbour (Van de Noort *et al* 2014). Though neither boat has yet been trialled in the open sea, mainly due to modern health and safety and training issues, those responsible for the trials are confident of the boats' sea-going capabilities. It is reasonable to suppose that Bronze Age people would have chosen the time to travel very carefully and that journeys would generally have been made under the calmest conditions of summer. Even so, journeys in the open sea would have carried a high risk to set against the substantial rewards in terms of material goods and status for those that succeeded. Boats, and the distant contacts which they facilitated, can be seen as having an pivotal social role by providing access to exotic raw materials, especially the metals which were only available in very restricted areas. Production of the most prestigious artefacts involved the combination of alloys and raw materials available in very different locations. In that sense long distance communication was central to Bronze Age society. Voyages would also have provided access to exotic and esoteric knowledge and are likely to have been rites of passage for young elite crews. Van de Noort (2011) has argued that the sewn plank boats were seen as such powerful symbols on account of their exotic contacts that boat pieces were ritually incorporated in structures such as bridges and tracks at Caldicot 2, Testwood Lakes and Goldcliff.

**Possible wrecks round Britain**

Support for the transport of exotic goods by boat may be provided by two collections of Bronze Age metalwork from the seabed which are both interpreted as the sites of wrecks (Needham *et al* 2013). Both are from high energy exposed sea beds, so no trace of a boat itself can be expected to survive. Both collections of metalwork date to the thirteenth century BC on metalwork typology. The most productive of these sites is at Langdon Bay just outside the east harbour wall at Dover, 0.5 km from the present shore and just 2.25 km east of the find spot of the Dover Boat. The find comprises some 360 bronzes, many of them types which are normally found in continental Europe, though some are of types thought to have been made in Britain (Needham *et al* 2013; Lehoërff *et al* 2012). The second collection is from Salcombe, Devon and was made 450 m seaward of a rocky cliffed shore. It comprises 29 objects, mostly bronzes but also gold, tin, iron and bone.

**Landing places in Britain**

Making connections between waterborne and terrestrial routes is made more difficult by the fact that the dugouts, skin boats and other lightly constructed boats of prehistory could have been beached at any gently shelving, sheltered location with no need for a landing stage. No recognisable dock arrangements are represented in north-west Europe until the Roman period. Nonetheless there are indications of landing places. In a riverine context, it was noted in Chapter 5 that the intersections of the Stonehenge avenue with the river Avon and those of routes at Durrington Walls indicate the locations of landing places. In marine contexts a series of sites have been identified, mostly in Scotland. They are protected havens at river mouths, often associated with sand dunes and characterised by artefacts dated between 4000 and 2000 cal BC, including the use of exotic lithic raw materials, evidence of artefact production and the implication that they were places where traders arrived, and goods were produced and exchanged (Bradley *et al* 2016). The presence at Ferriby, Humberside of fragments of plank boats spanning some 1500 years right through the Bronze Age and into the Iron Age can be interpreted as both a frequented landing place and somewhere where boats were also dismantled, repaired and rebuilt. The case is strengthened by the presence of trackways and other wood structures in the Ferriby intertidal area (Van de Noort and Ellis 1999) and by the presence of a long established routeway which later became a Roman road, known today as High Street, along the Lincolnshire Wolds to south Ferriby on the opposite bank of the Humber (Figure 8.1; Van de Noort and Ellis 1999). Also in the Humber wetlands at Brigg, a natural crossing place where the Ancholme valley narrows, is the findspot of a middle to late Bronze Age dugout canoe, an early Iron Age trackway and the Brigg sewn plank boat of the late Bronze Age. The presence at Caldicot, Wales of three sewn plank fragments, one early and two late Bronze Age, also implies a frequently used landing place, an idea supported by other wood structures including a bridge / jetty of the late Bronze Age (Nayling and Caseldine

1997). In the intertidal zone of the Essex coast a number of wood structures were interpreted as possible jetties and landing places (Wilkinson and Murphy 1995). The possibility also needs to be considered that some of the double post alignments on the river Thames at London, for instance that of middle Bronze Age date at Vauxhall (Cohen and Wragg 2017), may represent landing places rather than bridges, or perhaps a combination of the two, since the place where riverine and terrestrial routes cross are natural landing places. In the Thames Estuary trackways, of both wood and stone,  are reported leading in the direction of the estuary, some, as noted in Chapter 6, continuing dryland droveways. The destinations of these are potential landing places and potential locations for boat finds. The clearest evidence for prehistoric harbour installations comes from Poole Harbour, Dorset where two substantial timber and stone jetties were constructed in the later Iron Age (Wilkes 2007). Poole is one of a series of natural harbours on the English Channel Coast associated with cross channel trade at this time.

Portages are places where boats, or goods, can be transported across an isthmus or promontory to avoid long, or dangerous, sea crossings, or river rapids; they are obvious focal points for future investigation. There are many examples in Scandinavia and Scotland which are documented using historical and place-name sources. Some Scandinavian examples have hollow ways leading to them and it has been suggested that such places might be associated with ballast dumps, though no such examples are yet documented (Westerdahl 2006; Bradley *et al* 2016).

**Artefact distributions in Scandinavia**

In the identification of patterns of maritime communication we can also deploy evidence provided by artefact distributions. As early as the late glacial interstadial (Allerød, c 13000BP) it has been inferred that upper Palaeolithic groups colonised the west coast of Norway by boat since there seems to have been no ice-free corridor on land at that time (Coles 2000). In the Mesolithic of Denmark, the distribution of distinctive axe styles has been used to suggest Mesolithic territories spanning 50km at most (Fischer 2003). During the Danish Kongemose *c* 6500-5400 cal BC, the distribution of a distinctive so-called 'wheatsheaf' decorative motif on bone artefacts points to maritime connections around the Little Baelt, between the west of Fyn, the east coast of Jutland and south to Schleswig-Holstein (Figure 9.4; Terberger 2006). This argument is strengthened by similarities of material culture between what is argued to be a year-round site at Tybrid Vig and other sites in this area which may have been visited as a result of logistical (ie task specific) mobility (Andersen 2013). Close similarities in material culture between Scania in southern Sweden and the island of Bornholm, 37km to its south, point to the maintenance of connections across this open sea (Fischer 2002). In the final Mesolithic Ertebolle period, much more distant connections are manifest with the appearance of stone 'shoe last' axes obtained from Danubian farmers and originating from outcrops 1000-1500 km to the south in Bulgaria and Slovakia (Fischer 2002). These probably do not reflect the actual movement of people but of objects. However, the significant point is that they are found on Baltic Islands well to the north of contemporary farming communities and must have arrived there by boat.

**Transported things in Britain and Europe**

Britain was recolonised *c* 12700 cal BC but that was overland at a time when low sea level connected it to continental Europe by Doggerland in the North Sea. Britain finally became an island as a result of sea level rise *c* 6000 cal BC and subsequent contact required a boat crossing of at least 38km. Ireland was colonised by Mesolithic communities about 8000 cal BC and that must have been by boat since it became an island *c* 12,000 cal BC. Recent evidence shows that Orkney, Shetland, the Outer Hebrides and Isles of Scilly were visited in the Mesolithic. There is increasing evidence from the western seaways of the British Isles of the facility with which people moved significant distances, both in the Mesolithic and Neolithic (Garrow and Sturt 2017). Domesticated animals and plants reached the British Isles by boat. Domestic cereals and sheep /goat are non-native and bone measurements also show that domestic cattle and pigs were from introduced stock rather than local domestication (Davis 1987). The scale of human migration as opposed to acculturation of Mesolithic populations remains the subject of active debate, nonetheless it is clear that there was active maritime communication through the Neolithic. Curiously, the earliest dated domesticate, a bone of *Bos* dated 4495-4165 cal BC, is from the west of Ireland on a Mesolithic site at Ferriter's Cove (Woodman *et al* 1999). *Bos* was non-native in Ireland and this suggests the possibility of precocious Neolithic contact up the Atlantic fringe, for which Sheridan (2003; 2004) has argued on the basis of tomb and pottery typology. In England the earliest Neolithic dates are from Kent and the Thames valley, *c* 4100 cal BC. From there Neolithic attributes spread widely and rapidly west and north as far as Wales and Scotland by *c* 3800 cal BC (Whittle *et al* 2011). West to east Irish Sea connections are demonstrated by links of megalithic tomb type and art between the great tombs of the Irish Boyne Valley and north Wales, and from south to north between the

Boyne valley and the tombs of Orkney. Cunliffe (2001a, 199) saw this as reflecting a common Atlantic cultural province. Noble (2006) has likewise argued that travel by sea was a significant factor in the positioning of Orkney Neolithic tombs. Even Britain's most remote island, St Kilda, has produced evidence of Neolithic material culture (Fleming 2005a).

With the arrival of metals, maritime connections are even more clearly demonstrated. Maritime Beakers, among the earliest of the type, have, as the name suggests, a strongly Atlantic distribution from Iberia to Britain (Cunliffe 2001a, fig 6.11). Sheridan (2008) has pointed to close similarities between early Beakers and associated burial practice in Holland and Scotland. Similarly, gold lunulae, which are mostly found in Ireland, also occur on the Cornish coast where one example is almost identical to a find at Kerivoa on the French Cotes d'Amour (Figure 9.5). Figures on stone menhirs in Brittany and Guernsey are shown wearing lunulae (Cunliffe 2001a, fig.6.13). Recently a combination of lead isotope and elemental analysis has concluded that much of the Chalcolithic and early Bronze Age gold, originally thought to come from Ireland, may derive from south-west British alluvial, or other, as yet unidentified, sources (Standish *et al* 2015). Many metal artefacts demonstrate connections between Ireland, the Wessex region and continental Europe, as shown for instance by gold hair rings, neckrings and bar torcs (Eogan 1994), and Cunliffe (2001a) includes many distributions of bronze artefacts illustrating these Atlantic connections. Some of the most compelling evidence for maritime connections has been assembled from the English Channel area, leading Needham to refer to this as a 'maritory', meaning a maritime cultural area (Needham and Parfitt 2006). Connections are demonstrated by a series of precious cups of gold, silver, amber and shale, which span the period 1850-1550 cal BC and occur on the south coast of England, the Netherlands and Brittany (Figure 9.5c). Needham proposes that these cups may have had a role in propitiatory rites associated with maritime travel and related exchange networks. The distribution of amber in southern Britain, much of it probably of Baltic origin, indicates transport along the Channel coast and then, as previously noted, riverine transport to the Stonehenge area (Figure 9.5d). Amber spacer beads and discs mounted in gold, an artefact type distinctive of Wessex, then found their way to the shaft graves of Mycenae and to Crete respectively, perhaps via an Atlantic, French and Mediterranean route (Bouzek 1993). Amber in central Europe seems to have moved south via riverine exchange networks. This is part of a network of amber trade between the Baltic coast of Jutland, where vast numbers of amber beads are found in Bronze Age contexts, and Europe as far as the Mediterranean (Beck and Shennan 1991). In reviewing the rock art of Atlantic Europe, Bradley (1997) has observed that from Scotland to Iberia similar motifs are arranged in similar ways at a similar chronological horizon between *c* 3000 and the early second millennium BC suggesting that these communities were linked by maritime communication.

In the middle Bronze Age the volume of metalwork as represented by hoards and other finds increases markedly and there is abundant evidence for occurrence in British hoards of types characteristic of production on the continent, and vice versa. (Needham *et al* 2013; Lehoërff *et al* 2012). Combining materials of high status to create artefacts of probable cosmological significance contributes to the evidence for exotic maritime contacts. Pre-eminant among them is the Nebra sky disc of *c* 1600 BC, found in central Germany, and apparently depicting the phases of the moon and stars, perhaps used in navigation (Meller 2004). Geochemistry has shown that the gold used was of Cornish origin (Ehser *et al* 2011). Another example is the Caergwrle bowl combining materials of diverse geographic origin: shale, gold and tin (Green 1985; Rednap 2011).

In recent years, evidence of distant metalwork connections has been supplemented by other forms of artefactual and settlement pattern evidence which suggest the connections extended well beyond simple concepts of trade, as indeed Needham's 'maritory' label implies. Among the most telling evidence is the discovery of a very distinctive large pot in the Cornish Trevisker style which was made of Gabbroic clay from Cornwall but was found at the other end of the English Channel on the Isle of Thanet, Kent (Gibson *et al* 1997). Pottery in Trevisker style also turns up on the French side of the English Channel. That pottery also has a coastal distribution up the Bristol Channel and Severn Estuary into south Wales (Bell 2013, fig 17.4) which may suggest that the Trevisker-producing communities of middle Bronze Age Cornwall played a significant role in maritime communication in western Britain and the English Channel. Pots made in Finistère, France are also found in the Solent region of England, for instance on the Isle of Wight (Murphy 2009). Coaxial field systems, discussed in Chapter 8, which are widespread in coastal areas of south-east England have been found in the Cherbourg peninsula, Normandy and elsewhere on the continental side of the Channel (Bradley *et al* 2015). A range of evidence has been assembled in terms of pottery, fields and house forms for strong cross-Channel connections in the middle and late Bronze Age (Marcigny *et al* 2007; Lehoërff *et al* 2012).

During the Iron Age metalwork continued to reach Britain from continental Europe via both Atlantic connections and cross-Channel links to central Europe (Cunliffe 1991). In the later Iron Age cross-Channel trade appears to have particularly focused on favoured harbours at sites such as Hengistbury Head, Mount Batten and Poole Harbour. Particularly illuminating are the writings of Pytheas of Massalia some time before 320 BC whose book *On the Ocean* is only known from references in later works. Pytheas appears to have circumnavigated Britain, voyaging as far as Iceland since volcanos and frozen seas are described (Cunliffe 2001b). In the final centuries of the Iron Age other Greek and Roman writers such as the Massaliote Periplus, Timaeus and others provide tantalising glimpses of voyages up the Atlantic coast to Britain and beyond, often for trade in tin (Cunliffe 2001 a and b). From the north coast of the Isle of Wight, pottery and foreign stone from Brittany and south west England, inferred to be ships' ballast, indicates increasing cross-Channel and along Channel shipping in the later Iron Age (Tomalin *et al* 2012). By the late Iron Age pottery was reaching the Solent area from Brittany (Cunliffe 1991, 437) and wine amphorae of Mediterranean origin were reaching Britain, at first via Hengistbury Head and later, when Caesar's conquest of Gaul disrupted Atlantic routes, the focus of trade shifted to a cross-Channel route into Eastern England for the century preceding the Roman conquest in 43 AD.

As regards the ships which carried this Iron Age trade, we have only indirect evidence. Ships illustrated on Celtic coins of Cunobelin (*c* AD 10-43) show a mast, square sail and side rudder (McGrail 2004). Anchors of Iron Age date are known from Bulbury, Dorset and Porth Felen, Wales, the latter apparently a Graeco-Roman type of the second or first century BC (Cunliffe 2001a). Caesar, when writing of the

Veneti of western Brittany, describes ships with leather sails, the hull fashioned from flush-laid oak planks fastened to thick framing with substantial iron nails, vessels more suited to Atlantic conditions than the ships at the disposal of the Romans. Thus, at least by the later Iron Age, there were larger and more substantial ships than sewn-plank boats. Further evidence of their character is provided by a series of so-called Romano-Celtic boats which share some of the characteristics Caesar described but which were made after the Roman conquest and have been found in the Severn Estuary, the Thames at London, the Channel Islands, the Rhine basin and in Switzerland (Nayling and McGrail 2004). The construction of these ships differs markedly from Roman vessels in the Mediterranean hence the view that the type is of indigenous Iron Age derivation.

**Scandinavia: ships and rock art**

Sewn-plank boats are represented in continental Europe only by a more-or-less complete example from Hjortspring, Denmark, displayed in the National Museum, Copenhagen. It is a light slender war canoe with bevelled lap planks with raised cleats lashed to frames, some 19m long and 2m wide with distinctive upturned projections  (horns, ie keel and prow extensions) at either end. It would have carried 18 paddlers. It was found in a tiny peat bog 3.4 km from the sea, in which it had been ritually deposited together with the weaponry of 70-100 warriors, perhaps the booty of a defeated raiding party (Crumlin-Pedersen and Trakadas 2003). An experimental full size replica performed effectively as rapid marine transport capable of covering *c* 100km a day. Other probable fragments of sewn plank boats are reported from

Haugvik, northern Norway dated to the first or second century BC, and Hampnas, Vasternorrland, Sweden, dated *c* 220BC (Sylvester 2009; Janssen 1994).

For the Bronze and Iron Ages the rock art of Norway and Sweden, and depictions of boats on bronzes from Denmark, provide a complementary perspective on later prehistoric maritime communication which is especially important in illuminating the social and cosmological aspects of exotic contacts. The rock art of southern Scandinavia is dominated by pictures of boats of which 19,322 images are documented (Nimura 2016). Many examples are remarkably informative as to boat type; they apparently show sewn-plank boats with the distinctive horned prow as at Hjortspring. The prow often has an animal head, usually horse.

Figure 9.6 is an example from Soletorp, Sweden depicting three boats, the upper with 13 crew, larger figures fore and aft with horned helmets and axes, horse head terminals at either end of the boat and an acrobat above the boat. A few examples with deeper hulls are thought to depict hide boats (Crumlin-Pedersen 2010). Many of the plank boats depict rows of paddlers and occasionally a steering oar is shown. They do not generally have obvious sails although Bengtsson (2017) has recently argued that aspects of the iconography should be interpreted as sails. Among the crew there is often one or more much larger figure interpreted as leader(s). These prominent figures are often phallic and the overall imagery with the emphasis on weapons is strongly male with a near absence of female figures and obvious children (Hygen and Bengtsson 2000). Prominent figures are sometimes depicted with distinctive types of artefacts which can be dated typologically (Coles 1990), for example, sword scabbards with forked terminals and swords with curved blades (early Bronze Age), horned helmets (late Bronze Age), shield types (round Bronze Age, rectangular Iron Age), lurs (late Bronze Age), and crescentic axes (middle Bronze Age). Sometimes, as in Figure 9.6, mysterious acrobatic figures are shown leaping over the boat.

The Scandinavian rock art is pecked on prominent glacially smoothed rockfaces which often sit at the edges of level plains. Ling (2004; 2008) has shown that many examples sit around the margins of former shorelines, 15-20m above today's sea level, as a result of still continuing isostatic readjustment which followed removal of the huge weight represented by the Pleistocene ice sheets. Many boat images are now kilometres inland but at the time they were made they overlooked the beach and would have been visible from the sea (Hygen and Bengtsson 2000). Isostatic readjustment also provides some guide to dating since earlier images and types of boat relate to higher former shorelines. Sites where ship representations are abundant may represent places where boats from across the Baltic habitually landed for seasonal gatherings involving social and economic exchange. They are concentrated in areas where the effects of shoreline displacement were especially marked, and it has been argued by Nimura (2016) that the art may have had active agency in enabling communities to cope with dramatic environmental changes.

The case for cross-Baltic connections is strengthened by links between the belief systems, symbolism and cosmology of the art in southern Norway and Sweden and those represented iconographically on bronzes in Denmark. Indeed the significance and meaning of the ships, their horse head prows, the acrobats and other features, is greatly augmented by depictions of ships on bronze objects, mainly razors, of which there are 800 from Denmark (Kaul 1998). Kaul has shown that the ships on bronzes are a central part of a sophisticated cosmological scheme representing the solar cycle and the passage of day and night and probably also the seasons, life and death. A significant clue in deciphering this scheme was the Chariot of the Sun from Trundholm, Denmark (*c* 1400 BC), a bronze wheeled model of a horse, drawing a solar disc, with gold on one side, representing day, and silver grey on the other representing night. In Denmark the mysterious acrobatic figures, horse head terminals, figures with horned helmets and axes are also represented as cast bronzes, probably originally fitted to models of ships (Kjaerum and Olsen 1990). All this seems to point to a common cross-Baltic cosmological belief shared by southern Norway, Sweden and Denmark, in which boats played a central part and to which other means of transport, the horse and wheeled vehicles, also contributed. The significance of the means of transport, and particularly the boat, is partly explained by the fact that the metals and ostentatious metal artefacts used in Norway and Sweden were imported from central Europe, as lead isotope and elemental analysis shows (Ling *et al* 2014).

**Conclusions: Maritime connections and cultures**

A theme of this chapter has been the role of movement by water, rivers and the sea in connecting rather than dividing communities (Van de Noort 2011). The significance of this from an early date is demonstrated by the Palaeolithic and early Holocene colonisation of islands in the Mediterranean and South East Asia (Broodbank 2013; Gamble 1993). It is also increasingly apparent from material cultural evidence, that many islands had more connection with outside communities than previously imagined and that their distinctiveness sometimes relates not so much to isolation as to the establishment of a cultural identity in the context of wider contacts. This case has been effectively made by Fleming (2005a) in the case of Britain's most remote island, St Kilda. A similar case can be made for Orkney and the Isles of Scilly, which are now known to have been more connected to other areas in the Mesolithic to Bronze Age than previously imagined (Garrow and Sturt 2017). The implication of this is that archaeologists have tended to underplay the social significance and probably the frequency of maritime communication. Maritime archaeology has suffered from pigeonholing as a separate category of evidence disconnected from the mainstream. Fortunately, that tendency is now being very actively counteracted by Cunliffe' s (2001a) approach to the archaeology of the Atlantic and that of Broodbank (2013) in the Mediterranean. Such studies take account of currents and winds and the natural patterns of movement which are observed today and would have been utilised in the past. These help to explain the patterns of artefactually attested connectivity between Aegean islands and the routes used to cross the English Channel (McGrail 1983). The challenge is to develop an approach to maritime cultural landscapes or seascapes which integrates the archaeology of the sea and land (Westerdahl 1992; 2006; Hunter 1994). A move towards this has been the development of a seamless approach to coastal archaeology which incorporates submarine, intertidal and terrestrial evidence, as pioneered on the Langstone Harbour Survey, UK (Allen and Gardiner 2000) and the Strangford Lough Survey in Northern Ireland (McErlean *et al* 2002). The subject has certainly benefited from greater attention in recent decades, because heritage agencies in many countries have placed increasing emphasis on coastal archaeology. In the UK this has dramatically increased our knowledge of the coastal and maritime heritage resource (Murphy 2014). In seeking to understand distinctive maritime ways of life we can draw not just on the direct archaeological evidence, but on a wider studies of human engagement with the sea from a diversity of periods and perspectives including anthropology, literature and history (Mack 2011; Gillis 2012). Examples where ethnohistorical perspectives have proved especially illuminating include an understanding of traditional fishing practice (O'Sullivan 2003c) and the performance and role of skin curragh boats in the Aran Islands on the west of Ireland (Synge 1979). As Van de Noort (2011) has emphasised, people's relationship with seascapes defined them in terms of their livelihood, identity and place in history.

So why do coasts often appear to be seen as special places and what motivated distant maritime communication? It has been widely recognised that coasts have been seen as liminal places representing transitions, for instance from life to death. Mesolithic Ertebolle burials in dug-out canoes have been interpreted in these terms (Bradley 2000), as have ship images on Bronze Age razors from Denmark and the related rock art of Scandinavia. The liminal properties of the coast may also account for the concentration of megalithic tombs on the coastal fringes of Atlantic Europe, for instance in Brittany (Scarre 2002) and Pembrokeshire (Tilley 1994). An extension perhaps of this liminality or transitional concept concerns the particular properties of the ship itself. Van de Noort (2011) has highlighted the notion of the ship as hererotopia, a space where the conventional is contested. He further argues that, through the significant social role that ships played, the ships themselves acquired iconic status and were ritually deposited. That is a somewhat different emphasis from the ritual deposition of the boats of defeated raiders which has been proposed at Hjortspring in Denmark. Regarding the motivation of distant contact, valuable insights are provided by Homer's (ND) *Odyssey* written in the ninth century BC but set in the time of the Trojan War in the thirteenth century BC. It describes a distant, immensely challenging voyage by which the status and character of those involved were built.  Helms (1988) has developed this idea from the perspective of anthropology, demonstrating that by distant travel people acquired esoteric knowledge and privileged access to exotic objects; this exoteric knowledge became part of the validation, or legitimation, of elite status (Kristiansen and Larsson 2005). Amber can be seen in these terms (Beck and Shennan 1991) and the same can be said of many of the prestige goods of later prehistoric north-west Europe. It is striking how many of them combine metals and geological material derived from diverse geographical sources and are themselves icons of mobility, for instance the Cergwyle bowl in the form of a boat, the Broighter boat, the Nebra Sky Disc and the Trondholm 'Chariot of the Sun'. Clearly acquisition and display of exotic objects was of central importance to the maintenance and reproduction of elites who, through distant travel, had privileged access to other worlds and the esoteric knowledge which they provided.

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This chapter has highlighted the importance of understanding relationships between terrestrial, riverine and maritime transport and the significant social role which these relationships played in prehistory. These relationships will be further touched on at the end of the following case study chapter and in the conclusions.

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# Chapter 9

# Maritime and riverine connectivity and the allure of the exotic.

## Introduction

Preceding chapters have found limited evidence for long-distance prehistoric communication routes on dryland, particularly in the British Isles. Long accepted prehistoric origins for the ridgeways have been shown to be limited and questionable. Thus far the focus has been on movement and routes in terrestrial landscapes, but that is only part of the story. Terrestrial routes will have been linked by boat on rivers and the sea and may often only make sense when considered in that wider context. In some areas, and during some periods, it is likely that most journeys were by water. Archaeologists have tended to treat movement on land and by water as separate specialist categories whereas the two must often have been complementary as Westerdahl (2006) has argued in a Scandinavian context. Most early journeys would have been along the coast and people would have navigated using many of the markers which we considered in a terrestrial context: cairns, standing stones, local clearings, modified trees; all, along with natural features, are likely to have played a part and connected maritime with terrestrial routes.

The purpose of this chapter is to complete the story by highlighting the complementary role of transport by water. The comparatively brief treatment here is justified in two ways. Firstly, in relation to riverine transport, although many log boats are known, there has been comparatively little synthetic treatment of the role which rivers and lakes played in movement. This is a challenging topic beyond the scope of this book.  However, one or two case studies provide pointers to possible ways forward. Secondly, in relation to maritime transport, the situation is almost the opposite; there has been much recent research and synthesis which has advanced understanding significantly, so what is required here is to signpost this work and consider how it may have linked to patterns of riverine and terrestrial movement.

The advantages of water in facilitating rapid movement over distance are evident; however, such practical issues are not the only reasons prehistoric communities were interested in watery places. They were also sometimes places of ritual and symbolic significance, liminal places where ritual deposition took place in many periods from the Mesolithic to the Iron Age and later. Certain rivers are particularly associated with the deposition of selected artefact types such as weapons and also human skulls, as for instance in the Thames during the Bronze Age and Iron Age (Bradley 1990; 2016). The deposition of metalwork in association with bridge and trackway crossing places has already been noted in the context of Flag Fen and several similar sites in the UK and La Tène in Switzerland (Chapter 6; Schulting and Bradley 2013). On the Atlantic fringe and the Baltic travel by sea was the connecting factor. In much of continental Europe the major river arteries such as the Danube and the Rhine would have served as the main conduits. Thus there is a need to extend recent advances in the understanding of maritime connectivity to riverine environments.

**Riverine transport**

Riverine movement is not particularly easy to identify. We have to consider the character of the river and its suitability for transport at relevant periods in the past.

Many channels may have been very different prior to the human modifications in recent centuries. Increasingly their past character can be reconstructed using geoarchaeological techniques (Brown 1997). We can be reasonably confident of the major rivers being navigable at most times, whilst minor rivers may only have been seasonally navigable. In some cases it may be the river valley itself which acted as corridors of movement rather than riverine transport. Where drainage was disrupted by the effects of glaciation, or the activities of beavers (Coles 2006), extensive early Holocene water bodies would have facilitated local movement, although, in the more minor rivers and streams, beaver dams may have blocked routes, so that easily carried lightweight canoes were more suitable than dugouts fashioned from trees. There are finds of dug-out canoes demonstrating water transport but only rare occurrences of artefacts in them providing evidence for their purpose, or where they came from.

This highlights the importance of making the connection between dry ground and wetland landscapes. Such links have been most effectively demonstrated in the Stonehenge landscape, as discussed in Chapter 5. The Avenue at Stonehenge leads down to the river Avon leaving no doubt about the relationship here between a route and riverine movement. This case has been significantly strengthened by the recent discovery of a short avenue leading from the entrance to Durrington Walls henge down to the same river. It has generally been considered that the bluestones at Stonehenge completed their journey from west Wales on the Wiltshire River Avon; the much larger sarsen trilithon stones could also have completed their journey from the Marlborough Downs on the same river. Both journeys would also have involved overland tracts and, in the case of the bluestones, transport by sea, probably up the

Bristol Channel, then the Bristol River Avon as the least risky route (Parker Pearson 2012).

The recent evidence from the Stonehenge landscape demonstrates the perspicacity of an earlier paper by Sherratt (1996) which encouraged prehistorians to consider the role of rivers as arteries of communication in prehistory. Sherratt argued that the rivers were much more important than the ridgeways which archaeologists had previously emphasised, but which he regarded as a myth. Sherratt particularly emphasised the role of the Wiltshire and Bristol Avon rivers in providing a key communication route across southern Britain. He also suggested that both rivers may share the name Avon,  the Celtic word for river, because the corridor that they together provide was seen as part of one conceptual entity. Coles (1994) has extended this argument by proposing that other river names such as Trent and Tarrent, also of Celtic derivation, may point to their role as routes in later prehistory; several such names occur on the Avon/ Severn route. The distribution of amber artefacts of early Bronze Age date particularly highlights the key role of maritime connections into the Poole Harbour area and riverine transport up the Wiltshire Avon to Stonehenge (Figure 9.5).

**Log boats**

Many types of boat will have proved suitable for river and lake transport under certain conditions. Log, hide and bark boats can be inferred to have been used in the Mesolithic and Neolithic periods, though only log boats are represented in the prehistoric archaeological record and these are likely to have been used principally for riverine and lacustrine travel, as indeed the findspots of most examples indicate

(McGrail 1978; Mowat 1996; Gregory 1997). More sophisticated forms extended, or improved, the shape with separate fitted transoms, bows and plank extensions at the side to create larger, more complex craft. A database of European log boats compiled by Arnold (1995; 1996) comprises some 2400 examples. Many are old discoveries of the nineteenth and twentieth centuries and do not survive. Scientific dating programmes provide radiocarbon dates for 571 examples and dendrochronological dates for 58 (Lanting 1997-8). The earliest dugout in Europe seems to be from Pesse, Netherlands dated 8010-7510 cal BC (Menotti 2012). Excavations of a major waterlogged Mesolithic site on the edge of a river dune at Hardinxveld-De Bruin, Netherlands revealed a dugout at the dune edge and dated *c* 5400 cal BC (Figure 9.1; Louwe Kooijmans 2001b). The greatest concentration of Mesolithic dugouts is in Denmark where they are known from 15 sites, all of them later Mesolithic in date; wooden paddles are also recorded from 14 sites (Figure 9.2b-c). This distribution suggests that the dugouts were important not just in riverine communication but along the coast and between the mainland and islands of the Baltic. A dugout from the submerged settlement at Tybrind Vig (Andersen 2013) had a clay hearth, which recent folk practice suggests was used in night fishing to attract eels. Tybrind Vig also produced richly decorated wooden paddles (Figure 9.2c) highlighting the role which boats are likely to have played in social communication both within and between communities. Excavations in advance of the fixed link bridge and tunnel across the Storebaelt, Denmark revealed fragments of 19 dugouts in a mass of drifted wood, much of it derived from fishtraps, at Magrethes Naes, Zealand; these dated between *c* 5440 and 4950 BC (Pedersen *et al* 1997).

From the British Isles the evidence for early logboats is much more limited. There is an early Mesolithic paddle from Star Carr but that could have been used on a boat of hide or bark.   Two Mesolithic logboats are know from Ireland, at Brookland dated 5407 BC and at Lough Neagh dated 5490-5246 BC, and there are three Neolithic examples from Ireland (Gregory 1997; McErlean *et al* 2002). In the rest of the British Isles there are no certain Mesolithic dugouts, although two old finds from Scotland at Friarton on the river Tay and the river Carron were described respectively as coming from under, and within, a Carse clay deposit which was laid down in the Mesolithic. However, without direct dating this remains uncertain. Three Scottish logboats are dated to the Bronze and Iron Ages. No Neolithic logboats are known from England where the earliest is early Bronze Age.  Several British early Bronze Age log coffin burials are boat-shaped and interpreted as either metaphorical, or reused, dugout boats, for example the burial of Gristhorpe Man (Melton *et al* 2013). Boat-shaped stone settings and graves also occur, mostly close to the coast in Scotland with some round the Bristol Channel; these are argued to highlight the significance of connectivity by water in the early Bronze Age (Bradley forthcoming). Six log boats dated between 1300-700 BC have recently been found in a palaeochannel at Must Farm in the English Fenland, near a timber platform settlement and with evidence for some very well-preserved basketry fish traps (Gibson *et al* 2012; Knight and Murrell 2012).

Although experiments have shown that log boats can be used at sea under certain conditions (Dunkley 2014), in practice their use is likely to have been restricted to the more sheltered locations. We may suppose logboats were the general workhorse of communication in many inland waters.  At Shardlow a logboat dated 1430-1190 cal

BC was used to transport large blocks of sandstone and was found beside a causeway of wood and sandstone in a palaeochannel of the river Trent (Garton *et al* 2001). An especially magnificent dugout, which provides some pointers to its use, is the Hasholme boat from Yorkshire (Millet and McGrail 1987). It was of sophisticated construction and was fashioned from a 800 year old tree, 14m long and 1.4m in diameter. It was capable of carrying a crew of 20, or, with a crew of five, could carry 5.5 tonnes of cargo. Its final cargo included sides of beef and timber. The boat had a carved oculus or eye, a feature seen on boats of many periods especially in the Mediterranean.

**Hide boats**

Sea-going boats are described in written Classical sources relating to Iberia, Brittany and Britain from the later first millennium BC (McGrail 2004, 181; Cunliffe 2001a); they were of wooden frames covered with animal hides. Representations in the form of artefacts dated to the Bronze and Iron Ages mean we can be confident that such craft existed. The Caergwrle bowl is a wetland find from north Wales; it is an elaborate oval bowl fashioned from Kimmeridge shale, decorated with sheet tin and gold apparently depicting shields or sun motifs along the side, with oars and a wavy sea; it is dated *c* 1200BC (Green 1985; Rednap 2011). Though the boat attribution may seem speculative, a clinching piece of evidence is the presence of pairs of oculi at either end. These eye motifs, seen also at Hasholme, are found on boats of many periods. A second artefact, the Broighter sheet gold boat from Ireland, is dated by associated objects to the first century BC. This certainly represents a boat which, from its oval shape and curved profiles, was hide and probably seagoing. It was propelled by nine oars on either side and a steering oar is also represented; of special significance is the presence of a mast demonstrating the use of a sail (McGrail 2004). Its proportions suggest a boat maybe 12-15m long. Hide boats known as currachs have been used in areas such as the Aran Islands in the west of Ireland into recent times, demonstrating their suitability for challenging sea conditions (Synge 1979). McGrail (2004) is of the view that hide boats were more seaworthy than the types of prehistoric plank boats discussed below. From Nors in north-west Jutland, Denmark there are 100 miniature gold leaf canoe-shaped boats, some decorated with solar symbols. Their form is suggestive of skin rather than log boats (National Museum, Copenhagen, Denmark). A much more modest type of hide boat, which has survived to the present day in Wales, is the coracle, traditionally a bowl-shape of woven wickerwork with a hide covering and seat for one person, which was used on rivers for fishing (Jenkins 1988). One such fisherman, Mr Edward Thomas, crossed the English Channel in a coracle in 1974 in 13.5 hours (Dunkley 2014), but their historical use was in riverine and very sheltered estuarine locations. A key point is they were light weight, easily carried on a person’s back, and are thus illustrative of the intimate connection between dryland and water mobility. An oval, bowl-shaped burial with traces of organic lining from Fife, Scotland has been interpreted as a hide coracle reused for burial in the early Bronze Age (Watkins 1980).

**Sewn-plank boats in the British Isles**

In the Bronze Age and Iron Age, the one boat type which is very well represented in the archaeological record is the sewn plank boat. In all probability, these were the vessels which provided the connections between cultural groups both in north-west

Europe and the Baltic, the means by which metals and other commodities of great social significance were obtained. The archaeological evidence for these boats contrasts geographically: in England and Wales there are finds of the boats themselves mainly of Bronze Age date, while in Scandinavia there is very abundant evidence for Bronze Age boats in rock art and images on metalwork but the only boat finds are of Iron Age date. We will consider first the boats themselves, then the Scandinavian iconographic evidence.

The sewn plank boats are typified by the most complete example found at Dover in 1992 and now magnificently displayed in its own galley in Dover Museum (Clark 2004a). There is another group of finds from the river Humber, especially the discoveries from Ferriby made by the pioneering boat archaeologist Ted Wright from 1937 onwards (Wright 1990). These boats are sophisticated and complex pieces of carpentry (Figure 9.3a and b) which demonstrates the importance of maritime communication during the Bronze Age. The boats were made from hewn planks sewn together with withy ties (twisted thin roundwood) through individual holes on the planks. The ties were generally rebated into the wood to reduce abrasion on beaching.  The planks have internal raised ridges and semi-circular cleat bosses which were perforated for transverse timbers providing lateral strength. The joints between planks were caulked with moss and covered with laths to create a more effective seal between planks. None of the sewn-plank boats have produced any evidence for a mast, sail or fitments for oars and they are presumed to have been paddled.

Eleven or twelve sewn plank boats are known in the British Isles (Figure 9.3c): 4 or 5 from Ferriby, 1 from Brigg and a fragment from Kilnsea, all in the Humber wetlands; 3 fragments of 2 or 3 phases from Caldicot, and 2 planks of the same date from Goldcliff, both in the Severn Estuary; the two-thirds complete boat from Dover; and a fragment from Testwood Lakes inland of the Solent. The dates of these finds are shown on Figure 9.3d which demonstrates they are mainly Bronze Age, with fragments from Ferriby of Iron Age date. The earliest are very close to the beginning of the Bronze Age. Van de Noort (2011) has argued that such complex carpentry became possible with Bronze Age technology and that the sewn plank boat was of Beaker origin, associated with accelerated maritime contacts which occur at this time, although the earliest radiocarbon dates are a few centuries later (Figure 9.3d). As reconstructed Ferriby 1 is the largest of the sewn plank boats, 15.4 by 2.6m and 0.7m high, a boat capable of carrying about 3 tonnes including a crew of up to twelve.  When complete the Dover boat would have been c 11m long and was 2.2m wide and capable of carrying 2 tonnes. It was calculated that with 16 paddlers it could travel at 5 knots and cover up to 56 km a day.

There have been conflicting views as to the environment in which the sewn plank boats were used. McGrail has argued that they were boats for river and estuary use but not seagoing, a purpose for which he favoured the use of hide boats. The locations in which they were found are mostly estuarine, with Dover, Brigg and Testwood being riverine (Van de Noort 2011, fig 40), but the finding of a boat in a river, need not indicate where it was habitually used. Environmental evidence showed that the Dover boat lay in freshwater conditions yet the presence of glauconitic sand and beach-rounded marine shells within the boat suggest it travelled along the coast (Green 2004), whilst a fragment of Kimmeridge shale from the boat may indicate longer sea journeys some 220km west as far as Dorset. The river Dour on which it was found is such a minor drainage of *c* 6 km that it scarcely seems to have justified such a boat and the same can be said of the Nedern Brook where the Caldicot fragments were found,  at the tidal limit in this inlet of the Severn Estuary (Nayling and Caseldine 1997).

Understanding of the capability of these boats has recently been significantly advanced by the making of two experimental reconstructions. A half scale replica of the Dover boat was launched in 2012 (Figure 9.3b) and has been trialled in waves in the outer harbour at Dover (Lehoërff *et al* 2012). A full-size replica of a Ferriby boat (Figure 9.3a) was made in 2012 at the National Maritime Museum, Falmouth and has undergone trials in Falmouth Harbour (Van de Noort *et al* 2014). Though neither boat has yet been trialled in the open sea, mainly due to modern health and safety and training issues, those responsible for the trials are confident of the boats' sea-going capabilities. It is reasonable to suppose that Bronze Age people would have chosen the time to travel very carefully and that journeys would generally have been made under the calmest conditions of summer. Even so, journeys in the open sea would have carried a high risk to set against the substantial rewards in terms of material goods and status for those that succeeded. Boats, and the distant contacts which they facilitated, can be seen as having an pivotal social role by providing access to exotic raw materials, especially the metals which were only available in very restricted areas. Production of the most prestigious artefacts involved the combination of alloys and raw materials available in very different locations. In that sense long distance communication was central to Bronze Age society. Voyages would also have provided access to exotic and esoteric knowledge and are likely to have been rites of passage for young elite crews. Van de Noort (2011) has argued that the sewn plank boats were seen as such powerful symbols on account of their exotic contacts that boat pieces were ritually incorporated in structures such as bridges and tracks at Caldicot 2, Testwood Lakes and Goldcliff.

**Possible wrecks round Britain**

Support for the transport of exotic goods by boat may be provided by two collections of Bronze Age metalwork from the seabed which are both interpreted as the sites of wrecks (Needham *et al* 2013). Both are from high energy exposed sea beds, so no trace of a boat itself can be expected to survive. Both collections of metalwork date to the thirteenth century BC on metalwork typology. The most productive of these sites is at Langdon Bay just outside the east harbour wall at Dover, 0.5 km from the present shore and just 2.25 km east of the find spot of the Dover Boat. The find comprises some 360 bronzes, many of them types which are normally found in continental Europe, though some are of types thought to have been made in Britain (Needham *et al* 2013; Lehoërff *et al* 2012). The second collection is from Salcombe, Devon and was made 450 m seaward of a rocky cliffed shore. It comprises 29 objects, mostly bronzes but also gold, tin, iron and bone.

**Landing places in Britain**

Making connections between waterborne and terrestrial routes is made more difficult by the fact that the dugouts, skin boats and other lightly constructed boats of prehistory could have been beached at any gently shelving, sheltered location with no need for a landing stage. No recognisable dock arrangements are represented in north-west Europe until the Roman period. Nonetheless there are indications of landing places. In a riverine context, it was noted in Chapter 5 that the intersections of the Stonehenge avenue with the river Avon and those of routes at Durrington Walls indicate the locations of landing places. In marine contexts a series of sites have been identified, mostly in Scotland. They are protected havens at river mouths, often associated with sand dunes and characterised by artefacts dated between 4000 and 2000 cal BC, including the use of exotic lithic raw materials, evidence of artefact production and the implication that they were places where traders arrived, and goods were produced and exchanged (Bradley *et al* 2016). The presence at Ferriby, Humberside of fragments of plank boats spanning some 1500 years right through the Bronze Age and into the Iron Age can be interpreted as both a frequented landing place and somewhere where boats were also dismantled, repaired and rebuilt. The case is strengthened by the presence of trackways and other wood structures in the Ferriby intertidal area (Van de Noort and Ellis 1999) and by the presence of a long established routeway which later became a Roman road, known today as High Street, along the Lincolnshire Wolds to south Ferriby on the opposite bank of the Humber (Figure 8.1; Van de Noort and Ellis 1999). Also in the Humber wetlands at Brigg, a natural crossing place where the Ancholme valley narrows, is the findspot of a middle to late Bronze Age dugout canoe, an early Iron Age trackway and the Brigg sewn plank boat of the late Bronze Age. The presence at Caldicot, Wales of three sewn plank fragments, one early and two late Bronze Age, also implies a frequently used landing place, an idea supported by other wood structures including a bridge / jetty of the late Bronze Age (Nayling and Caseldine

1997). In the intertidal zone of the Essex coast a number of wood structures were interpreted as possible jetties and landing places (Wilkinson and Murphy 1995). The possibility also needs to be considered that some of the double post alignments on the river Thames at London, for instance that of middle Bronze Age date at Vauxhall (Cohen and Wragg 2017), may represent landing places rather than bridges, or perhaps a combination of the two, since the place where riverine and terrestrial routes cross are natural landing places. In the Thames Estuary trackways, of both wood and stone,  are reported leading in the direction of the estuary, some, as noted in Chapter 6, continuing dryland droveways. The destinations of these are potential landing places and potential locations for boat finds. The clearest evidence for prehistoric harbour installations comes from Poole Harbour, Dorset where two substantial timber and stone jetties were constructed in the later Iron Age (Wilkes 2007). Poole is one of a series of natural harbours on the English Channel Coast associated with cross channel trade at this time.

Portages are places where boats, or goods, can be transported across an isthmus or promontory to avoid long, or dangerous, sea crossings, or river rapids; they are obvious focal points for future investigation. There are many examples in Scandinavia and Scotland which are documented using historical and place-name sources. Some Scandinavian examples have hollow ways leading to them and it has been suggested that such places might be associated with ballast dumps, though no such examples are yet documented (Westerdahl 2006; Bradley *et al* 2016).

**Artefact distributions in Scandinavia**

In the identification of patterns of maritime communication we can also deploy evidence provided by artefact distributions. As early as the late glacial interstadial (Allerød, c 13000BP) it has been inferred that upper Palaeolithic groups colonised the west coast of Norway by boat since there seems to have been no ice-free corridor on land at that time (Coles 2000). In the Mesolithic of Denmark, the distribution of distinctive axe styles has been used to suggest Mesolithic territories spanning 50km at most (Fischer 2003). During the Danish Kongemose *c* 6500-5400 cal BC, the distribution of a distinctive so-called 'wheatsheaf' decorative motif on bone artefacts points to maritime connections around the Little Baelt, between the west of Fyn, the east coast of Jutland and south to Schleswig-Holstein (Figure 9.4; Terberger 2006). This argument is strengthened by similarities of material culture between what is argued to be a year-round site at Tybrid Vig and other sites in this area which may have been visited as a result of logistical (ie task specific) mobility (Andersen 2013). Close similarities in material culture between Scania in southern Sweden and the island of Bornholm, 37km to its south, point to the maintenance of connections across this open sea (Fischer 2002).  In the final Mesolithic Ertebolle period, much more distant connections are manifest with the appearance of stone 'shoe last' axes obtained from Danubian farmers and originating from outcrops 1000-1500 km to the south in Bulgaria and Slovakia (Fischer 2002). These probably do not reflect the actual movement of people but of objects. However, the significant point is that they are found on Baltic Islands well to the north of contemporary farming communities and must have arrived there by boat.

**Transported things in Britain and Europe**

Britain was recolonised *c* 12700 cal BC but that was overland at a time when low sea level connected it to continental Europe by Doggerland in the North Sea. Britain finally became an island as a result of sea level rise *c* 6000 cal BC and subsequent contact required a boat crossing of at least 38km. Ireland was colonised by Mesolithic communities about 8000 cal BC and that must have been by boat since it became an island *c* 12,000 cal BC. Recent evidence shows that Orkney, Shetland, the Outer Hebrides and Isles of Scilly were visited in the Mesolithic. There is increasing evidence from the western seaways of the British Isles of the facility with which people moved significant distances, both in the Mesolithic and Neolithic (Garrow and Sturt 2017). Domesticated animals and plants reached the British Isles by boat. Domestic cereals and sheep /goat are non-native and bone measurements also show that domestic cattle and pigs were from introduced stock rather than local domestication (Davis 1987). The scale of human migration as opposed to acculturation of Mesolithic populations remains the subject of active debate, nonetheless it is clear that there was active maritime communication through the Neolithic. Curiously, the earliest dated domesticate, a bone of *Bos* dated 4495-4165 cal BC, is from the west of Ireland on a Mesolithic site at Ferriter's Cove (Woodman *et al* 1999). *Bos* was non-native in Ireland and this suggests the possibility of precocious Neolithic contact up the Atlantic fringe, for which Sheridan (2003; 2004) has argued on the basis of tomb and pottery typology. In England the earliest Neolithic dates are from Kent and the Thames valley, *c* 4100 cal BC. From there Neolithic attributes spread widely and rapidly west and north as far as Wales and Scotland by *c* 3800 cal BC (Whittle *et al* 2011). West to east Irish Sea connections are demonstrated by links of megalithic tomb type and art between the great tombs of the Irish Boyne Valley and north Wales, and from south to north between the

Boyne valley and the tombs of Orkney. Cunliffe (2001a, 199) saw this as reflecting a common Atlantic cultural province. Noble (2006) has likewise argued that travel by sea was a significant factor in the positioning of Orkney Neolithic tombs. Even Britain’s most remote island, St Kilda, has produced evidence of Neolithic material culture (Fleming 2005a).

With the arrival of metals, maritime connections are even more clearly demonstrated. Maritime Beakers, among the earliest of the type, have, as the name suggests, a strongly Atlantic distribution from Iberia to Britain (Cunliffe 2001a, fig 6.11). Sheridan (2008) has pointed to close similarities between early Beakers and associated burial practice in Holland and Scotland. Similarly, gold lunulae, which are mostly found in Ireland, also occur on the Cornish coast where one example is almost identical to a find at Kerivoa on the French Cotes d’Amour (Figure 9.5). Figures on stone menhirs in Brittany and Guernsey are shown wearing lunulae (Cunliffe 2001a, fig.6.13). Recently a combination of lead isotope and elemental analysis has concluded that much of the Chalcolithic and early Bronze Age gold, originally thought to come from Ireland, may derive from south-west British alluvial, or other, as yet unidentified, sources (Standish *et al* 2015). Many metal artefacts demonstrate connections between Ireland, the Wessex region and continental Europe, as shown for instance by gold hair rings, neckrings and bar torcs (Eogan 1994), and Cunliffe (2001a) includes many distributions of bronze artefacts illustrating these Atlantic connections. Some of the most compelling evidence for maritime connections has been assembled from the English Channel area, leading Needham to refer to this as a ‘maritory’, meaning a maritime cultural area (Needham and Parfitt 2006). Connections are demonstrated by a series of precious cups of gold, silver, amber and shale, which span the period 1850-1550 cal BC and occur on the south coast of England, the Netherlands and Brittany (Figure 9.5c). Needham proposes that these cups may have had a role in propitiatory rites associated with maritime travel and related exchange networks. The distribution of amber in southern Britain, much of it probably of Baltic origin, indicates transport along the Channel coast and then, as previously noted, riverine transport to the Stonehenge area (Figure 9.5d). Amber spacer beads and discs mounted in gold, an artefact type distinctive of Wessex, then found their way to the shaft graves of Mycenae and to Crete respectively, perhaps via an Atlantic, French and Mediterranean route (Bouzek 1993). Amber in central Europe seems to have moved south via riverine exchange networks. This is part of a network of amber trade between the Baltic coast of Jutland, where vast numbers of amber beads are found in Bronze Age contexts, and Europe as far as the Mediterranean (Beck and Shennan 1991). In reviewing the rock art of Atlantic Europe, Bradley (1997) has observed that from Scotland to Iberia similar motifs are arranged in similar ways at a similar chronological horizon between *c* 3000 and the early second millennium BC suggesting that these communities were linked by maritime communication.

In the middle Bronze Age the volume of metalwork as represented by hoards and other finds increases markedly and there is abundant evidence for occurrence in British hoards of types characteristic of production on the continent, and vice versa. (Needham *et al* 2013; Lehoërff *et al* 2012). Combining materials of high status to create artefacts of probable cosmological significance contributes to the evidence for exotic maritime contacts. Pre-eminant among them is the Nebra sky disc of *c* 1600 BC, found in central Germany, and apparently depicting the phases of the moon and stars, perhaps used in navigation (Meller 2004). Geochemistry has shown that the gold used was of Cornish origin (Ehser *et al* 2011). Another example is the Caergwrle bowl combining materials of diverse geographic origin: shale, gold and tin (Green 1985; Rednap 2011).

In recent years, evidence of distant metalwork connections has been supplemented by other forms of artefactual and settlement pattern evidence which suggest the connections extended well beyond simple concepts of trade, as indeed Needham's 'maritory' label implies. Among the most telling evidence is the discovery of a very distinctive large pot in the Cornish Trevisker style which was made of Gabbroic clay from Cornwall but was found at the other end of the English Channel on the Isle of Thanet, Kent (Gibson *et al* 1997). Pottery in Trevisker style also turns up on the French side of the English Channel. That pottery also has a coastal distribution up the Bristol Channel and Severn Estuary into south Wales (Bell 2013, fig 17.4) which may suggest that the Trevisker-producing communities of middle Bronze Age Cornwall played a significant role in maritime communication in western Britain and the English Channel. Pots made in Finistère, France are also found in the Solent region of England, for instance on the Isle of Wight (Murphy 2009). Coaxial field systems, discussed in Chapter 8, which are widespread in coastal areas of south-east England have been found in the Cherbourg peninsula, Normandy and elsewhere on the continental side of the Channel (Bradley *et al* 2015). A range of evidence has been assembled in terms of pottery, fields and house forms for strong cross-Channel connections in the middle and late Bronze Age (Marcigny *et al* 2007; Lehoërff *et al* 2012).

During the Iron Age metalwork continued to reach Britain from continental Europe via both Atlantic connections and cross-Channel links to central Europe (Cunliffe 1991). In the later Iron Age cross-Channel trade appears to have particularly focused on favoured harbours at sites such as Hengistbury Head, Mount Batten and Poole Harbour. Particularly illuminating are the writings of Pytheas of Massalia some time before 320 BC whose book *On the Ocean* is only known from references in later works. Pytheas appears to have circumnavigated Britain, voyaging as far as Iceland since volcanos and frozen seas are described (Cunliffe 2001b). In the final centuries of the Iron Age other Greek and Roman writers such as the Massaliote Periplus, Timaeus and others provide tantalising glimpses of voyages up the Atlantic coast to Britain and beyond, often for trade in tin (Cunliffe 2001 a and b). From the north coast of the Isle of Wight, pottery and foreign stone from Brittany and south west England, inferred to be ships' ballast, indicates increasing cross-Channel and along Channel shipping in the later Iron Age (Tomalin *et al* 2012). By the late Iron Age pottery was reaching the Solent area from Brittany (Cunliffe 1991, 437) and wine amphorae of Mediterranean origin were reaching Britain, at first via Hengistbury Head and later, when Caesar's conquest of Gaul disrupted Atlantic routes, the focus of trade shifted to a cross-Channel route into Eastern England for the century preceding the Roman conquest in 43 AD.

As regards the ships which carried this Iron Age trade, we have only indirect evidence. Ships illustrated on Celtic coins of Cunobelin (*c* AD 10-43) show a mast, square sail and side rudder (McGrail 2004). Anchors of Iron Age date are known from Bulbury, Dorset and Porth Felen, Wales, the latter apparently a Graeco-Roman type of the second or first century BC (Cunliffe 2001a). Caesar, when writing of the

Veneti of western Brittany, describes ships with leather sails, the hull fashioned from flush-laid oak planks fastened to thick framing with substantial iron nails, vessels more suited to Atlantic conditions than the ships at the disposal of the Romans. Thus, at least by the later Iron Age, there were larger and more substantial ships than sewn-plank boats. Further evidence of their character is provided by a series of so-called Romano-Celtic boats which share some of the characteristics Caesar described but which were made after the Roman conquest and have been found in the Severn Estuary, the Thames at London, the Channel Islands, the Rhine basin and in Switzerland (Nayling and McGrail 2004). The construction of these ships differs markedly from Roman vessels in the Mediterranean hence the view that the type is of indigenous Iron Age derivation.

**Scandinavia: ships and rock art**

Sewn-plank boats are represented in continental Europe only by a more-or-less complete example from Hjortspring, Denmark, displayed in the National Museum, Copenhagen. It is a light slender war canoe with bevelled lap planks with raised cleats lashed to frames, some 19m long and 2m wide with distinctive upturned projections  (horns, ie keel and prow extensions) at either end. It would have carried 18 paddlers. It was found in a tiny peat bog 3.4 km from the sea, in which it had been ritually deposited together with the weaponry of 70-100 warriors, perhaps the booty of a defeated raiding party (Crumlin-Pedersen and Trakadas 2003). An experimental full size replica performed effectively as rapid marine transport capable of covering *c* 100km a day. Other probable fragments of sewn plank boats are reported from

Haugvik, northern Norway dated to the first or second century BC, and Hampnas, Vasternorrland, Sweden, dated *c* 220BC (Sylvester 2009; Janssen 1994).

For the Bronze and Iron Ages the rock art of Norway and Sweden, and depictions of boats on bronzes from Denmark, provide a complementary perspective on later prehistoric maritime communication which is especially important in illuminating the social and cosmological aspects of exotic contacts. The rock art of southern Scandinavia is dominated by pictures of boats of which 19,322 images are documented (Nimura 2016). Many examples are remarkably informative as to boat type; they apparently show sewn-plank boats with the distinctive horned prow as at Hjortspring. The prow often has an animal head, usually horse.

Figure 9.6 is an example from Soletorp, Sweden depicting three boats, the upper with 13 crew, larger figures fore and aft with horned helmets and axes, horse head terminals at either end of the boat and an acrobat above the boat. A few examples with deeper hulls are thought to depict hide boats (Crumlin-Pedersen 2010). Many of the plank boats depict rows of paddlers and occasionally a steering oar is shown. They do not generally have obvious sails although Bengtsson (2017) has recently argued that aspects of the iconography should be interpreted as sails. Among the crew there is often one or more much larger figure interpreted as leader(s). These prominent figures are often phallic and the overall imagery with the emphasis on weapons is strongly male with a near absence of female figures and obvious children (Hygen and Bengtsson 2000). Prominent figures are sometimes depicted with distinctive types of artefacts which can be dated typologically (Coles 1990), for example, sword scabbards with forked terminals and swords with curved blades (early Bronze Age), horned helmets (late Bronze Age), shield types (round Bronze Age, rectangular Iron Age), lurs (late Bronze Age), and crescentic axes (middle Bronze Age). Sometimes, as in Figure 9.6, mysterious acrobatic figures are shown leaping over the boat.

The Scandinavian rock art is pecked on prominent glacially smoothed rockfaces which often sit at the edges of level plains. Ling (2004; 2008) has shown that many examples sit around the margins of former shorelines, 15-20m above today's sea level, as a result of still continuing isostatic readjustment which followed removal of the huge weight represented by the Pleistocene ice sheets. Many boat images are now kilometres inland but at the time they were made they overlooked the beach and would have been visible from the sea (Hygen and Bengtsson 2000). Isostatic readjustment also provides some guide to dating since earlier images and types of boat relate to higher former shorelines. Sites where ship representations are abundant may represent places where boats from across the Baltic habitually landed for seasonal gatherings involving social and economic exchange. They are concentrated in areas where the effects of shoreline displacement were especially marked, and it has been argued by Nimura (2016) that the art may have had active agency in enabling communities to cope with dramatic environmental changes.

The case for cross-Baltic connections is strengthened by links between the belief systems, symbolism and cosmology of the art in southern Norway and Sweden and those represented iconographically on bronzes in Denmark. Indeed the significance and meaning of the ships, their horse head prows, the acrobats and other features, is greatly augmented by depictions of ships on bronze objects, mainly razors, of which there are 800 from Denmark (Kaul 1998). Kaul has shown that the ships on bronzes are a central part of a sophisticated cosmological scheme representing the solar cycle and the passage of day and night and probably also the seasons, life and death. A significant clue in deciphering this scheme was the Chariot of the Sun from Trundholm, Denmark (*c* 1400 BC), a bronze wheeled model of a horse, drawing a solar disc, with gold on one side, representing day, and silver grey on the other representing night. In Denmark the mysterious acrobatic figures, horse head terminals, figures with horned helmets and axes are also represented as cast bronzes, probably originally fitted to models of ships (Kjaerum and Olsen 1990). All this seems to point to a common cross-Baltic cosmological belief shared by southern Norway, Sweden and Denmark, in which boats played a central part and to which other means of transport, the horse and wheeled vehicles, also contributed. The significance of the means of transport, and particularly the boat, is partly explained by the fact that the metals and ostentatious metal artefacts used in Norway and Sweden were imported from central Europe, as lead isotope and elemental analysis shows (Ling *et al* 2014).

**Conclusions: Maritime connections and cultures**

A theme of this chapter has been the role of movement by water, rivers and the sea in connecting rather than dividing communities (Van de Noort 2011). The significance of this from an early date is demonstrated by the Palaeolithic and early Holocene colonisation of islands in the Mediterranean and South East Asia (Broodbank 2013; Gamble 1993). It is also increasingly apparent from material cultural evidence, that many islands had more connection with outside communities than previously imagined and that their distinctiveness sometimes relates not so much to isolation as to the establishment of a cultural identity in the context of wider contacts. This case has been effectively made by Fleming (2005a) in the case of Britain's most remote island, St Kilda. A similar case can be made for Orkney and the Isles of Scilly, which are now known to have been more connected to other areas in the Mesolithic to Bronze Age than previously imagined (Garrow and Sturt 2017). The implication of this is that archaeologists have tended to underplay the social significance and probably the frequency of maritime communication. Maritime archaeology has suffered from pigeonholing as a separate category of evidence disconnected from the mainstream. Fortunately, that tendency is now being very actively counteracted by Cunliffe' s (2001a) approach to the archaeology of the Atlantic and that of Broodbank (2013) in the Mediterranean. Such studies take account of currents and winds and the natural patterns of movement which are observed today and would have been utilised in the past. These help to explain the patterns of artefactually attested connectivity between Aegean islands and the routes used to cross the English Channel (McGrail 1983). The challenge is to develop an approach to maritime cultural landscapes or seascapes which integrates the archaeology of the sea and land (Westerdahl 1992; 2006; Hunter 1994). A move towards this has been the development of a seamless approach to coastal archaeology which incorporates submarine, intertidal and terrestrial evidence, as pioneered on the Langstone Harbour Survey, UK (Allen and Gardiner 2000) and the Strangford Lough Survey in Northern Ireland (McErlean *et al* 2002). The subject has certainly benefited from greater attention in recent decades, because heritage agencies in many countries have placed increasing emphasis on coastal archaeology. In the UK this has dramatically increased our knowledge of the coastal and maritime heritage resource (Murphy 2014). In seeking to understand distinctive maritime ways of life we can draw not just on the direct archaeological evidence, but on a wider studies of human engagement with the sea from a diversity of periods and perspectives including anthropology, literature and history (Mack 2011; Gillis 2012). Examples where ethnohistorical perspectives have proved especially illuminating include an understanding of traditional fishing practice (O'Sullivan 2003c) and the performance and role of skin curragh boats in the Aran Islands on the west of Ireland (Synge 1979). As Van de Noort (2011) has emphasised, people's relationship with seascapes defined them in terms of their livelihood, identity and place in history.

So why do coasts often appear to be seen as special places and what motivated distant maritime communication? It has been widely recognised that coasts have been seen as liminal places representing transitions, for instance from life to death. Mesolithic Ertebolle burials in dug-out canoes have been interpreted in these terms (Bradley 2000), as have ship images on Bronze Age razors from Denmark and the related rock art of Scandinavia. The liminal properties of the coast may also account for the concentration of megalithic tombs on the coastal fringes of Atlantic Europe, for instance in Brittany (Scarre 2002) and Pembrokeshire (Tilley 1994). An extension perhaps of this liminality or transitional concept concerns the particular properties of the ship itself. Van de Noort (2011) has highlighted the notion of the ship as hererotopia, a space where the conventional is contested. He further argues that, through the significant social role that ships played, the ships themselves acquired iconic status and were ritually deposited. That is a somewhat different emphasis from the ritual deposition of the boats of defeated raiders which has been proposed at Hjortspring in Denmark. Regarding the motivation of distant contact, valuable insights are provided by Homer's (ND) *Odyssey* written in the ninth century BC but set in the time of the Trojan War in the thirteenth century BC. It describes a distant, immensely challenging voyage by which the status and character of those involved were built. Helms (1988) has developed this idea from the perspective of anthropology, demonstrating that by distant travel people acquired esoteric knowledge and privileged access to exotic objects; this exoteric knowledge became part of the validation, or legitimation, of elite status (Kristiansen and Larsson 2005). Amber can be seen in these terms (Beck and Shennan 1991) and the same can be said of many of the prestige goods of later prehistoric north-west Europe. It is striking how many of them combine metals and geological material derived from diverse geographical sources and are themselves icons of mobility, for instance the Cergwyle bowl in the form of a boat, the Broighter boat, the Nebra Sky Disc and the Trondholm 'Chariot of the Sun'. Clearly acquisition and display of exotic objects was of central importance to the maintenance and reproduction of elites who, through distant travel, had privileged access to other worlds and the esoteric knowledge which they provided.

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This chapter has highlighted the importance of understanding relationships between terrestrial, riverine and maritime transport and the significant social role which these relationships played in prehistory. These relationships will be further touched on at the end of the following case study chapter and in the conclusions.

Making One’s Way in the World

3.7.19

Words before 5842

# Chapter 11

# Conclusions: Why paths matter

## Bodily engagement, perception, anthropology and literature

The almost boundless nature of archaeology is both daunting and exciting. It is a discipline concerned with material evidence for the entire history of human activity. This is daunting, because so many lines of evidence contribute and are inevitably fragmentary, due to the destroying hand of time. It is exciting, because of the opportunities for interdisciplinary engagement which are much in evidence in the study of past patterns of movement. The daunting aspect of studying past routeways has too often been emphasised. Today, however, past patterns of mobility are the subject of active academic engagement, not just in archaeology, but in several cognate disciplines. Especially influential in this regard has been the anthropologically-developed ideas on mobility of Tim Ingold (eg Ingold and Vergunst 2008), who contends that one knows the world, not purely by thinking, but through the bodily engagement of movement, which is central to the way we structure space and understand our identify and place in the world. There is also a much wider and growing recognition of the cultural role and value of walking. Representative of this are the writings of Robert Macfarlane (eg 2012) who conveys empathy with landscape and enthusiasm for what can be perceived through movement. Such concepts are accessible to everybody because, at some level, this is something we all do all the time. The observations that we make are not a series of separate still frames, like photographs, but their significance is derived through movement, from sensory engagement creating perspectives, which change and are enriched as we move.

Prehistorians are increasingly aware of the need to develop an approach to mobility which can animate prehistory; this helps us to escape from a static picture of the past, with its focus on individual sites, to one which looks at the relationships between places as part of living landscapes. Many of the advances so far have been in terms of theoretical perspectives. Moving forward requires consideration of the full range of sources of evidence for past patterns of movement and the development of a practical toolkit of approaches for their application in the field and laboratory.

**Steps forward**

An obvious first step is getting out into the field, developing an understanding and empathy with existing routes and the landscape of which they form part. The approach draws on phenomenological perspectives but seeks to enhance this with other sources of evidence to facilitate evaluation of the strength and reliability of subjective interpretations. The same point applies to the identification of ‘natural routes’, those places where constricted topography, such as a watershed between two valleys, suggests a route once existed. They too can only be accepted if there is independent evidence demonstrating their use at a particular time, eg sites or rock art along the route.

Conceptual changes are also required, a shift of focus from the individual site to a far wider landscape perspective. Drawing on his work on prehistoric routeways in the

Netherlands, Bakker (1976, 76-80) outlined some principles for the identification of ancient roads, particularly highlighting the need to draw on a combination of prehistory, protohistory and historical geographic sources and make full use of the evidence provided by topographic maps. As Bakker (1976, 79) acknowledges, there is a great deal of fragmentary information, eg in individual site reports, but there remains the considerable challenge of putting this together into an understanding of wider patterns of communication. Although, much significant work has been done recently, the essential challenge still remains 40+ years after Bakker wrote this. Other sage advice not yet adequately responded to is Coles' (1984) entreaty that we look at places where supposed ridgeways cross wetlands, and Bowen's (1961) emphasis on the need to establish ways of dating hollow ways and working out their relationship to the ridgeways, a call which has been responded to in Chapter 10.

A wider understanding of routeways and their significance also requires the identification of recurrent characteristics of routeways produced in different areas and by different cultural groups, thus developing a comparative approach to their study. A conference on *Landscapes of Movement* published by Snead *et al* (2009) adopted this approach for cases mainly in middle America and the American South West.  Variables included the amount of construction involved, technology of movement, sites at terminals, functions, scale and meaning. Many of those cases had the benefit of direct ethnographic evidence so that it was possible to establish that many routes had a primarily ideological, rather than practical purpose, such as linking settlements to ceremonial centres. A relationship was also demonstrated between the characteristics of routeways and the social complexity of the groups concerned. The semi-desert context, relatively late date and available anthropological perspectives contrasts with the European cases. However, as Chapter 2 on North America set out to show, perspectives from very different areas can stimulate new approaches and ways forward,in that case highlighting the contribution of niche construction and the manipulation of plant resources to the creation and marking of routes.

**Multi-scalar and multi-disciplinary approaches**

This book has progressed from the local scale of footpaths and footprints to longer routeways and riverine and marine movement. Evidence at a local scale has been deliberately foregrounded. This approach is encapsulated by two terms, often employed in a pejorative way, but amenable to more positive definition. One is parochial, highlighting the benefits of knowledge gained from an intimate understanding of an area. The other is pedestrian, highlighting the value of walking as a way of knowing. Our approach cannot, however, confine itself to a local scale; it is necessarily multi-scalar, from a footprint-track to a long-distance route.

In the case of footprints, particularly important contributions concern the population structure and the axes of movement (Figure 11.1). Prehistoric footprints, discussed in  Chapter 4, highlighted the role of children in prehistoric communities. Footprints can also help us understand the relationship between animal and human movement and provide a new and independent perspective on human / animal relationships based on the animals actually present at the spot in question. This has, for instance, contributed to an understanding of the seasonality of early hominid activity at Laetoli and evidence for the role of saltmarsh exploitation in the later prehistory of the Severn Estuary. In considering the footprint evidence, a relatively new topic for most archaeologists, it has been important to identify the extent of present evidence worldwide and the range of sedimentary and topographic contexts in which it occurs. The preservation of footprints is inevitably restricted to certain geographic and sedimentary contexts and that will influence the conclusions we can draw. However, logic and observation suggests that this form of evidence is far more widespread than is generally appreciated. Wider recognition and recording could make a very significant contribution to work on patterns of past human movement.

Research is inhibited if we confine ourselves to one environment type, or one class of evidence. As Chapter 6 showed, the connectivity implications of wetland tracks have been limited because so few wetland routes have successfully been related to those on dryland. Maybe many were so ephemeral and short-lived that there was no detectable continuation, but the question remains how often have such continuations been actively sort. A notable exception is the suggestion that Corlea Irish bog road formed part of a much longer route apparently linking two royal centres (Figure 6.9).

Two chapters have focused on wetlands, Chapter 4 on footprints and Chapter 6 on constructed tracks, mostly of wood. It is striking how few trackway sites, beyond the Severn Estuary, have also produced footprints. This is puzzling, because in many ways wetlands provide ideal contexts for footprint preservation. Again, we must consider whether we have always looked hard enough. A common theme linking footprint tracks and constructed trackways, particularly in wetlands, is the contribution they make to understanding patterns of connectivity at both a site and landscape scale. We have seen how, in the Severn Estuary, convergent patterns of both footprint-tracks (Figure 4.10) and wooden trackways (Figures 6.8) may enable us to predict the locations of occupation sites and activity areas and how, when, in the case of the Somerset Levels, the evidence for convergence can be combined with palaeoenvironmental evidence for foci of activity, the settlement pattern picture can be further refined (Figure 6.7).

The value of a broad-scale and multi-period approach is demonstrated by excavations in advance of HS1, the high speed rail link between London and the Channel Tunnel (Booth *et al* 2011). Because that work originated in a modern communication route, it was logical that the archaeological investigation included routeway themes and this resulted in particularly important case studies at Whitehorse Stone, where a cross topography route was apparently earlier than the ridgeway routes, and Saltwood Tunnel, where tracks established in the Bronze Age were shown to survive in the Post-medieval landscape. Since major transport infrastructure inevitably changes and disrupts earlier patterns of communication, it is appropriate that environmental mitigation should include documentation, investigation and preservation of these earlier routes. The need to work across all periods has been highlighted by the Wealden case study in Chapter 10. Here there were three main types of routeway: the ridgeways which have been little investigated, the Roman roads which have been well studied, and the multiple parallel droveways at right angles to the topography. Paradoxically each has been considered in isolation respectively by prehistorians, Romanists and medieval historians, without any real focus on the opportunities which their spatial relationships offer for establishing chronology. Clearly this topic needs a great deal more investigation on the ground. However, on present evidence it appears that some of the droveways may be older than the ridgeways and the Roman roads. On the subject of Roman roads, the case of Sharpstone, Shropshire (Figure 8.10) and several other cases have demonstrated there is clear evidence that some had pre-Roman origins.

The American North West Coast has provided a rich seam of ethnographic analogy due to the lateness of European contact and the quality of the ethnohistorical record, particularly with regard to the wide range of plant resources utilised and the effect of people and movement on plant communities (Turner 2014). Evidence for the manipulation and encouragement of plant resources by hunter-gather communities, and the ways in which these were concentrated in particularly favoured places and along routeways, is illustrated by the Douglas map (Figure 2.2). Many types of effect on landscape (eg hollow ways), vegetation, the creation of occupation sites and monuments give rise to spatial structures which influence subsequent patterns of movement. It has been argued that tracks, and especially their intersection points, provide a logical explanation for the frequently observed reoccupation of sites centuries, or even millennia, apart in date; examples include Megalithic tombs in Britain on sites which were previously occupied in the Mesolithic; or evidence of giant posts at Stonehenge millennia before it became enhanced by the great stone monument. The point about the intersection of routeways is especially illustrated by Avebury henge, the four opposed entrances of which make it clear that the grassy clearing which preceded henge construction was at the intersection of two routes.

**Landscape structures and retrogressive analysis**

Although the emphasis here has been on prehistory, there can be no apologies for straying at various points into historic periods, for instance in discussing the origins of Roman roads, and, in the Wealden case study, where droveways are attested from early medieval times, but in some cases these have been shown to have prehistoric origins. The prehistoric focus has served a purpose in demonstrating that, contrary to many earlier opinions, there is much evidence for routeways in prehistory and ways of studying and dating them have been identified. However, when it comes to the identification of specific localised areas,  it is acknowledged that a prehistoric focus is often not the most appropriate approach. More applicable is a uniformitarian approach which acknowledges that we have no other way of knowing the past except from the perspective of the world in which we live. Retrogressive landscape analysis starts from the landscape of today and works progressively back in a time transgressive way. Use is made of air photographs, and old maps to identify patterns of landholding, settlement etc in historic periods (Rippon 2012), such that one arrives at a residue of trackways and fields which underlie the historic frameworks and may be prehistoric. LiDAR has great potential in this regard because it can detect the microtopographic features such as lynchets and hollow ways which, as we saw in earlier chapters, are important in tracing and dating past routeways. The case for LiDAR is well made by the success of the Secrets of the High Woods project on the South Downs, UK (Manley 2016) and the recent mapping of hollow ways in several areas of Europe enabling their prehistoric origins to be identified.  It was argued in Chapter 8 that elements of continuity in co-axial landscapes may owe more to landscape structures imposed by multiple parallel droveways than to the continuity of individual fields or forms of land use. We have certainly seen some notable cases of routeway continuity, particularly at Saltwood, Kent (Figure 10.12) and in the Kilen area of Denmark (Figure 7.2). However, because so little research has been specifically focused on ancient routeways, and most discoveries were made during other investigations, we still have a very fragmentary picture of the extent to which continuities exist. It must also be acknowledged that many of the prehistoric routeways identified here have no apparent relationship to surviving, or historically recorded, routes. Indeed, many case studies demonstrate radical changes over time in the alignment of routes; these are just as culturally significant as the cases of continuity. Indeed many excavated Bronze Age and Iron Age drove ways have no obvious relationship to later routes. In Wessex during the late Bronze Age, *c* 850-750 cal BC, extensive linear ditches cut across the earlier fields and trackways alike. This created extensive ranch boundaries for cattle and sheep husbandry, with some boundaries radiating from sites which then developed as hillforts (Bradley *et al* 1994; McOmish *et al* 2002; Cunliffe 2004). At Danebury and on the Yorkshire Wolds (Figure 8.6) trackways later became ranch boundaries. Again the relationship of this evidence to routeways requires further and wider investigation.

**'Natural routes' and ridgeways**

In some cases what generations of archaeologists have defined as natural routes are well supported by field evidence; examples are the axial route down the watershed of Jutland in Denmark (Figure 7.1) and the Hoddersrug route in the Netherlands (Figure 6.6). 'Natural routes' should, however, only be accepted when they are substantiated by other forms of evidence for use in the period in question. Other routes regarded as 'natural' by generations of archaeologists are more open to question and this is particularly so of the Ridgeways, seen as the main long-term routes of prehistoric movement in lowland England. In some cases the evidence is hopelessly weak, for instance the so-called Jurassic Way. Other cases may be seen as a little stronger, for instance the Wiltshire-Oxfordshire Ridgeway. Even here, however, both the Uffington (Figure 8.8) and Avebury/Overton (Figure 5.5) studies showed that the present routes seem to be post-Roman, likewise the Pilgrim's Way at Whitehorse Stone (Figure 10.11b).

Perhaps we have been misled by erroneous expectations as to how ridgetops were used, seeing them as a bounded trackway a few metres to tens of metres wide and used over long distances as they are today. Such expectations overlook two closely linked factors: the environmental evidence and the reasons prehistoric communities were using and moving through these landscapes. Burial monuments such as barrows of Neolithic and Bronze Age date tend to be concentrated along the ridges. Where we have environmental evidence from barrows of both periods, it generally indicates cleared landscapes characterised by grassland (Evans 1972). The maintenance of that environment indicates regular grazing; such areas are likely to have been grazed during the later spring and summer when it would have been necessary to keep animals away from growing crops and to allow the winter pastures to regrow for hay. It has been widely accepted that Neolithic and early Bronze Age communities in Britain remained quite mobile and moved around seasonally with their animals. The open landscape of the ridge tops are likely to have been used in this way. However, animals as they were moving around required grazing so a broad expanse of grassland a few kilometres wide is likely to have been utilised. Individual routes taken would not have been closely defined but meandered depending where grazing was best and the effects of the weather most favourable, or least harsh. What this envisages is not a closely defined route but a broad band, maybe hundreds of metres to, in places perhaps, kilometres wide. During the middle to late Bronze Age cross-ridge dykes may represent attempts to restrict movement, or perhaps to lay proprietary claim to some tracts of grazing where others could pass but not tarry. Later in about the Iron Age or Roman period, as pressure on land increased and fields encroached, broad ridge top belts may have become defined as multi-stranded trackways.

**Droveways**

Rather more tangible than the ridgeways has been the identification of multiple parallel routes often running down the crest of spurs at right angles to the escarpments. Their significance lies in the fact that they link areas of contrasting topography, geology, vegetation and economic resource. They also connect areas on the ridgetops associated with burial, with lower areas more suitable for settlement. In the medieval period, these routes served as droveways connecting the resources of parent and daughter settlements. They are in places marked by very prominent hollow ways descending steep escarpments (Figure 8.4), or crossing the Lower Greensand in the Rother valley (Figure 10.10d). The Wealden case study has shown that some cross-topographic routes were of early origin. That at Whitehorse Stone (Figure 10.11b) had possible Neolithic origins and, on the South Downs, routes down spurs at right angles to the escarpment had Iron Age origins at Thundesbarrow Hill and Ports Road (Figure 10.6). A route down an escarpment spur at Bishopstone (Figure 10.3) may have Neolithic origins and have been in use for perhaps 4500 years until abandonment by the Anglo-Saxon period.

Where routeways were associated with the seasonal movement of animals it is probable that the requirements to provide grazing involved belts of grassland rather than narrowly constrained  tracks. That might explain some curiously long thin landholdings in the Weald (Figure 8.3; Chatwin and Gardiner 2012).

Many instances have been noted where there are multiple parallel routes, for instance in the Bronze Age at Fengate (Figure 6.10) and Heathrow T5 (Figure 8.7) and in the historical period, the cross topographic droveways; these  have all been associated with the seasonal movements of animals, as particularly discussed in the Wealden case study in Chapter 10, but also reported in many other areas of the UK. It seems that individual communities each had their own droveway, which might at first seem like redundant duplication, but makes sense in terms of the need to provide adequate grazing, especially if animals were being moved from many settlements at the same time of year.

**Ethnohistory of Lesser Transhumance**

Around the uplands of western Britain trackways have been identified connecting lowland farms and upland seasonal pastures in a system of Lesser Transhumance which continued into historical times in Wales, Scotland and Ireland. In Wales the lowland settlement is known as the hafod or home farm and up in the hills is the hendref or summer farm. This system is attested in Cornwall by place-name evidence and, because the same Welsh terms are used, Herring (2012) was able to demonstrate that the system was in place before the seventh century AD when Anglo-Saxon influence extended to the area. In that area the home farm and upland pastures were at distances of 4-10km. Similarly, writing of the upland moors beyond the enclosed landscape of Swaledale, Yorkshire, Fleming (1998) describes routeways down to Swaledale marked by pronounced hollow ways which can be documented at least as far back as the twelfth century AD. Fleming (1998) and Herring (2012) draw on the ethnohistorical evidence from Wales and Ireland to infer that seasonal settlement of the moorland was during the upland vegetation growing season between Beltane (early May) and Samhain (late October) (Kelly 1997). In recent ethnohistorical practice it was the teenage girls and young women who went to the upland pasture where they engaged in dairying, butter and cheese production; a spinning wheel was also invariably taken by them. Men and older women stayed at the home farm to work the fields. Although these Lesser Transhumance practices are generally thought of as involving the uplands, there is evidence from both Wales and Ireland of comparable seasonal movement between lowland farms and seasonally available saltmarsh grazing resources. This was the interpretation suggested in Chapter 6 for middle Bronze Age to Iron Age seasonal settlements in the Severn Estuary. Such practices may also be suggested by the droveways associated with coaxial fields which lead to coastal and riverine lowlands. The Wealden case in Chapter 10 provided evidence that some of the multiple parallel long-distance droves, which have generally been associated with medieval lesser transhumance, may have their origins in prehistory. Thus it seems that parts of later prehistoric communities, at least in some areas, were a good deal more seasonally mobile than has generally been assumed.

**Excavation**

In resolving the many research questions concerning prehistoric routeways we cannot rely only on the sort of chance exposure which was exploited at Lyminge

(Figure 10.13), or assessments in advance of development. There is also a need for research-led excavation specifically to establish the date and character of past routeways. Some of the cases most in need of attention are: droveways connecting uplands and lowlands wetland and dry ground; those associated with surviving co-axial patterns; routes associated with prehistoric bridges; possible routeways of the late Iron Age oppida; and those connecting terrestrial, riverine or marine transport such as landing places.

Dating and sequencing palimpsests of field, settlement and trackway evidence can often not be resolved without excavation. However, sometimes this can be relatively small-scale excavations, as demonstrated, for instance, by the dating of double lynchet trackways at Itford Bottom and Bullock Down (Figure 10.4). The value of excavation and dating programmes using a combination of radiocarbon, artefacts and OSL has been very effectively shown by the demonstration that the road at Sharpstone, Shropshire had its origins in the Iron Age rather than the Roman period (Figure 8.10).

**Linear environmental archaeology**

The writer approached the topic of this book from the perspective of landscape archaeology and a background in environmental archaeology and geoarchaeology. Environmental archaeology has often had a site-based focus. Now, as the density of investigated sites increases, it has become possible, in some areas, to develop a more spatial picture derived from multiple environmental sequences in an area, as demonstrated for instance by reconstructions of environmental change round Stonehenge and Avebury (Allen, M. 1997; 2005). One of the messages of the review of hunter-gather landscapes in north America (Chapter 2) and Europe (Chapter 3), is that landscapes are likely to be at least partially structured by linear patterns of movement between sites, which was most clearly exemplified by the James Douglas map (Figure 2.2). Linear heathland strips associated with barrow marked routes on the Veluwe, Netherlands have also been identified by Doorenbosch (2013). This proposition that environmental patterns in some areas may relate to routeways is an hypothesis which is likely to repay testing elsewhere; it could make a significant contribution both to the identification of past routeways and recognising one of the ways in which humans contribute to niche construction.  This constitutes the case for an approach to environmental archaeology which is less static and with a greater focus on mobility, ie one which has a linear focus.  In Chapter 1 a wide range of palaeoenvironmental sources which can contribute to identification of routes used by people and animals was identified (Figure 1.2). In subsequent chapters we have seen the contribution made by many of them, others such as non-pollen palynomorphs, stable isotopes, geochemical analysis and sedimentary DNA  are set to make even greater contributions to the study of early routeways in the years to come.

**Geoarchaeological approaches to human and landscape connectivity**

It has been shown that dating can be achieved by developing a geoarchaeological approach focused on the sedimentary context of routeways and the composite landforms which they often represent, an approach which might be called archaeogeomorphology. It has been demonstrated that, in agricultural landscapes, hollow ways are often not simply negative erosive features, but have datable positive lynchets running along their upslope flanks, and negative lynchets along their downslope edges. It should be emphasised that these features were not deliberately constructed; they are the product of gradual soil movement downslope within cultivated fields. It was the realisation that a positive lynchet defined part of the route at Woodland Road, Lyminge, which facilitated its dating using a combination of techniques: artefacts, mollusc analysis, OSL and Uranium Series (Figure 10.13).

The processes of water erosion which contribute to the formation of hollow ways have also been shown by Boardman's (2013) Rother Valley study (Figure 10.10) to be geomorphologically significant. These processes created new drainage channels, which in some cases went against the grain of the topography, eg by running down the axis of spurs. In this way, the density of drainage and amount of runoff was increased. The contribution of routeways to drainage has been quantified in wooded landscapes of the Polish Carpathians, where, on sedimentary flysch geology, 70-80% of suspended sediment entering drainage basins is derived from unmetalled road surfaces which, under modern conditions, are being incised at an average rate of 6.6mm per year (Froehlich 1991). In the case of both agricultural fields in the Rother Valley and wooded landscapes in the Carpathians, routeways are shown to be very significant sources of sediment entering river systems. We may infer that, in at least some river systems, hollow ways may be a significant contributor to the increased minerogenic alluvial sedimentation which is a widespread characteristic of later prehistory (Brown, A 1997). Identification of discharge fans of sediment from hollow ways to floodplains thus offers a further potential way of dating hollow ways by identifying and dating the sedimentary increments from eroded tracks.

The implications of this are not restricted to dating and geomorphology. Routeways are created by people and are thus reflective of social and economic relationships. By so doing, people have created additional channels for water and sediment movement. Such relationships exemplify the increasingly recognised interdependence of hydro-geomorphic, ecological and human processes and functions highlighted by Harden *et al* (2014). They represent coupled relationships between human and natural systems with feedback loops (Chin *et al* 2014). It is likewise illustrative of the interrelationships between multiple agents: human agents had a significant effect on geomorphic processes, which is not perhaps so surprising. More notable is the effect of geomorphic agents, literally making patterns of human movement entrenched and in that way influencing future patterns of movement, land use and the perspective from which perceptions are formed.

**Movement as niche construction**

The entrenchment of hollow ways is just one of the myriad contributions which movement makes to niche construction. This has emerged as a significant theme, linking the social connectivity represented by past routeways and the scientific aspects of environmental archaeology and geoarchaeology which contribute to their study. Niche construction was defined in Chapter 1 as the process whereby organisms modify their own and each other's niches, thus creating the potential for change and evolution. It recognises that all organisms can play a part in the construction of their own niches and those of others. The concept is particularly significant for environmental archaeology with its ecological emphasis.  Early ecologists struggled to accommodate human agency into their models by attempting to define 'natural ecology'. This approach which became increasingly untenable when it become apparent that there are few ecosystems on earth unaffected by humans. The attempt to isolate ‘natural ecology’ is also challenged by the realisation that many organisms, not just humans, contribute to niche construction, such that the difference between humans and other organisms becomes a matter of degree rather than fundamental difference. That resonates with one of the themes developed in Chapters 2 and 3 that some tracks which are influential in the patterns of human movement are likely to have originated as animal tracks. The influence exerted by tracks can be longstanding. When people move through a landscape on a route established centuries or millennia earlier, their approach to, and perception of, that landscape will be influenced by those who first took that route long before. That remains the case whether the original walkers were aurochs, Mesolithic hunter-gatherers, or prehistoric herders.  This does not imply that their choices are conditioned by precedent, they are themselves active agents with free will, so in some cases the choice will be to deliberately avoid what has gone before, and set off on a new path. To the landscape historian both continuity and radical change are of interest and can tell us much more than just the daily habits of those who used that route. Long continuities of use may serve to legitimise the landholdings of communities, or the authority of elites. Radical changes of routeway can help identify periods of social and ideological change and conflict.

Human geographers have demonstrated that it is not animals alone that exhibit agency in their capacity to engender change, but also plants, as Jones and Cloke (2002) showed in the context of the cultural significance of trees. Archaeologists have similarly argued, through concepts of the extended mind and material engagement theory (DeMarrais *et al* 2004), that material culture, such as the objects made by people, can have agency and the capacity to lead to change. The material things that facilitated, or enhanced, travel clearly took on iconic significance. These range from human footprints, rock art depictions and models of boats, wheeled objects, deposits of wheels and depictions of the horse. Many such traits appear together in the Bronze Age rock art of Norway and Sweden (Figure 11.2). Likewise significant are high status travel-related objects fashioned from exotic materials drawn from several places: the Chariot of the Sun, the Nebra Sky disc and the Caergwle bowl (Chapter 10). These serve to highlight the social and cosmological significance of travel, which is especially apparent in the middle and late Bronze Age. This is further emphasised by Kaul's (1998) cosmological interpretations concerning the depictions of boats and horses on Danish bronze objects to which may now be added the apparent relevance of footprints to the cosmological scheme (Skogland *et al* 2017). Communities acquired materials, esoteric knowledge and status through travel to distant and exotic places (Helms 1988).

Pathways are the material manifestation of the activities of human and animals in the landscape and as such they represent classic cases of both agency and niche construction. In the foregoing chapters we have seen many ways in which routeways of human movement became part of living landscapes and thus contributed to the construction of those niches. In hunter-gatherer landscapes there are the effects on vegetation of trampling, transplanting, burning, marks on trees from utilisation or trail marking blazes, plants propagated from faeces or those which flourished because of the chemical conditions created by faeces. In later prehistoric landscapes the traces become more tangible, and potentially more long lasting, with the construction of monuments and barrows which may be designed to channel movement and convey a particular message to travellers about ancestry, genealogy and ownership. With the development of agricultural landscapes in which routes run between fields trackways can be more easily identified. Technology, engineering and the development of elite centres are likewise contributory factors, along with the development of bridges, constructed roads, wheeled transport and the horse.

**Critical thresholds**

From the various case studies reviewed we may begin to discern some key thresholds in terms of trackway development in north west Europe. Some of these are perhaps predictable, because they correspond to significant boundaries between periods, others are perhaps more surprising. Some vary regionally. Some may be questionable, but still worth stating to stimulate debate and critical research.

One perhaps surprising conclusion has been that, on present evidence, there are no certain Mesolithic constructed wood trackways and the first clearly constructed wetland trackways appear with the earliest farmers in both North Germany and later in the UK. Barrow alignments indicating former routeways are also present from early in the Neolithic in Denmark, north Germany and the Netherlands. Such evidence from Britain has been argued on the grounds of antecedent activity episodes but is less securely attested. The first widespread, clearly defined dry ground tracks in Europe appear with extensive field systems in the middle Bronze Age. They are particularly clear in the coaxial field systems and associated droveways of south-east England. The use of wheeled transport is a further critical threshold; in northern Europe this begins in the later Neolithic and, on present evidence, later in the British Isles, around the middle Bronze Age. Bridges appear in the UK in the later Bronze Age and one may speculate that they were associated with some form of road, so far unattested, which was at least partly constructed. A further threshold is represented by the greater speed and distance of communication facilitated by the horse from the Later Bronze Age. The next threshold, which can be predicted, but again is not yet attested, may be associated with the emergence of oppida settlements in the later Iron Age. Finally, the most dramatic change of all, within the zone of Roman influence was the development of the Roman road network. In some ways the most intriguing aspect of this story is the evidence from Britain for chariots in the Iron Age and the pre-Roman origins of some Roman roads (Chapter 8). Such fragments of evidence seem to presage a network of routes in the final Iron Age which we have hardly begun to glimpse.

In terms of maritime and riverine communication thresholds are less clear; log boats are attested from the Mesolithic but, given evidence for Palaeolithic island colonisation, boats of some kind are clearly earlier. Advances in the use of skin boats are not archaeologically attested except in terms of their representation in Bronze Age and Iron Age boat models. However, with the identification of possible boats in burials near the coast and prehistoric coastal havens it is at least becoming clearer where we need to look. The first evidence of the sewn plank boat is early Bronze Age in Britain, and may suggest introduction with Beakers and the use of metals. Iconographic evidence in Scandinavia begins *c* 1700 BC (Ling 2008). A further critical threshold is the advent of sail. In the Mediterranean this appeared during the Bronze Age and in north west Europe apparently in the later Iron Age, with the substantially-built Romano-Celtic boat type which is described in historical sources such as Caesar and depicted on coins (McGrail 2001).

In the foregoing chapters a greater role has been proposed for maritime and riverine communication than is generally appreciated . This partly reflects a growing awareness of maritime archaeology, but perhaps the most compelling evidence is negative, the surprisingly limited evidence for well-defined long distance routeways in prehistory, especially in Britain. This implies that the study of ancient routeways requires some reorientation towards integration of terrestrial, riverine and maritime routes and ways of identifying landing places. It would additionally be appropriate to look at those watershed locations where waterborne transport would have to be replaced by tracks, such as east to west across the Pennines, UK.

There is evidence of regional contrasts as between waterborne and terrestrial transport. The clearer evidence for longer routes and the earlier and more abundant use of the wheel in Denmark, north Germany and the Netherlands could reflect a greater terrestrial emphasis to communication, compared to the British Isles with radial drainage to an encircling sea. However, one might anticipate maritime communication being particularly important in Denmark, as in historic times. Regional contrasts may be as much cultural as environmental, and quite possibly cultural in two very different ways. Firstly, during prehistory, particularly in Bronze Age northern Europe in terms of a link to metal producing areas to the south creating a need for overland transport. Whereas Britain was connected by sea to the continent. Secondly, in terms of the emphasis of archaeologists who in continental Europe have perhaps given greater attention to patterns of prehistoric communication than in Britain where archaeologists can be argued to have been intimidated by the legacy of Alfred Watkins (1925) and mesmerised by the chimera of the ridgeways.

**Route to sustainable heritage and nature conservation**

It has hopefully been shown that past routeways are central to understanding landscapes and how they became structured through movement. It has also been observed that their study in many ways has been a neglected topic, especially in prehistory. Limited research has contributed to inadequate attention to routeways in Historic Environment Records in the UK. The paved paths or Trods of the North York Moors are a locally appreciated historic asset but only 20% of those recorded in the late nineteenth and early twentieth century survive (Evans 2008). In Britain some routes are protected because they form part of wider sites such, as Neolithic stone avenues, also some wooden trackways are protected, for instance in the Somerset Levels. The vast majority are unrecognised and without protection except tangentially through footpath and access legislation. In Denmark the situation is more positive an inventory of early routes having been established for heritage protection purposes (Bang 2013). In Chapter 7 case studies were reviewed at Kilen, Denmark and Veluwe, Netherlands where walks along prehistoric routeways were marked by display boards or geocaches explaining the relationship between the barrow alignments, hollow ways and ancient routes. People informed in this way are more likely to support the preservation and enhancement of this significant evidence for past landscape connectivity.

Walking is increasingly recognised for the contribution it makes to quality of life and health. Political initiatives have increased access to the countryside, freedom to roam and in Britain to the creation of an almost complete coastal path. Some long distance paths provide people with opportunities for encounters with the past which are stimulating and well attested such as those along Hadrians Wall and Offas Dyke. Other initiatives aimed at walkers make much of the supposedly ancient origins of the Ridgeways, which as we have seen are open to question. In other cases attractive walks are promoted using quasi-historical tags of variable validity. Examples are the Monarchs Way a serpentine 625 mile route approximating to that of Charles II on his escape from the battle of Worcester to the south coast, Robin Hoods Way in Nottinghamshire, or the Vangard Way in the Weald which follows the path of a 1960s rambling group. If such designations encourage people out in the countryside walking they are in many ways a good thing. To often, however, those who go out into the landscape, are fascinated and moved by the obviously ancient nature of some of the routeways they are following, have only debatable assertions and quasi-historical associations to satisfy their curiosity. The case presented here is that if the origins of these route were the subject of focused scientific research then the encounters with landscape which they provide would be significantly more stimulating. The importance of learning about these things becomes especially apparent when we consider the imperative of getting children out into the landscape and the educational benefits derived from walking and thinking on one's feet.

Routeways are not just historic assets but contribute to wider agendas and inform broader debates concerning people, nature, connectivity, quality of life and migration. This is apparent from the strongly biographical flavour of much writing about landscape as outlined in Chapter 1. That literature demonstrates how walking is both a metaphor for, and a route to, self discovery. Giddens (1991) described thoughts engendered in such ways as contributing to a sense of ontological security, through which people negotiate their sense of self and place in the world. Increasingly the experience of heritage and landscape is seen as of therapeutic value because of its contribution to an individuals self-discovery (Raily *et al* 2018; Nolan forthcoming). When that occurs through the bodily engagement of walking the benefits become both physically and mentally embedded.

Nor should these issues be seen from a purely human perspective. Just as animals have contributed to the construction of routeway niches so the ancient routeways formed by human agency have created specific niches for plant and animal life which has significance in terms of sustainable nature conservation. In eastern Austria the deeply incised hollow ways in loess are recognised for their nature conservation significance because of the habitats they provide for rare plants, insects etc (Wiesbauer and Zettel 2004). In her book on rewilding the Knapp estate, Sussex Isabella Tree (2019) highlights the contribution which Wealden droveways make to the connectivity of nature conservation sites. Having walked along many miles of hollow ways and other early routes in conducting this research the writer is aware from the footprint tracks and signs of wild animals that they serve as significant corridors for animal movement, and with them seeds etc, today. This is important because in Britain a recent review of the condition of wildlife sites conducted for the government concluded that nature conservation sites are generally too small, fragmented and isolated from one another by tracts of intensively farmed landscape with significant risks of loss of species biodiversity and local or wider extinction (Lawton *et al* 2010). A proposed solution is the creation of corridors of connectivity between nature reserves. It may not be sufficiently appreciated that in many areas such corridors already exist in the form of the long established routeways. Many are deeply incised, semi-abandoned and overgrown. Of special significance is the connectivity they often provide across topographic and environmental zones. Quite often these favourable circumstances have been created by benign neglect of a routeway that has gone out of active use, a form of unconscious rewilding. In other case it may be that targetted management of the trackway habitat and enhancement of the connectivity they provide could significantly add to their conservation value. The proposition is that learning to appreciate the significance of past routeways makes a major contribution to understanding landscape origins and structures, contributes to access to the outdoors with the associated mental and physical benefits and also contributes to developing agendas for wildlife sustainability.

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