

## Changing climate

### *Image of glacier*



The earth is approximately 4.5 billion years old. Since its early origins when it was a naked lump of molten rock, it has gradually cooled down; a crust of solidified rock formed landmasses separated by oceans of condensed water vapour. The cooling rocks released gases which blanketed the earth with an atmosphere and shielded it from the harsh solar radiation. It wasn't until destructive ultra violet rays were mostly filtered out by the atmosphere that life was able to develop. Throughout all this time, the earth's climate has gone through many dramatic changes and consequently its surface temperature has fluctuated. This has been brought about by several factors including atmospheric changes, deep and surface ocean currents and incident solar radiation which varies according to the earth's orbit. Movements of the earth as it spins on its axis and orbital variation has given rise to episodes when the earth's surface cooled down sufficiently to allow large areas to become covered by ice. These episodes are known as ice ages or glaciations.

### **What was the Ice Age like?**

#### *Image of north pole seen from space.*



It is rather misleading to refer to 'The Ice Age'. This is because there have been several long periods of time known as ice ages or glaciations or glacials, when there were exceptionally cold temperatures over much of the earth's surface. Within these long cold ice ages, periodic warming caused what are known as interglacials.

There has been a succession of such glacials as the earth's surface has fluctuated, each one lasting for many thousands of years. The last glacial, which we tend to refer to as The Ice Age, began around 2.6 million years ago is called the Pleistocene, but the fact that regions of the earth, the Arctic, Greenland and Antarctic, are still covered with ice sheets, shows that we are still in the midst of a much, much longer cycle of events. The Pleistocene began to draw to a close, around 16,000 years ago as the earth's temperature increased, causing the ice sheets that covered most of the northern hemisphere to gradually melt. As the ice retreated further and further north, it ended up where it is at present – the north and south poles. We are now going through a warmer interglacial period, called the Holocene, which began in earnest about 11,700 years ago.

## *Bubbles trapped in glacial ice*



The evidence for these varying conditions and temperature fluctuations comes from several sources such as the levels of certain isotopes present in bubbles of gas trapped in layers of ice and preserved pollen from the plants as well as other fossil records.

The artefacts from Fardon left by the hunter-gatherers have been identified as belonging to a style that was used in the Late Upper Palaeolithic. This is not a geological name for that period of time but one that relates to the technology of the Three Age System of Stone Age, Bronze Age and Iron Age. (Late Upper = last or most recent stage, Palaeolithic = Old Stone Age). The Late Upper Palaeolithic started around 14,000 years ago, so we know that the hunter-gatherers were experiencing the last stages of the most recent Ice Age.

So, in summary, geologically speaking, we are in the Quaternary period, which began 2.6 million years ago. Within this, there has been a long cold glacial epoch called the Pleistocene. The ice reached its peak about 20,000 years ago, following which, warming has not been a continuous upward trend, as there have been frequent periodic fluctuations in temperature (called stadials and interstadials), caused by such effects as the melting of ice sheets and ocean current changes; these fluctuations tend to last a mere couple of thousand years. The start of the warmer interglacial epoch began 11,700 years ago and continues to this day.

The major cycles which drive the larger-scale warming ('greenhouse earth' – no ice anywhere) and cooling ('ice ball' earth – almost total ice coverage) of the earth operate on time scales of millions of years and so, despite present day warming, the earth is probably inevitably heading to a shift back towards ice age conditions. In the meantime, human activity is also having a marked impact on the composition of the oceans and atmosphere, which is in turn contributing to climatic changes.

## **Ice Age Landscape**

Biomass Step.



Although still in the grips of the last cold stage (called the Devensian after an ancient tribe which inhabited an area beside the River Dee in the midlands) at the time when the hunter-gatherers were making their journeys, this northerly region was going through one of the warmer interglacials.

As the temperature rose, the first landscape to emerge was one of open plains and newly formed river valleys, where lush herbs and grasses could grow in the warmer climate. This early type of landscape is often called a 'lost biome' because no such equivalent occurs today, although it is somewhat similar in character to arctic tundra and steppe type biomes. The land of the hunter-gatherers, known as grassy mid-latitude Glacial Tundra, no longer exists anywhere on Earth.

### *Tundra*



This lost 'biome' was more lush than today's high latitude Arctic Tundra and was rich pasture for grazing animals. It contained alpine flora with a rich assemblage of herbs such as Artemisia, Meadowsweet, Meadow Rue and common weeds for example Thrift, Docks and the alpine plant Dryas Octopetala. The hunters would also see, and be able to make use of, small stands of a variety of trees such as Dwarf and Silver Birches, Willow, Rowan and Juniper.

The rich sward attracted roaming herds of grazing animals to extend their migratory routes and venture further north seeking out the new pasture, moving on as the seasons permitted. One of these migration routes passed close to modern day Newark.

### *Image of migrating reindeer*



Around 14,000 years ago, as warming was already under way, river gravel in the Trent valley that had accumulated during cold phases began to be washed away. The river acquired a braided or wandering mode with elevated 'islands' of gravel adjacent to multiple shallow river channels.

We think that the movements of Ice Age hunter-gatherers would have been dictated by the behaviour of their animal food sources which was a function of their migration and breeding cycles, timed to be in phase with food availability.

The hunter-gatherers, therefore, would have lived an itinerant life moving in a predictable seasonal cycle and along specific corridors, like ridges or river valleys. As hunter-gatherers, they relied on animals to provide meat and marrow for food, hide and sinews for clothing and bone and antlers for tools.

*Image of person scraping hide.*



The hunter-gatherers would have known and used certain natural stopping points and from time to time along the way, they would have lost or discarded objects. It's the objects that have been left behind that provide the only evidence we have so far of their presence. The tools can be identified as belonging to more than one particular style which suggests that they have been created over many years, possibly two distinct periods, implying that this journeying along river valleys and trackways was the way of life for these hunter-gatherers for a considerable period. Although we're talking thousands of years ago and very little remains to tell the story, we can still gain a great deal of insight, from the artefacts now being recovered, into their world and their Ice Age journeys.

**Braided River.**



Standing on a vantage point, (such as the rise around Top Farm, Hawton) our Ice Age hunters would have looked over an open undulating plain with a wide expanse of shallow braided rivers now known as the Trent and the Devon. These river systems had been created earlier in the glacial cycle by the melting waters from the glaciers to the north, although by this time the glaciers had receded much further north and were only to be found in Scotland.

Our investigations so far enable us to envisage several possible scenarios at Farndon. The evidence is suggested by the location of the flints that have been found through excavation (especially those believed to be '*in situ*') and information from the analysis of underlying deposits from which we can make tentative inferences about the topography.

One scene might place a group on a slight rise above the flat river bed, possibly a vantage and crossing point; here, some individuals might be on 'look out duty', whilst others, maybe with an animal carcass, needing to cut up flesh and clean the hide, produced (knapped) their flint tools on the spot, as they made their temporary camp beside the river

Another possibility would have our people closer to the river, maybe using the shallow water for their own ablutions or washing hides, which they scraped with freshly prepared flint tools. The hides, perhaps pierced to lash them together, might be used for making garments, and possibly also shelters, essential for protection against the cold. Other flint tools might have been used for whittling wood or scoring bone to remove sharp splinters for piercing.

## Climate

Although the average temperature in Britain 14,000 years ago was around 5 °C, the 8-16 hours of daylight at mid-latitude gives a much longer growing season of the Arctic tundra which, despite the extended daylight in summer, had very limited daylight in winter.

Precipitation, both rain and snow fall, was much lighter due to reduced evaporation and the position of the polar front between 16 –10,000 years ago.

## Animals

### *Arctic hare*



Ice Age hunters would be preparing to hunt for large animals like aurochs (wild cattle), wild horses (similar to Steppe ponies), saiga antelope, red deer, brown bear and reindeer. They may even have hunted mammoth, which are now known to have survived until this period. The presence of butchered Arctic hare bones from caves at Creswell Crags reminds us that meat from snaring small animals may also have been an important food source. ([hyperlink to 'How' with Creswell image of hares](#))

We can envisage the lifestyle of our Ice Age people as being that of a continuous journey coupled to hunting and gathering in the pursuit of food, punctuated by intervals spent at certain resting places, including by the river at Farndon and visiting the caves of Creswell Crags.

It is almost certain that as part of their Ice Age Journeys, they would, with ease, have habitually covered the distance of 21 miles (35 kilometres) between Farndon and Creswell Crags to the north (on the boundary between present day Nottinghamshire and Derbyshire). They may have carried their flint tools between these places, as analysis of the composition of the raw material suggests that it came from similar sources. We might imagine that the individual who may have sat for a while beside the river at Farndon to strike a flint, later used it for scratching the rock of Church Hole cave to engrave an image of an ibex into the walls.

The international significance of the occupation of the caves along the river gorge at Creswell during the last Ice Age, marks it out as a World Heritage Site without comparison. The Unesco website states '*There are no other examples on the World Heritage List that offer the unique combination of Ice Age archaeological and palaeobiological evidence that is present at Creswell Crags*'. The probability that the two sites (Farndon, an exposed open site by a river crossing and Creswell, offering shelter within caves), were visited and occupied by the same people, adds another dimension to our understanding of the lives of the hunter-gatherers. Indeed, since Farndon represents one of

the few rare open sites of the Late Upper Palaeolithic, it is not an understatement to say that the project work of IAJ is of immense significance and the investigations currently being undertaken and those envisaged for the future, will provide unique evidence of great value.

*by Elaine Kazimierczuk*