The Ice Age in North Hertfordshire

What do we mean by 'the Ice Age'?

Thinking about 'the Ice Age' brings up images of tundra, mammoths, Neanderthals and great sheets of ice across the landscape. This simple picture is wrong in many ways. Firstly, there have been many different 'Ice Ages' in the history of the earth. The most dramatic happened between 2.4 and 2.1 billion years ago, known as the Huronian Glaciation. About the same time, earth's atmosphere suddenly became rich in oxygen, and some scientists believe that the atmospheric changes reduced the temperature so much that the whole planet became covered in ice.

1: an Arctic ice sheet (© Youino Joe, USFWS, used under a Creative Commons licence)

Another global cover of ice happened 650 million years ago when the first multi-celled animals were evolving. Geologists sometimes refer to this period as the 'Snowball Earth' and biologists know it as the Proterozoic. Temperatures were so low that the equator was as cold as present-day Antarctica. They began to rise again as concentrations of carbon dioxide in the atmosphere rose to about 13%, 350 times greater than today. Some carbon dioxide came from volcanic eruptions, but some was excreted by microbial life, which was beginning to diversify and increase in numbers.

Neither of these Ice Ages is the one that dominates the popular imagination. Both happened many millions of years before life moved on to land. There were no humans, no mammals, no dinosaurs: none of the creatures familiar from The Flintstones. The period most people think about as the 'real' Ice Age is the geologists' Pleistocene era, from more than two-and-a-half million years ago to the beginning of the Holocene, almost 12,000 years ago.

The Pleistocene

Even if we want to think of the Pleistocene as the important Ice Age, we still need to dispel some common misconceptions. It lasted from about 2,588,000 to 11,700 years ago and was not a period of constant cold. True enough, it was a time of repeated glaciations, but these were mixed with much warmer periods. We should think more in terms of repeated rapid climate change. For more than 2 million years, the climate flipped between cold and warm, with the shift between them sometimes much less than a century. The change could be short enough for an individual to notice the variation in climate during their lifetimes.

There were indeed times during the Pleistocene when Britain was partly covered with an ice sheet. At the height of a glacial period, the ice could be over a mile thick. The ice sheets differed in their extent at various times: one reached southern England, while others barely affected anywhere south of the River Trent. During these glaciations, areas outside the ice sheet would have tundra conditions resembling present-day Siberia or Alaska, with plants and animals adapted to the extreme cold. Creatures such as the woolly mammoth or woolly rhinoceros are well-known, and there have been local finds of mammoth remains.

2: Middle Pleistocene fauna (painting by Mauricio Antón © 2008 Public Library of Science, used under a Creative Commons licence)

During the warmer periods known as interglacials, Britain could reach sub-tropical temperatures, much warmer than today. Flora and fauna would match the climate, so we would see lions, elephants, hyaenas and other creatures that are today found in Africa or the Indian subcontinent. The first human visitors to this area evolved alongside such animals and travelled north with them as the European climate became hotter.

Britain remained a peninsula of northwest Europe throughout the Pleistocene. We often think that rising sea levels after the end of the Ice Age cut Britain off from the mainland, but this is only part of the story. Even with higher sea levels during the interglacials, the Strait of Dover did not yet exist and animals – including early humans – were free to migrate north during the summer months in search of new pastures.

The picture of alternating cold glacials and warm interglacials is even more complicated, though. More temperate snaps, known as interstadials, occurred during glacials. There were conversely cold periods,

stadials, during the interglacials. Understanding the sequence of these dramatic climate changes helps us to write the history of human beings in Britain. Much of our knowledge of the climate comes from deep-sea cores. Sediments on the ocean floors preserve the remains of microscopic sea creatures that lived near the surface. They absorbed oxygen that became incorporated into their shells; the proportion of the stable isotopes O12 and the rarer O13 depends on the temperature of the water at the ocean surface. By drilling deep into the sediments and measuring the ratio between the two forms of oxygen, we can understand fluctuations in global temperatures.

We need to think about the ground

The landscape provides another clue to how the Pleistocene climate affected North Hertfordshire. The rocks on which the district sits all formed underwater. Gault clay, which outcrops in the low-lying areas around Hinxworth and northern Ashwell, is the earliest rock in this area. Chalk sits over the Gault, and it is divided locally into the Lower and Middle Chalks. They formed between about 100 and 90 million years ago.

3: broken ichthyosaur skull, discovered at Sollershott in Letchworth Garden City in the 1920s

At that time, Britain lay about 15° farther south than it does today. Much of southeast England was covered by shallow seas, and the climate was sub-tropical. The remains of marine creatures found as fossils show the date of the rock and the environment in which it formed. These remains include the shells of ammonites, the rostra (stiffening rods) of belemnites (a squid-like invertebrate), as well as occasional ichthyosaur and plesiosaur bones. These animals are typical of the middle Cretaceous, about 99 to 89 million years ago, when ichthyosaurs became extinct.

Successive periods in which the tectonic plate was pushed up above sea level, only to sink again and be covered with new deposits before being raised again caused changes in the surface. Once above the water, the bedrock was subject to erosion caused by rain and wind. Soils developed, valleys formed

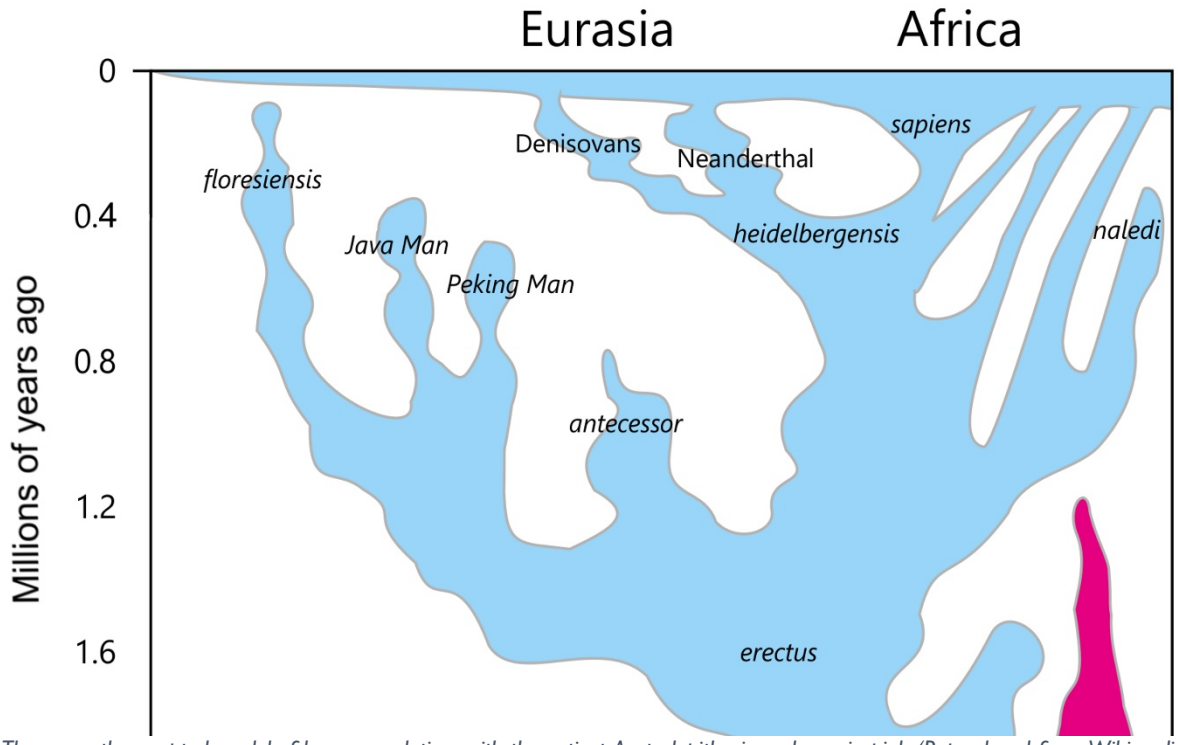
where the softer rock was worn away by streams and rivers. These were partly filled with clays deposited when the plate sank again. When it rose above water for the final time, more erosion took place, creating a new landscape. All the time, the plate on which Britain sits was moving north. It was at its current latitude by the time the Pleistocene began, more than 2½ million years ago.

The shape of the land existing at the start of the Pleistocene was different from that of today. Northern Hertfordshire was covered in low clay hills, with a significant river valley running to the west of Letchworth Garden City. It contained a river that flowed north to meet the Bytham River, the principal watercourse that flowed east across the northern Midlands, through Peterborough and Lowestoft, to reach the River Rhine about 80 km (50 miles) east of the present coast. The Rhine flowed north into an estuary in what is now the middle of the North Sea. The river west of Letchworth has left a series of gravels that formed in its bed, known as the Letchworth Gravels.

The ice sheets that began to develop about 475,000 years ago changed the shape of the land by wearing it away through grinding at the bottom of the ice sheet. As an ice sheet grew from the north and flowed across the hills of North Hertfordshire, it wore them away completely, exposing the chalk beneath the clay. Acidic meltwater under the glacier and in front of it also dissolved the softer chalk. These actions created new valleys, including the Hitchin Gap and the dry valleys of the northern Chiltern scarp. In many places, smaller holes in the chalk were filled with acidic sands left by the ice.

Human evolution

It is impossible to look at the Palaeolithic without understanding human biology. Humans are a member of the Hominoidea, which include lesser apes, such as gibbons, and the great apes, which are orangutans, gorillas and Hominins. The Hominins are chimpanzees and humans as well as several extinct genera, all



4: The currently accepted model of human evolution, with the extinct Australopithecines shown in pink (Reproduced from Wikimedia Commons under a Creative Commons licence, by User:Conquistador, User:Dbachmann - updated version of File:Homo-Stammbaum, Version Stringer-en.svg, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=64917473)

of which first arose in Africa. The lineage split into two branches about 7 million years ago, according to geneticists. These are the lines known as Panina (chimpanzee ancestors) and Australopithecines (human ancestors). The Australopithecines split into three genera, Australopithecus, Paranthropus and Homo, about 4 million years ago.

Modern DNA science has helped unravel the complex history of migrations that Homo has undertaken, uniquely among the Hominins. A member of the genus, *Homo erectus*, left Africa about 2 million years ago. They travelled north, probably through the Caucasus, before one group turned east into Asia, and another turned west into Europe. Descendants of this second group evolved in *Homo heidelbergensis*, which in turn evolved into *Homo neanderthalensis* (Neanderthals). Members of Homo that remained in Africa includes groups that became the earliest *Homo sapiens*, ancestors of all modern humans. One group left Africa about 90,000 years ago, crossing the Gulf of Aden and travelled northeast through Yemen, to cross the Strait of Hormuz into southern Iran.

Their descendants spread from there. One group travelled east to settle eventually in Australia and north-east, to settle Siberia and the Americas; another group moved northwest into the Caucasus, where the ancestors of most modern Europeans evolved, and another travelled west through Anatolia into Europe. These were the humans who encountered Neanderthals, interbred with them, and brought Neanderthal DNA into modern populations (about 5% of western Europeans carry this genetic marker).

Hidden lakes

Once the ice had melted, by about 424,000 years ago, it left behind a lake in the Hitchin area. It was discovered in geological boreholes dug in 1896 and instantly recognised to date from the Pleistocene. Biologists who re-examined the animal remains from the lakebed during the 1990s found that they are from the early Hoxnian, about 424,000-400,000 years ago. The lake was created by a block of glacial clay and gravel across the north end of the Hitchin Gap. It drained away to the south, towards the River Thames. Another lake has been identified at Fishers Green, on the northwestern edge of Stevenage.

The first human visitors

The lakes attracted migrating animals, moving north to summer pastures and south again in winter. The remains from the lake beds show that straight-tusked elephants and hyaenas stopped here for water and some died. The animal herds were followed by early humans, a species known as *Homo heidelbergensis*, who made tools from the flint that was found locally. A few of their artefacts have been found in the sediments of the lakebed, showing that they camped beside it and discarded their tools once they no longer needed them. We know from other sites that they made tools whenever they needed them and left them behind after using them, to avoid being burdened with unnecessary weight when travelling.

The lakes dried out by about 400,000 years ago and a layer of tufa formed. Tufa is a type of limestone that forms when carbonate-rich water evaporates, much like the limescale that builds inside kettles and hot water pipes. A ground surface formed over these deposits, which is where most of the artefacts were found. The buried soil is extensive, surviving as far east as Little Wymondley and south towards Offley.

5: Victorian geologist William Hill standing beside an exposure of the Hitchin lake bed deposits

Palaeolithic stone tools

The stone tools created by *homo heidelbergensis* are among the most significant elements of the archaeology of North Hertfordshire as the collection is recognised to be of national or even international significance. Its size and its association with a buried soil are rare. Most of the tools were found by workmen digging for clay in the nineteenth century, part of Hitchin's brick-making industry. Some were also found in gravel pits.

The tools can be dated to the Hoxnian Interglacial (about 424,000 to 374,000 years ago) because they are associated with the remains of extinct animal species. Some of the animal bones have cut marks, where people used handaxes during butchery. This type of evidence is scarce, underlining the importance of the North Hertfordshire finds.

Most of the tools are a type known as handaxes. They are not axes: they were not put into handles and were not used for chopping wood. Instead, they were multi-purpose tools that have been described as the Swiss Army knife of prehistory. The French term *biface*, which describes how they were made, by chipping away flakes from both sides, is more neutral and a few English-speaking prehistorians prefer the term. Some of them have shapes that suggest some had specialised uses. The ficron is pointed and would be suitable for digging out roots and tubers, while rectangular shapes would be useful for pounding and smashing bones.

Handaxes are the most successful technology ever invented by humans. The earliest were made more than 2½ million years ago, while the last were made about 35,000 years ago. They were used by several

different species of hominids (the biological group to which modern humans, *Homo sapiens*, belongs). A site at Boxgrove, near Chichester in Sussex, excavated during the 1990s shows how they were made and used. A group of people had killed a horse, and about a dozen of them made handaxes to butcher it. The position of the waste material, in horseshoe-shaped scatters, shows that they were kneeling. One of them accidentally broke the tip off a half-finished tool and threw it away, probably in anger. The horse was butchered, but the hoofs, which are not suitable for eating, were missing. The lack of feet is evidence that they kept the hide intact, with the hoofs still attached to the skin. The tools were left with the stripped skeleton of the horse.

There are a few wooden tools of this period, including spears with fire-hardened tips: stone technology was not yet refined enough to make spearheads. Wood could also have been used to create temporary, tent-like structures in which a basic framework would be covered with animal hides. These people seem not to have used bone for tool making.

6: a handaxe from the Hitchin lake bed deposits (the orange colour typical of flint stained by iron dissolved in water)

The next wave of cold

Tundra conditions returned to Britain around 375,000 years ago, so the migrating herds of animals and the people following them remained further south, perhaps retreating as far as the Iberian peninsula and the Near East. The period is known as the Wolstonian Glaciation, a complex cold phase, in which there were three main glaciations divided by the Purfleet Interglacial 337,000-300,000 years ago and the Aveley Interglacial 243,000-191,000 years ago. *Homo neanderthalensis* evolved, probably from *Homo heidelbergensis*, during this period, although there is no record of their presence in Britain during the Purfleet Interglacial.

During the Alveley Interglacial, 243,000 and 191,000 years ago, a few people visited Britain. They were *Homo neanderthalensis* type, but there are no finds definitely of this date from North Hertfordshire. The Wolstonian Glaciation was followed by the Ipswichian Interglacial, about 130,000-115,000 years ago. Again, there is no evidence of humans visiting Britain at this time. Strangely, the next record of humans comes from the height of the Devensian Glaciation, which began about 115,000 years ago.

The Devensian

The final part of the Pleistocene is known as the Devensian, which began about 115,000 years ago. The glacial ice sheet that grew during it covered only northern England, much of Wales, Scotland and Ireland at its maximum, about 22,000 years ago. North Hertfordshire remained free from ice, but its landscape resemble Arctic tundra, with snow remaining across much of the ground throughout the year. Despite

the cold conditions, people were visiting Britain about 57,000 years ago during the Devensian glaciation. These late Neanderthals had developed the adaptations to cold climates that people often wrongly associate with the species as a whole: flat, broad noses, prominent brow ridges and a thick-set build. They had probably also developed clothing that allowed them to survive in an Arctic climate.

The Middle Palaeolithic

Neanderthals developed a more extensive range of tools than earlier people. Prehistorians call the period the Middle Palaeolithic, and it is defined by their technology. Although they continued to make handaxes, they made miniature types as well as one with a flat base, known as a *bout coupé* (bottom cut). Their key innovation was to create shaped tools using flakes of flint. Left-over chips from making handaxes had always been useful, but Neanderthals began to form them to use in specialised tasks, such as scraping animal hides. They used a technique called pressure flaking to remove thin slivers of flint to make beautifully crafted objects, including a long thin blade known as a laurel leaf because of its shape. The also made specially prepared cores, sometimes called tortoise cores because they look like the shell of tortoises, from which they could strike off a single piece. These flakes, known as Levallois points, were used as spearheads. Making them was very wasteful of flint, as it was not possible to make a second point from the same core.

Some Neanderthal tools have been found in North Hertfordshire. They include a miniature handaxe from Letchworth Garden City, a *bout coupé* handaxe from Hitchin and a poorly made Levallois point from Baldock. There are also some mammoth remains from Baldock, including part of a tusk now on display in North Hertfordshire Museum. It was found when the Salisbury Road estate was being built in 1920, close to the line of a winterbourne (a stream that flows only in winter) and had perhaps been chased into a boggy hollow where it was killed. We do not know if the rest of the skeleton is still underground, awaiting discovery.

7: mammoth tusk fragments from Baldock, on display in North Hertfordshire Museum

Modern Humans

The climate warmed rapidly about 14,100 years ago. This warm phase is known as the Windermere Interstadial, which lasted little more than a century. It ended when the climate cooled rapidly – over the space of only a decade or so – when the ice sheet in northern Scotland began to grow again, from about 12,900 years ago. This sudden cold snap is known as the Loch Lomond readvance.

People came to Britain again during the Windermere Interstadial. This time, they were modern humans – *Homo sapiens* – whose ancestors had arrived in Europe about 46,000 years ago. They travelled

through the Middle East and Anatolia before reaching the Balkans. Early sites dated to 43,000 years ago in Slovakia and 42,000 years ago in Bavaria show their progress across northern Europe. They were the first people to make tools from bone and antler as well as stone. Although tools in the Aurignacian tradition – such as the well-known discoveries as Kents Cavern in Torquay – show that a few people came to Britain before the Windermere Interstadial. The fragment of a bifacially-worked leaf point, found in Weston, was perhaps lost by a visitor during this cold period.

8: broken bifacially worked point from Weston

A barbed bone spearhead in the British Museum is said to have been found in Royston, but Roger Jacobi suggested in 1987 that it was probably from Barrington. It is identical to one found in Suffolk and radiocarbon dated to the Windermere Interstadial. Other tools of this time have two distinctive styles of point: the Cresswell Point, found across the southern Pennines and into Cheshire, and the Cheddar Point, found in southern England. These subtly different artefact types show that there were two groups of people who visited Britain at this time, one travelling west across the North Sea basin, which was still dry land, and the other travelling north across the Manche River, which flowed where the English Channel is today.

After the ice

The Loch Lomond Stadial began about 12,900 years ago (in other words, about 10,900 BC) and ended with another sudden warming, about 9700 BC. There have been no cold periods since then. The landscape slowly became wooded, although the climate remained cool and damp. New animals arrived, including a tiny permanent population of *Homo sapiens* with a new form of technology, based on small blades known as microliths. These miniature blades were not themselves tools, but components with a wide variety of uses. They could be mounted in handles to use as knives, sickles and scrapers, or used on the tips of wooden shafts as spears or arrows (hunting with bows was another innovation of this period). When one blunted or snapped, it could be replaced easily. This new technology was more efficient, and it shows that people were thinking about their tools not as something to drop when no longer needed but as something important that could be maintained and repaired.

These people are hard to detect in the landscape, although the hints we have from the discovery of microliths show that they seem to have been most active in the hillier areas. River valleys would have been good places to fish, catch wildfowl and gather reeds to use in making shelters. The period in which they lived is known as Mesolithic.

The origins of human behaviour

It is wrong to think of people in the prehistoric past as 'primitive'. The brains of the first *Homo sapiens* were the same as ours, so they had the same intellectual capabilities. They had a much smaller range of technology and were less dependent on it than we are. But their tools were perfectly adapted to their needs. The fact that handaxes were used for more than two million years is evidence that they were perfect for the jobs they needed to perform.

There is even evidence from North Hertfordshire that shows *Homo heidelbergensis* behaving just like us. During the excavation of one of the clay pits in Hitchin, a broken handaxe was found, missing its tip. The missing part was found later, some distance away, where the use had thrown it in anger. These early humans were well adapted to their environment and knew how to exploit available resources. Hitchin has provided some of the best evidence in northwest Europe for early humans, with more than a hundred of their stone tools found.

9: a broken handaxe from Highbury in Hitchin

Although climatic factors determined when people could come to Britain, the Neanderthals discovered how to survive in extreme cold. Their thick clothes and adaptations to the shape of their nasal passages enabled them to visit Britain even when it was covered by Arctic tundra. Their technology allowed them to survive and flourish in extremely hostile conditions

Keith Fitzpatrick-Matthews
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