NEWS & VIEWS

Two views of the Happisburgh archaeological site.

ARCHAEOLOGY

Early human northerners

Andrew P. Roberts and Rainer Grün

A site in Norfolk, UK, provides the earliest and northernmost evidence of human expansion into Eurasia. Environmental indicators suggest that these early Britons could adapt to a range of climatic conditions.

The coastline of Suffolk and Norfolk, two adjoining counties in the East Anglian region of Britain, is proving to be a treasure trove for those in search of the earliest evidence of 'Homo britannicus'[1]. Excavations at Pakefield, Suffolk, provided evidence for human activity around 700,000 years ago[2]. On page 229 of this issue, Parfitt *et al.*[3] now describe an archaeological site near the village of Happisburgh, Norfolk, which seems to be even older, perhaps extending back 950,000 years.

The Happisburgh site was revealed by coastal erosion. Plant and animal remains analysed by Parfitt *et al.* indicate that the early humans occupied a forest-fringed estuary of the ancient River Thames. An ensemble of knapped flint artefacts, which would have been used for cutting or piercing, provides the key evidence for human occupation. Apart from the reasonable assumption that the people who made these artefacts were hunter–gatherers, details about their population size or family structure remain elusive.

Nonetheless, Happisburgh is a significant site — not just because of its probable older age, but because the thorough reconstruction of environmental conditions points to a climate that was similar to that of today. It was cosy by British standards, but still miserable for those used to Mediterranean climes. The site is also remarkable because it represents the northernmost site of human expansion into anywhere in Eurasia at this early stage. The first humans knocked at Europe's door around 1.8 million years ago, as indicated by human fossils found in the Caucasus at Dmanisi, Georgia[4]. By 1.3 million years ago, humans were established in the Mediterranean as indicated by fossils from Sima del Elefante, near Burgos, Spain[5], and several archaeological sites in Spain, southern France and Italy[6].

Until the Happisburgh site was found and described, it was thought that these early humans were reluctant to live in the less-hospitable climate of northern Europe, which frequently fell into the grip of severe ice ages. Happisburgh joins a list of perhaps less-well-dated sites at around 1 million years ago in Germany[7] and northern France[8]. Evidence from these localities suggests that the first middle Europeans were far more adaptable to ever-changing climatic conditions than previously thought.

A key concept in archaeology is whether a find is 'uncontested'. A find can normally be contested on one or more of three grounds. Is an artefact real? Has it been reworked (moved) since it was originally deposited? Is it well dated? In many cases, the reality and position of artefacts are not in question, but dating old sites in central and northern Europe is notoriously difficult. Techniques such as radiocarbon dating do not work that far back in time, and there is often insufficient material available for techniques that do work.

At Happisburgh, the excavators found that the sediments in which the artefacts were buried record a period when Earth's magnetic field had reversed polarity. That is, if one had a compass, it would have pointed south at that time instead of north. There is a well-known timescale of polarity reversals, the last of which occurred 780,000 years ago (Fig. 1, overleaf). Identification of reversed palaeomagnetic polarity is therefore taken as a 'smoking gun' for ages older than 780,000 years. But does the documented reversed polarity mean that the Happisburgh site has an uncontested chronology? The sedimentary interval with reversed-polarity magnetizations is only a few metres thick, and could have been deposited rapidly. It is therefore possible that the palaeomagnetic results document one of many brief periods during the past 780,000 years when Earth's magnetic field wandered into a transient reversed-polarity state, called a geomagnetic excursion[9] (Fig. 1).

The likelihood of human activity at Happisburgh before 780,000 years ago is established by the palaeomagnetic results combined with

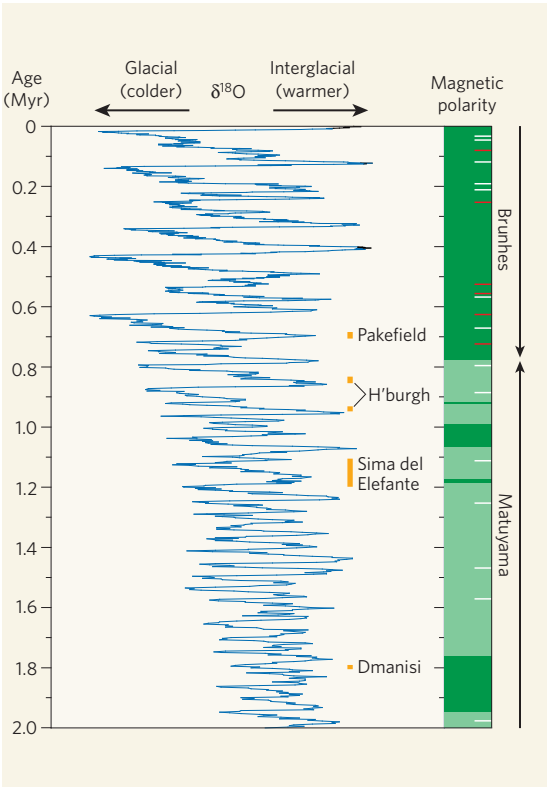

Figure 1 | Palaeomagnetic and climatic context for the human occupation of Europe. 'Magnetic polarity' represents the timescale for reversals of Earth's magnetic field (dark green, normal polarity; light green, reversed polarity), with the boundary between the Brunhes (normal) and Matuyama (reversed) intervals at 780,000 years ago. White bars on the polarity log denote 'validated' geomagnetic excursions; red bars denote 'possible' geomagnetic excursions[9] in the Brunhes interval. Variations in global climate between glacial and interglacial stages — blue curve, from marine oxygen isotope ($\delta^{18}O$) data[11] — are also shown. The most likely interglacial stages for human presence at Happisburgh, when the climate in Britain was milder than today but still chilly by Mediterranean standards, are marked in orange. The geomagnetic evidence of reversed polarity could be consistent with an excursion at a later time, but Parfitt and colleagues' fossil evidence[3] favours the earlier dates. Other early sites with human artefacts or remains are Pakefield, UK[2], Sima del Elefante, Spain[5], and Dmanisi, Georgia[4]. Myr, millons of years.

Parfitt and colleagues' careful documentation[3] of rich fossil plant and mammal assemblages, which include extinct taxa such as hemlock-type conifers, hop-hornbeam birches, southern mammoths, equids (horse family), voles, elk and red deer. Temperatures indicated by fossil beetles suggest that summers at Happisburgh were similar to or slightly warmer than today's, but that winters were probably at least 3 °C cooler. Fossil pollen grains indicate a conifer-dominated woodland such as can be found today in southern Scandinavia. The authors' detailed analysis suggests that human visits to Happisburgh occurred during the later part of a warm interglacial period, either at 840,000 or 950,000 years ago (Fig. 1). Parfitt and colleagues have therefore produced a credible chronology, along with an analysis that provides insights into the ability of early 'Homo britannicus' to exploit a resource-rich but challenging environment during a period of climatic deterioration.

At face value, the work of Parfitt *et al.*[3] indicates that humans moved farther into Europe at an earlier stage than was previously thought. But much work remains to obtain precise dates and to test this assertion at many other European archaeological sites. As scientists who use palaeomagnetism and electron spin resonance (ESR), respectively, to determine the age of sediments, we are especially aware of the difficulties in dating the types of deposit that contain archaeological artefacts. ESR dating of river sediments in the Loire basin, central France, suggests that humans were present at similar times to those at Happisburgh[8], but not all of the problems associated with the physical basis of the ESR method have been adequately addressed.

There is a real need to develop robust dating methods with the chronological precision to resolve questions about the timing of the human occupation of Europe. Particularly promising is the application of cosmogenic isotopes to determine the burial age of sediments[10]. Systematic efforts to improve dating of archaeological sites will clarify questions concerning the timing of arrival of our European ancestors, their development of technology, their adaptation to cold, and the role of climate in determining their chosen habitats. The exceptional preservation of artefacts and fossils that provide information about human presence and environmental conditions along the East Anglian coast means that further discoveries at Happisburgh, and elsewhere, are likely to continue to shape our thinking about these questions. ■

Andrew P. Roberts and Rainer Grün are at the Research School of Earth Sciences, The Australian National University, Canberra, ACT 0200, Australia.
e-mails: andrew.roberts@anu.edu.au; rainer.grun@anu.edu.au

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