



Frontispiece 1. Photograph of the 2023 rescue excavation of a Late Palaeolithic site at Louviers in the Eure valley, close to the confluence with the River Seine, 100km north-west of Paris. Radiocarbon dated to end of the last Ice Age, the Late Magdalenian site features a stone-lined hearth and associated lithic and faunal assemblages. Wild horse dominates the archaeozoological material. Among the 2300 flint finds are a few projectiles used for hunting but most of the assemblage comprises scrapers, blades and other tools for butchery and burins for working bone or antler. The variety of finds exceeds those of a kill site, suggesting instead the presence of a small camp. Photograph © Serge Le Maho, Inrap.




Frontispiece 2. Excavation during June 2023 at the site of Igbo IDU II at Igboukwu, in Anambra State, south-east Nigeria. Dr Kingsley Chinedu Daraajimba and local trainee, Bassey Okon, excavate a new locale at the Igboukwu complex that was first investigated by Thurstan Shaw in the 1960s. Igboukwu is the oldest known bronze-working site in West Africa, dating to the ninth to thirteenth centuries AD. The new excavations at Igbo IDU II have found pit features containing charcoal, highly decorated pottery sherds, metal objects, a lizard figurine and glass beads. Beginning in 2019, the Igboukwu Archaeological Project is exploring human-environment interactions and long-term landscape transformation. The initiative adopts a community-archaeology approach to benefit local people through a range of public-engagement strategies. Photograph © Mr Udochukwu Okeke, Igboukwu Archaeological Project.



EDITORIAL

Hot on the heels

 In 2023 we have been able to do things that have not been possible for tens of thousands of years. In January, for example, we could gaze up at a comet—C/2022 E3—that last passed by Earth 50 000 years ago (though it would have taken a keen-eyed hominin to spot the faint green smudge). More worryingly, in the past few months we have endured average global temperatures last experienced 120 000 years ago during the Eemian interglacial period. With a global average temperature of 16.95°C, July 2023 is officially the hottest month on record and, if you had taken a dip in the sea to cool off, you would have poached in water at a record average surface temperature of 20.96°C.¹ Such opportunities to experience prehistory without the need for time travel are a reminder that the past is catching up with us. But forget the distant Pleistocene, it is our recent carbon-gorging history that is snapping at our heels.

The past few months have witnessed extreme heat and precipitation across the world. During July and August, wildfires burned around the northern hemisphere, from the Mediterranean to Siberia and across North America. On the island of Maui, for example, fire razed much of the town of Lahaina—one of the early capitals of the Kingdom of Hawai‘i—and killed more than 100 of its citizens. Each such event is shocking in its own right, but the fact is that they are becoming increasingly frequent as a result of climate change. In a new book, *Fire Weather*, John Vaillant recounts the tragic irony of the 2016 wildfire that consumed the petro-boomtown of Fort McMurray in Alberta, Canada.²

That [petroleum] industry and this fire represent supercharged expressions of two trends that have been marching in lockstep for the past century and a half. Together, they embody the spiraling synergy between the headlong rush to exploit hydrocarbons at all costs and the corresponding increase in heat-trapping greenhouse gases that is altering our atmosphere in real time.

No serious scientist questions that human activities have fundamentally changed the Earth’s climate and environment. But do these changes constitute the start of a new geological epoch? And, if so, when did it start? Debate about the formal definition of the Anthropocene has been hotting up for some years. Some researchers have questioned the value of seeing human actions in geological terms; others argue that ‘Capitalocene’ would better capture the specific cause of the climate emergency. Some scholars have argued that humans have been deeply altering their environment for millennia; others point to the Industrial


¹ <https://www.theguardian.com/environment/2023/aug/08/july-2023-worlds-hottest-month-climate-crisis-scientists-confirm> (accessed 26 August 2023). <https://www.theguardian.com/environment/2023/aug/04/oceans-hit-highest-ever-recorded-temperature> (accessed 26 August 2023).

² Vaillant, J. 2023. *Fire Weather: a true story from a hotter world*. New York: Sceptre.

Revolution as a start date; still others prefer to limit the term to the era of the ‘Great Acceleration’ starting in the mid-twentieth century. Meanwhile, the Anthropocene Working Group of the Subcommission on Quaternary Stratigraphy has been collating evidence to support the potential formal recognition of the epoch. Since publishing its key findings in 2019,³ the group’s attention has focused on identifying a site for nomination as the internationally agreed reference point for the lower geological boundary of the Anthropocene. In July, the group announced its final recommendation of Crawford Lake, near Toronto, as its candidate site for the Global Boundary Stratotype Section and Point (GSSP), or ‘golden spike’, defining the start of a new age.⁴

Crawford Lake was selected because its great depth (24m) means that the annual precipitation of calcium carbonate from the surrounding karstic rock sinks to the lake’s floor where, undisturbed by mixing of the water column, it accumulates a fine-grained chemical record of the atmosphere.⁵ Coring of these deposits has revealed a clear anthropogenic footprint in the form of radioactive plutonium and fly ash from the burning of fossil fuels. Members of the working group were not unanimous in their choice of candidate site, with some preferring a lake in China located further from nearby sources of potential urban pollution; nor has the decision been welcomed by local Indigenous groups. Moreover, the selection of Crawford Lake does not resolve the question of the specific start date, although the chronological precision of the evidence for radioactive fallout from nuclear explosions makes either 1945 or 1950 strong candidates. But with or without the efforts of the subject of this summer’s blockbuster movie—*Oppenheimer*, not *Indiana Jones!*—the evidence for the scale of recent anthropogenic influence on Earth’s ecosystems is all too evident whether at Crawford Lake or elsewhere around the world.

All aboard?

 Railways and archaeology share a long history. Track construction, whether across open countryside or through and beneath cities, has produced archaeological finds for almost two centuries. These days, any self-respecting new metro station has a museum displaying the artefacts found during construction: recent examples include the Serdika II Metro Station in Sofia, Bulgaria, the San Giovanni Metro C station in Rome and the Dimotiko Theatro (Municipal Theatre) station in Piraeus, Athens. Even long-completed transit hubs are getting in on the act; for example, passengers travelling through the Montparnasse-Bienvenue station in Paris this summer were able to experience a ‘Journey to Ancient Gaul’ (Figure 1).

In addition to encountering archaeology on the daily commute, visitors can choose to travel by rail to visit archaeological sites. Earlier in the year, a new direct, high-speed service running on existing tracks between Rome and Pompeii was launched, an event of sufficient

³ Zalasiewicz, J., et al. (ed.) 2019. *The Anthropocene as a geological time unit: a guide to the scientific evidence and current debate*. Cambridge: Cambridge University Press.

⁴ Witze, A. 2023. This quiet lake could mark the start of a new Anthropocene epoch. *Nature* 619, 441–42. <https://doi.org/10.1038/d41586-023-02234-z>

⁵ McCarthy, F.M., et al. 2023. The varved succession of Crawford Lake, Milton, Ontario, Canada as a candidate Global boundary Stratotype Section and Point for the Anthropocene series. *The Anthropocene Review* 10: 146–76. <https://doi.org/10.1177/20530196221149281>



Figure 1. 'Voyage en Gaule antique' ('Journey to ancient Gaul'), a 138m-long exhibition at Montparnasse-Bienvenue station on the Paris metro, showcased archaeological excavations of Romano-Gallic sites undertaken by the Institut national de recherches archéologiques préventives (Inrap). The display, including reconstruction drawings by Jean-Claude Golvin, was on show from 12 July–25 September 2023. Photograph © Jennifer Brohan/Inrap.

national importance that the first train brought to the ancient Roman city no lesser figure than the Italian prime minister. In Mexico, meanwhile, the construction of an altogether more controversial railway is nearing completion. A signature project of Mexican president Andrés Manuel López Obrador, the \$20bn Tren Maya (or *Tsimin K'aák*) is intended to boost archaeological tourism across the Yucatán Peninsula. It comprises a 1500km network with 20 stations across five states (Campeche, Chiapas, Tabasco, Quintana Roo and Yucatán) connecting with some of the most famous Maya sites, including Calakmul and Palenque. By linking the developed coast with inland areas, the plan is to draw tourists away from their beach holidays to explore the archaeological riches of Mexico's poorest region, bringing with them investment and economic growth. Around half of the network uses existing tracks, while the other half opens entirely new routes across the peninsula, cutting through sensitive forest ecosystems and archaeological landscapes. Already contentious for its cost and impact on the environment and cultural heritage, the project has been pushed forward at a breakneck pace in order to enter service before the president leaves office in 2024, which has limited the time available for impact assessments and mitigation work. This construction schedule has required the rapid investigation of countless archaeological features, sometimes necessitating excavation in just days or weeks of what might typically have taken months or even years to complete. Even if achieved under sub-optimal conditions, however, when the study of all the findings is complete, our understanding of the Maya past will be transformed.

Alongside excavations, the railway has also generated extra funding for the region's cultural heritage—for example, a new museum at Chichén Itzá (already Mexico's most popular

archaeological site, with two million visitors a year). Of course, the intention is that the railway will not only increase archaeological tourism but also stimulate general economic development. As elsewhere, such growth will bring both prosperity and further threats to the region's environment and cultural heritage, which means that controversy will continue even after the Tren Maya network is completed in the coming months. Mega infrastructure projects such as this seem inevitably to polarise opinion by pitching heritage and environment against development and growth, especially when they become footballs in bigger political games. Yet, if the UN's sustainable development goals—to which nearly 200 countries have signed up—are worth the paper they are written on, such construction projects will need to work harder to harmonise their potentially conflicting aims and to build the broadest spectrums of support.

Similar politicking, but less haste, characterises two major infrastructure projects in the UK: the High-Speed 2 (HS2) project and the Stonehenge Tunnel (A303 road scheme). While Tren Maya has advanced at astonishing speed, the political dithering over HS2 continues. The spiralling costs, diminishing environmental logic and polarised political context have seen the railway's route repeatedly scaled back and its opening date postponed. Despite this, much of the archaeological dividend has already been reaped with the completion of extensive excavations along the route from London to Birmingham producing a slew of discoveries. Even if the route is never extended to connect with Euston station in central London as originally planned, for example, the latter site has already been excavated. Among the many thousands of burials investigated was that of Captain Matthew Flinders, grandfather of Egyptologist Sir Flinders Petrie; Captain Flinders will finally be reburied in his hometown of Donington in Lincolnshire next year, while the other remains will be reinterred at Brookwood Cemetery, Surrey. Simultaneously, the saga of the Stonehenge Tunnel rumbles on. In 2021 the High Court ruled that the secretary of transport's decision to ignore the recommendations of planners and to move ahead with the proposed scheme was unlawful. Having made only minor changes to the proposal, in July this year the government granted a new consent order for the £2bn scheme to go ahead. But with another legal challenge now underway, a general election looming and an empty treasury, the likelihood that the tunnel will be built anytime soon is surely lower than the odds of summer ice at the North Pole by 2030.

Combs, bones and runestones

CIn this issue, we feature three articles that explore the connectivity of the Viking world and the mobility of people and objects around the Baltic and North Seas and the Northern Atlantic Ocean. We start with the humble hair comb. In the Viking period, combs were typically made of antler. Well over 1000 examples have been recovered during extensive, long-term excavations at Hedeby in southern Jutland. During the ninth and tenth centuries AD, this was the site of the largest known Viking settlement, a trade hub connecting Scandinavia to central and southern Europe. It was also a place of manufacture, producing a huge assemblage of antler waste indicating on-site production of objects such as combs. As the vast bulk of the craft waste relates to red deer antler—and because these animals lived in the surrounding region—it might seem reasonable to assume that the finished combs recovered from the site were locally produced using red deer antler. However, Mariana Muñoz-Rodríguez and

colleagues' ZooMS analysis on a sample of the earliest combs demonstrates that at least 90 per cent of them are, in fact, made of reindeer antler. As reindeer lived much further north, in central and northern Scandinavia, the authors conclude that the earliest inhabitants of Hedeby groomed themselves with combs made from raw materials sourced from the edge of the Viking world. It is even possible that the combs themselves were manufactured in these 'outlands' for exchange hundreds of kilometres south as part of the burgeoning Viking trade network.

In the second of our trio of Viking-themed articles, Kimberly Plomp and colleagues consider the debate surrounding the identity of the Europeans who settled Iceland, and subsequently Greenland, during the ninth and tenth centuries. Sagas and historical texts suggest that these settlers originated in Norway, first colonising Iceland and then the Icelandic settlers colonising Greenland. Recently, however, several osteological and genetic studies have begun to identify some settlers as being of British and Irish ancestry. Here, the authors use 3D-shape analyses of human crania from one of the Icelandic colonies in Greenland, as well as sites in Scandinavia, Britain and Ireland, to assess the geographical genealogy of the settlers. The results indicate that almost two-thirds of the Greenlandic individuals have British and Irish origins. This very high figure raises significant questions about the nature of the settlement of the North Atlantic islands and the socio-economic and cultural backgrounds of the people involved. One possibility is that the settlers comprised two groups: a small elite of Scandinavian ancestry and a larger group of people with British and Irish ancestry, perhaps brought as the *thralls* or enslaved individuals of the first group.

Finally, Lisbeth Imer and colleagues bring us back to Jutland and the formation of the Danish Kingdom. During the tenth century AD, Harald Bluetooth ruled Denmark from the royal seat at Jelling. The two extant mounds and stone ship-setting at that site are traditionally associated with Harald's parents, Gorm and Thyra. The latter is named on two runestones at Jelling and the name, Thyra, unusually also appears on several others across the wider region. Typically, only a single runestone was erected to commemorate an individual. If these multiple mentions of Thyra all refer to the same person, this would indicate a woman of high social and political status. Using 3D-scanning to study the carving techniques on these various stones, as well as the analyses of orthography and language, the authors demonstrate that several were carved by the same hand—an individual identified as Ravnunge-Tue—lending support to the suggestion that the stones do indeed all refer to the same Thyra. If correct, the emphasis given to commemorating the queen at multiple sites suggests the important role she played in the foundation of the Danish state. So while it is Harald, Thyra's son, who is remembered for uniting Denmark as a single kingdom—both because he recorded his achievement on one of the Jelling stones and because the wireless specification found on a billion smartphones is consequently named after him (Figure 2)—his mother may have played an integral role in his consolidation of power.

Also in this issue

Among the other articles featured in this issue, two contributions take us back to archaeological research undertaken in early twentieth-century England in order to consider the developments in fieldwork and interpretation over the ensuing 100 years. Chris Evans and



Figure 2. A bronze plaque in the Domplein (Cathedral Square) in Utrecht marking the 300th anniversary of the university in 1936, with the text of the Jelling II stone, a transliteration and a Dutch translation. In English: “King Haraldr ordered this monument made in memory of Gormr, his father, and in memory of Thyrvé [Thyra], his mother; that Haraldr who won for himself all of Denmark and Norway and made the Danes Christian.” The Bluetooth wireless technology logo combines the king’s initials: H (H) and B (B). Photograph © Autopilot CC BY-SA 4.0.

colleagues mark the centenary of the publication of *The archaeology of the Cambridge region* by Sir Cyril Fox—a pioneering synthetic account of the long-term development of settlement and land use on the edge of the Cambridgeshire Fens. The volume was highly influential on contemporary archaeological thinking and practice, particularly in relation to its definition of a large study region (some 3000km²) and the use of distribution maps as a means of both visualising evidence and narrating the past. The article’s authors use Fox’s account as a starting point for reflection on the exponential increase in the quantity of evidence gathered from that region over the subsequent century. The results of developer-led archaeology in one of the fastest-growing regions of the UK have been particularly transformative. In many cases, work in advance of construction has allowed the investigation of every settlement and feature across large contiguous areas of the landscape, increasing the known numbers of sites tenfold, or more in many areas, and calling attention to the need for archaeologists to grapple with the full significance of such ‘high-density pasts’.

Meanwhile, Tom Moore and colleagues consider a category of monument—linear earthworks—that featured regularly in the pages of *Antiquity* between the 1920s and 1960s, not least because editor OGS Crawford sought to promote the investigation of these previously neglected landscape features. Subsequently, however, studies of these monuments have tended to appear in period-specific or local journals, their study becoming divided between Iron Age and early medieval specialists, and consequently drawn into divergent debates. Here, the authors propose a reconceptualisation of these linear earthworks, building on a growing database of archaeometric evidence for the dates of their construction and long-term development, to think afresh about the social and political significance of Britain’s largest archaeological monuments.

Several other articles in this issue also examine aspects of landscape archaeology. Juan Antonio Quirós Castillo and colleagues use geochemical analyses of soil cores to explore the role of ‘agroscares’ in the formation of early medieval village communities in the Basque country, and Seth Quintus and colleagues deploy ideal distribution models to assess changing landscape organisation and agricultural practices on the Hawaiian island of O‘ahu. We also have articles reporting on Neolithic rondel enclosures in Poland, an important Western Zhou urban site in central China, the zooarchaeology of big cats in the Near East, and long-term resilience strategies in Madagascar. Among six new Project Gallery articles, available online, we have an account of a rare site in the Turkana Basin dating to the Early to Middle Pleistocene transition; we’re also pleased to feature an overview of the results of the first archaeological excavation in São Tomé.

As ever, if you’d like to see your own research featured in *Antiquity*—either a full-length research article or a shorter Project Gallery piece—feel free to get in touch. You can find contact details here: <https://www.antiquity.ac.uk/contact>. We look forward to hearing from you!

ROBERT WITCHER
Durham, 1 October 2023