This is Archaeology

Impacting heritage, landscapes & lives

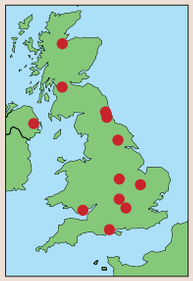
Archaeology, it is sometimes said, has limited popular appeal and little impact beyond academia. David Mattingly & Sally Foster introduce a special look behind the scenes at how British universities are making archaeology not just interesting, but socially relevant too

For over 30 years, British universities have been subject to regular national assessments of research quality measured in terms of international significance. Since 2014 the Research Excellence Framework (REF) exercise has included a significant emphasis on "Impact beyond Academia" – scholarly funding and jobs depend, to some degree, on the extent to which research is seen to be relevant to people's lives across the nation and beyond. And archaeology should be proud: the REF 2021 results, published in May 2022, confirmed UK university archaeology's international high standing, with a particularly strong showing for impact. Indeed, archaeology had the highest average impact scores across all the social sciences and humanities. So what is "Impact beyond Academia"? How is it measured, and how do scores affect research and teaching? What does university archaeology look like in the world of the REF?

Ingenious & imaginative

The Research Excellence Framework defines impact as "an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia" – so it covers a multitude of different aspects. The important thing to emphasise is that measuring these wider societal impacts increasingly underpins public (and political) valuation of archaeological and heritage work, and is thus especially crucial in a time of cuts to heritage budgets and public services. It matters both to universities and to society more generally what people think archaeology contributes to the public good.

Above: Feasting linked to Stonehenge was one of several world food stories researched by the University of York, celebrated with an exhibition put on with partners at the University of Cardiff and English Heritage



Impact Case Studies (ICS) produced and assessed for REF 2021 show archaeology's distinctive and important contribution. Archaeology offers more than exciting stories in the media of dramatic new discoveries. University-based archaeological research is leading to very diverse sorts of public impact, and this is also changing what we teach and how we train today's archaeology students. University departments very often work in partnership with commercial units, museums, local and central government, or other heritage bodies. So high-scoring impact is an

ENGLISH HERITAGE

important result beyond universities as well, demonstrating diverse societal benefits derived from archaeological work at a variety of organisations.

Some archaeologists have always done this sort of work, but often in an under-resourced and under-appreciated environment and in a somewhat haphazard manner. Impact now counts for 25% of the REF evaluation of university research, with the overall score informing the annual allocation of around £2bn in public funding. So REF impact and its weighting have changed university behaviours; research managers now recognise the value of the time invested in such activity, and the need for a systematic and planned approach to how to achieve and demonstrate impact. Grant bodies also offer more support for such research engagement. All of this has led to a huge range of imaginative and significant outcomes beyond the specialist books and articles on which academics have traditionally built their reputations.

Impact in the REF must be specifically related to academic research at the institution submitting the case study, and achieved within a prescribed timespan. There must be a proven link between the research and the impact claimed, as well as corroboration for the impact. This can be challenging. Sometimes the story is nicely linear – X excavates a site and publishes results, which then form the basis of X working with Y and Z to create a museum or tourist attraction that draws heavily on the research, bringing tangible financial benefits to the community. There may also be a transformed level of public engagement with the heritage, for instance through associated educational programmes with schools or community groups. Often the research and impact are the result of co-production involving agencies and individuals, as well as members of the public working together, and impact accruing even before the full scientific results are realised.

We were part of a sub-panel charged with rigorously assessing the submissions that 24 archaeology departments returned to the REF: a total of 61 case studies of which 59 are now published. Around 12 other clusters of archaeologists (as part of larger schools of say history or classics) were returned to different sub-panels. Some academics working in the field of heritage studies were submitted to the archaeology panel and, likewise, some to others.

Impacts on... Beneficiaries	Ways of making a difference
... understanding, learning & participation **... creativity, culture & society** **... the health & wellbeing of people, & animal welfare** • Place-based communities • Primary / secondary pupils • Tertiary education students • Teachers / lecturers • Socially disadvantaged, mentally ill, disabled • Citizen scientists / extra-curricular & Third Age audiences • Volunteers • Journalists & media-makers • Visitors • Festival-going public • Artists • Languages (minority)	• Connecting people • Engagement, co-design, co-production • Producing educational resources to enhance learning • Training for teachers • Producing digital surrogates / new artefacts / immersive technologies • Training for volunteers • Information & advice for newspapers & media • New interpretations that enhance visitor experience (heritage, museums) including new infrastructure • Engagement through pop-up stands & exhibitions • Prompting & inspiring artworks / performances • Providing focus & new identities for locus of regeneration • Creating employment • Generating income (including new funding for heritage)
... commerce & the economy **... production** • Developers • Heritage attraction managers • Tourism sector • Nature conservation bodies • Creative art industries • Businesses & employers	
... practitioners & delivery of professional services, enhanced performance or ethical practice • Heritage sector • Museums sector • Practising archaeologists / historic environment practitioners • Planning authorities	• Articulation of / challenging place / resource significance • Developing policy, guidelines, toolkits • Delivering training for professionals
... public policy, law & services • Policy advisors & makers	• Data sets / interpretative evidence • Topical global issues that may be relevant to United Nations Sustainable Development Goals: loss through conflict, climate change, earthquake, criminal activity etc
... social welfare • Victims of trauma & descendants • Police	
... the environment • Agriculture & forestry sectors • Nature conservation bodies	

The key criteria for the REF assessment are reach (to potential constituencies) and significance (degree to which these constituencies have been enriched). Analysing the case studies, our table (above) maps beneficiaries by areas of impact that REF identifies; it also illustrates the ways in which archaeology academics are making the difference happen – with and for whom.

It was apparent to the panellists reading these Impact Case Studies, and hopefully to anyone casting an eye over the REF results, that university archaeologists have become very engaged with the impact agenda in recent years. Academics have been extremely ingenious and imaginative in developing new sorts of partnerships to amplify the reach and significance of archaeological research. For this reason, we suggested to *British Archaeology* that it might be of broad interest to celebrate some of this work here. You can read in detail 59 archaeology Impact Case Studies online by entering [sub-panel] 15 Archaeology in search and filter at https://results2021.ref.ac.uk/impact. What follows is the editor's selection of some of the amazing impact stories relating to both UK and overseas research.

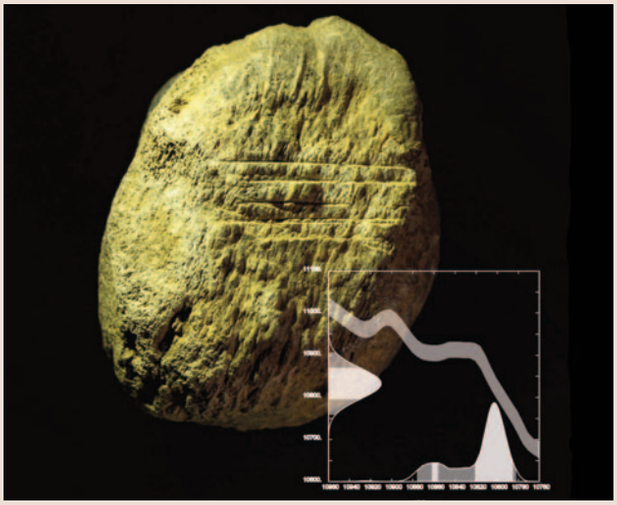
David Mattingly (professor of Roman archaeology at the University of Leicester) chaired the archaeology sub-panel in REF 2021; Sally Foster (professor in heritage & conservation at the University of Stirling) was an impact specialist on the sub-panel

Providing a unified timescale to our past: The global impact of Queen's radiocarbon chronological techniques

Queen's University Belfast

Since the development of radiocarbon (^{14}C) dating in the 1950s, it has been known that atmospheric ^{14}C concentrations have varied over time, causing measured ages to deviate from "real" calendar time by up to 10–15%. They can be corrected to calendar years with calibration curves built from samples of known age such as tree rings (see feature Sep/Oct 2019/168). As analytical precision and the number of dated samples contributing to calibration curves increase, so these curves become longer and more detailed and reliable.

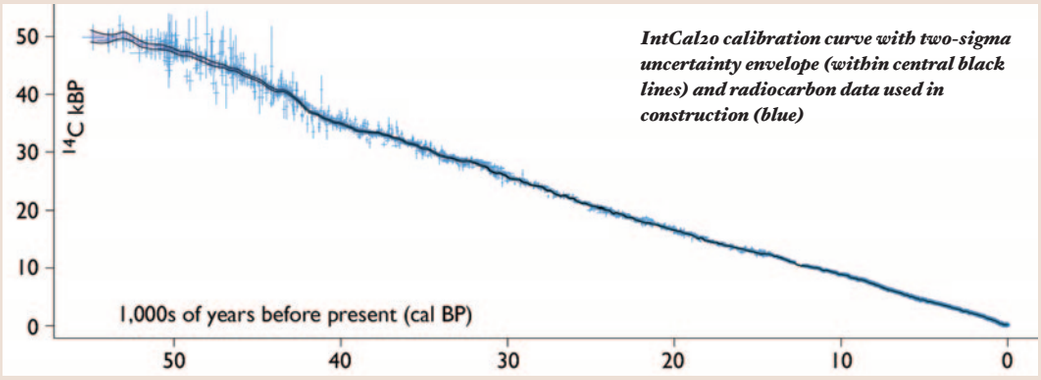
In 2001, Paula Reimer initiated the IntCal Working Group, assembling and leading a team of international experts to evaluate the available data from a variety of independently dated archives. With criteria for selection of calibration-quality data and improved statistical techniques, the working group built robust calibration curves back to 26,000 years ago. In 2006 the group, under Reimer, extended the marine and terrestrial calibration curves for both northern and southern hemispheres back to the 50,000-year limit of radiocarbon dating. Now calibrated radiocarbon dates for the last known Neanderthals, for example, could for the first time be compared to the timing of climate changes recorded in the Greenland ice cores.



JAMES CONNOLLY/MARION DOWD/RON REIMER

Above: Bear patella with butchery marks, the earliest evidence for people in Ireland, with IntCal20/CALIB 8.1 calibration plot

The IntCal calibration curves are free and are used by all commercial radiocarbon laboratories. Dating generates an estimated £45m annual revenue; over 92% of these samples are then calibrated using IntCal curves. Research at Queen's has been instrumental to the work of commercial dating labs, and has provided calibration software including Bayesian models developed by Maarten Blaauw which include information such as stratigraphy. It has provided scientific evidence for climate change policies, contributed to the safeguarding of cultural heritage sites and shed new light on the lives of past cultures including the oldest known figurative cave art in France, at Chauvet Cave, and the earliest people in Ireland.



IntCal20 calibration curve with two-sigma uncertainty envelope (within central black lines) and radiocarbon data used in construction (blue)

Glastonbury Abbey: Transforming policy & practice & shaping innovation at a sacred heritage site

University of Reading

World famous Glastonbury Abbey, England's earliest church and the legendary burial place of King Arthur, attracts a diverse range of spiritual seekers. But it was poorly served by previous archaeologists – 36 seasons of excavations remained unpublished – presenting a major barrier to visitor interpretation and new development. Through sustained co-creation over 14 years, Roberta Gilchrist's research transformed understanding of the abbey's archaeology (the complete dataset is now publicly available through a digital archive hosted by the Archaeology Data Service), profoundly influencing the behaviours and experience of staff, trustees, professional advisors, volunteers and visitors. The collaborative research process reformed the institutional culture; impacted policy and practice in conservation, collections, education and visitor experience; and raised ambition in immersive heritage interpretation. The research secured an optimistic future for Glastonbury Abbey and is influencing other heritage and cultural organisations.

© THE CENTRE FOR THE STUDY OF CHRISTIANITY & CULTURE/UNIVERSITY OF YORK

Improving understanding & protection of endangered archaeology in the Middle East & north Africa

University of Oxford

In the early 2010s heritage sites were systemically damaged during the Arab Spring (see feature May/Jun 2011/118). Oxford archaeologists had previously worked on projects such as Historic England's National Mapping Programme, and the Aerial Photographic Archive for Archaeology in the Middle East (APAAME). They decided to see how satellite and aerial archaeology could aid heritage protection in the Middle East & North Africa region (MENA), and in 2015 Andrew Wilson and Robert Bewley formed EAMENA (Endangered Archaeology in the Middle East & North Africa), with partners at the universities of Leicester and Durham, and the Institution Milá y Fontanals, Spain.

Using publicly available satellite and aerial imagery, maps and published sources, EAMENA recorded and assessed archaeological sites, building an open online database (https://database.eamena.org). Each partner has taken the lead for a particular region (Oxford covers Jordan, Palestine, Yemen, Egypt, Saudi Arabia, Oman, UAE and Mauritania). There are now files on over 300,000 site, 75% of which had not been digitally recorded before. Some evidence countered expectations: for example, looting had been claimed as the major threat to archaeological sites in Egypt, but EAMENA showed that indiscriminate bulldozing had caused far more widespread destruction. Data have been used to assess the likelihood and pattern of threats to sites, such as the illicit trade in cuneiform tablets.

Lebanon's Ministry of Culture and Directorate General of Antiquities (DGA), long-term EAMENA partners, recording damaged buildings in Medawar after an explosion at the port in 2020

Late prehistoric rock art at Wadi Mathandusch, Libya, damaged by bullets

Creating information on archaeological sites at risk from damage is a prerequisite for better protection. Adoption and use of the EAMENA database by heritage professionals in Yemen, Palestine, and Jordan has led to those countries being able to create their own national heritage inventories, and improved understanding and preservation of archaeological sites. The project's focus on satellite imaging has also led to changes to satellite policy in the USA, with implications for human rights monitoring in the MENA region.

Heritage-led regeneration in Govan for Glasgow & beyond

University of Glasgow

Archaeological research by Stephen Driscoll going back to 1994 established the collection of Govan Stones (carved in the ninth–11th centuries), housed in Govan Old Church, Glasgow, as an internationally popular heritage site. After Govan Old was promoted as a visitor destination, a free summer ferry service connecting Govan with the Riverside Museum across the River Clyde was established in 2013. Visitors to Govan Old doubled between 2013 and 2019, rising from around 6,000 to 14,000 annually. Driscoll's vision of Govan Old as visitor attraction and community cultural hub was central to efforts to raise £4m between 2015 and 2018 for the necessary capital improvements, with work starting in 2019. The high profile of Govan's early medieval cultural heritage has also contributed to wider regeneration in the Clyde waterfront, including some £15m for the construction of a bridge between Govan and the Riverside Museum.

ULAS/LEICESTER CITY COUNCIL

Roman worlds for diverse communities: Bringing archaeology & classics to new audiences

University of Leicester

The impact of the Roman conquest on Britain is often seen as a unidirectional and beneficial process resulting in the inevitable adoption of Roman lifestyles – a 19th-century conception mirroring contemporary European colonialism, in which the main protagonists are elite white men. However, the notion of a benign Roman imperialism, common in popular literature and museum displays and embedded in schools curricula and textbooks, has been widely challenged in scholarly circles. The limitations of narrowly defined perspectives on "nation building" in the English national history curriculum have also been highlighted by education professionals.

Staff in the School of Archaeology & Ancient History have developed alternative perspectives, exploring the richness and diversity of communities across the Roman world, and the varied and complex responses to Roman rule. Meanwhile 25 years of large-scale investigations by University of Leicester Archaeological Services (ULAS), the School's commercial contracting arm then directed by Richard Buckley, have made Leicester – Ratae Corieltavorum – one of the best explored cities of Rome's northern provinces: the excavated evidence shows that Leicester was a bustling multicultural centre in Roman times, as it is today (see feature Sep/Oct 2022/186).

A team of students and staff, led by Sarah Scott, has made this academic and field research accessible through a programme for schools called Life in the Roman World, including a book, resources for teachers and a website.

This has engaged new non-traditional audiences with archaeology and classics through the prism of local Roman heritage, and has supported provision of enrichment opportunities for young people, many facing multiple intersecting disadvantages. The programme has further increased participation through collaboration with arts and heritage organisations (see *Archaeology active*, Sep/Oct 2022/186). Between 2015 and 2021, the team made Roman-era history, culture and language accessible to almost 10,000 participants, including more than 6,600 pupils. The programme has influenced the strategy of schools, heritage bodies and universities regionally and internationally. It continues to flourish, promoting social justice and transforming lives.

Improving our understanding of victims of Nazism in the Channel Islands

University of Cambridge

German occupation during the Second World War had a profound impact on the heritage, memory and identity of Channel Islanders. The heritage of occupation traditionally focused on the occupiers and ordinary islanders: for reasons broadly connected with allegations of collaboration, victims of Nazism (Jews, political prisoners and forced labourers) were marginalised and their stories had not been told. Gilly Carr uncovered lost histories through extensive family interviews, archival research and field archaeology. At her instigation, compensation testimonies written in 1965 were released to the National Archives by the Foreign Office in 2016.

Carr's research led to fundamental changes in the islands' heritage landscape, as seen in museum exhibitions, memorials, commemorations and revised war narratives. It has changed public perception of the occupation, encouraging a more pluralistic understanding of the past, and greatly enriched the lives of victims' descendants (see feature Jan/Feb 2009/104).

Gilly Carr speaking from the pulpit in St Peter Port church, Guernsey on Holocaust Memorial Day

How the chicken crossed the globe: Using zooarchaeology to transform education & reframe public perceptions

Bournemouth University

Mark Maltby led pioneering research into the exploitation of chickens, from their first domestication to their modern-day roles, and examined the cultural and environmental impact of this most widespread and abundant domestic animal. The project brought together researchers from six universities with expertise in zooarchaeology, anthropology, ecology and genetics.

At Bournemouth, Maltby focused on Roman Britain. Julia Best investigated egg production through medullary bone laid within the shafts of the bones of laying hens. With colleagues, she developed and integrated analytical techniques for studying ancient eggshells, which revolutionised understanding of domestic egg production and showed that, even shortly after their introduction to new areas, chickens were laying regularly.

Best also led research to trace the spread of chickens in Europe, challenging previous interpretations and showing how the birds moved from being prize exotics to disposable food (see *The world in antiquity*, Sep/Oct 2022/186). Two doctoral research projects extended this research, examining the ecology of jungle fowl and chickens, and revealing the cultural, social and symbolic role of chickens in material culture from Roman Britain and Gaul. Maltby and Best collated bone samples from across Europe to create the largest species-specific zooarchaeological database in the world, enabling complex, multidisciplinary research collaboration in archaeological science.

Through such research, chickens were used to engage national and international audiences in exploring food production, human-animal relationships, economic significance, sustainability, health and wellbeing.

By tailored projects and resource creation the work has transformed teaching practice in the UK and Ethiopia, raising the educational attainment and aspirations of more than 3,000 students. It has reframed public perceptions by promoting greater understanding of the links between people and animals with events, exhibitions, films and podcasts reaching over 100,000 people, including the general public and heritage practitioners. The impact of the research has been felt on a very personal, yet international, scale. Through engagement at Glastonbury Festival's Science Tent, a stand-up comedy event in London featuring Kate Humble, and a documentary film that highlighted the importance of chickens for several vulnerable groups of society, the work enhanced public appreciation of how academic research into the past can be instrumental in understanding the present and planning for the future.

Saving metal heritage for future generations through new guidance for safer treatment, storage & display

Cardiff University

Research has led to an understanding of treatment efficiencies and humidity-related metallic corrosion risk, replacing guesswork and anecdotal procedures for treating and controlling corrosion. Working directly with national museums and archives in England, Wales and Ireland, David Watkinson and Nicola Emmerson produced accessible and customisable guidelines which have been adopted across the UK, Europe and the US. From archaeological repositories containing millions of artefacts charting human history to iconic ships, including the *Mary Rose*, Brunel's *SS Great Britain* and the Spanish Armada, the new research guided decisions saving our metal heritage for future generations.

Bodies of evidence: Transforming approaches to the location, recovery & analysis of human remains in forensic contexts

Durham University

For nearly two decades Rebecca Gowland has challenged the ways archaeologists, anthropologists and forensic practitioners explore human remains and the human condition, past and present. Examples include characterising specific types of erosion and damage to human remains from aquatic deposits which, if misinterpreted, might mislead crime scene investigators; differentiating stillborn from live-born infant burials on the basis of skeletal remains; developing statistical ways of improving estimations of age-at-death; and, working with Janet Montgomery, co-developing a new technique that allows sex to be reliably and cost-effectively determined in infant, juvenile and fragmentary skeletons.

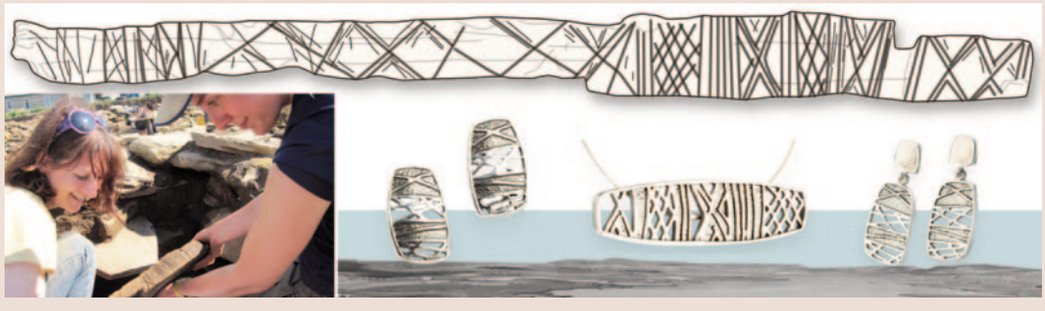
In 2009 Gowland launched Body Location, Recovery & Analysis in Forensic Contexts, a continuing professional development (CPD) programme, at the invitation of the North East Police scientific support managers. This training was soon expanded to national level,

and now works across international boundaries with active humanitarian forensic casework. The teaching ethos has been to incorporate the very latest archaeological and osteological research, and has been highlighted as an exemplar of good practice for its innovative university/industry co-production. The CPD has been turned into a massive open online course (MOOC); co-produced with the International Committee of the Red Cross, it has had over 28,000 registered learners from more than 140 countries. Gowland has been invited to advise in key international forensic contexts, from English police forces to investigators from the Balkans, Beirut and Malaysia. She works with human rights lawyers representing families of the missing in post conflict countries and other contexts to provides expert advice regarding body recovery and identification.

Art/Archaeology: Inspiring design & changing practice in Orkney's creative industries

University of the Highlands & Islands

Antonia Thomas' research on Neolithic art at the Ness of Brodgar (see feature Sep/Oct 2014/138) formed the basis for public Art/Archaeology workshops with diverse academics, creative practitioners and the wider Orkney community. Daniel Lee's creative mapping led to innovative collaborations with an Orkney-based fashion designer, linking art and archaeology and leading directly to the design, development and global marketing of three commercially successful new jewellery collections and one new contemporary fashion range. Thomas and Lee, with Anne Bevan and Jane Downes, then developed further workshops with artists, archaeologists and the community. These supported training and CPD courses and created opportunities for community groups to engage with archaeology-inspired creativity. Taken together, their Art/Archaeology activities support employment, encourage new ways of teaching, influence business practices and product development, and increase sales for rural businesses and Orkney's creative industries.



Below, clockwise from bottom left: Discovery, and digital drawing by Thomas of decorated stone, which inspired the Ness of Brodgar jewellery collection by Ola Gorie (www.olagorie jewellery.com)

Historic landscape research: Supporting landscape planning & management, shaping policy, & creating new capacity for historic character assessment

Newcastle University

Cultural and natural processes together give landscapes character. The concept of character is increasingly important as people respond to challenges ranging from spatial planning to climate change in rural, urban and maritime landscapes. Research by Sam Turner and Graham Fairclough on historic landscape character has furthered understanding of the archaeology and cultural significance of landscapes, and thus their significance for heritage management and planning. Research on GIS-based historic landscape characterisation (HLC) has developed better methods, created new datasets, and brought research and theory from landscape history and heritage into UK policy. It has also shown that historic characterisation can be adapted and used in different contexts around the world.

In 2006–07 Turner and Fairclough were asked by the Highways Agency to join a team to prepare new guidance to mitigate the impact of major road construction on historic landscapes. The resulting guidance was incorporated directly into the *Design Manual for Roads & Bridges* (2007), which provided the mandatory methodology for environmental assessment in advance of all major UK road schemes up to September 2019. Among projects where the guidance has informed road design are the A1(M) Leeming-Barton improvement scheme (see feature Sep/Oct 2016/150), the A14 Cambridge-Huntingdon upgrade (see feature Sep/Oct 2018/162), and the A303 Stonehenge project (Amesbury and Berwick Down, see feature Jul/Aug 2016/149). The manual also provided the basis for the environmental assessment methodology for the HS2 railway from London to Birmingham, Manchester and Leeds (see feature May/Jun 2019/166). In these and other cases, historic character guided the landscape mitigation design, such as replicating field patterns, boundary types and historic woodland disrupted by construction.

Historic landscape characterisation of Newcastle (above) and (below) in east Devon

Datasets created during research projects have been used in heritage management and environmental planning by local authorities and national agencies including Historic England, Natural England and the Marine Management Organisation. The research has shaped public policy and guidelines for practice in countries including Belgium, Ireland, the Netherlands, Spain and Turkey, and research policy in the European Union. International early-career landscape professionals have received tailored training which they have put to use in countries from Brazil to China.

SAM TURNER

Consuming prehistory: Opening access to the past & enhancing heritage practice through scientific research

Universities of York & Cardiff

Archaeological scientists from the University of York and Cardiff University have together shown how fields such as biology, biochemistry, genetics, geology, geoscience and organic and inorganic chemistry can provide new archaeological solutions – in this case identifying large-scale feasting at Durrington Walls, a site linked to ceremonies at Stonehenge.

The project revealed changes in farming practice, extraordinary food-miles and a far more diverse diet than previously understood, showing that food played a far more significant role in prehistory and shaping social and cultural practices. This initiated a new research agenda into prehistoric diet and cuisine.

Oliver Craig, Jacqui Mulville, Penny Bickle, Richard Madgwick and others integrated new methodologies to investigate ancient diets and food provenance by refining strontium isotope analysis and integrating zooarchaeology with lipid residue analyses. They found preference (from fishing to dairying) and agency (overcoming lactose intolerance by milk processing) far outweighed pragmatic dietary choices (such as availability).

Cooking on an open hearth in a Neolithic house at Durrington Walls

Working with partners at English Heritage the research was presented in an exhibition at the Stonehenge Visitor Centre, with a year of engagement activities building on the work of Guerilla Archaeology. This drew new visitors, changed public perception of prehistoric food and provided key resources for teaching at Key Stage 2 and STEM subjects at Key Stages 4 and 5. The pioneering engagement format led to changes in practice which continue beyond the exhibition, and the research is influencing decisions around Stonehenge's future.

Edited by Mike Pitts from REF 2021 Impact Case Studies