Discovery, Innovation and Science in the Historic Environment

RESEARCH

Historic England

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Welcome...

...to this winter issue of Research magazine.

This issue presents another wide-ranging review of our recent research. We explore efforts to gain a much better understanding of how the historic environment helps to improve quality of life and wellbeing. This understanding is fundamental to persuading policy-makers of the social (as well as economic) value of our shared heritage.

Keeping that heritage in good condition is often best achieved by finding new uses for historic structures. We report on research to understand the condition of the amazing group of historic textile mills in the north-west of the country, of which we have lost more than 500 in the last 30 years. Working in partnership with local authorities we hope to create a strategy to help preserve and repurpose these powerhouses of the industrial revolution.

Catastrophic loss is the subject of another article, but this time as a catalyst for renewed public interest in their heritage. A major fire at St Martin's Island in Exeter in 2016 destroyed two originally medieval buildings and damaged several more, receiving significant international media coverage, but prompting local interest and a book on one of Exeter's best collection of houses.

Fire features again, in '*Waking the Birdoswald Dead*'. Here we explore how heritage science disciplines are brought to bear on investigating Roman cremations from the vicinity of Birdoswald Roman fort on Hadrian's Wall, with some surprising and intriguing results.

The discovery is only one part of research and investigation: we also need to consider what to keep, where and for how long. A research partnership between the University of Reading and Historic England showcases the use of palaeoenvironmental archive resources to produce fresh interpretations of past environments and ancient ways of life, and exposes the challenges that these archives face.

Barney Sloane
National Specialist Services Director.

Front cover image: Birdoswald vessel SF33516 as reconstructed with the contents visible.

We are the **public body** that **helps people care for, enjoy** and **celebrate** England's **spectacular historic environment**

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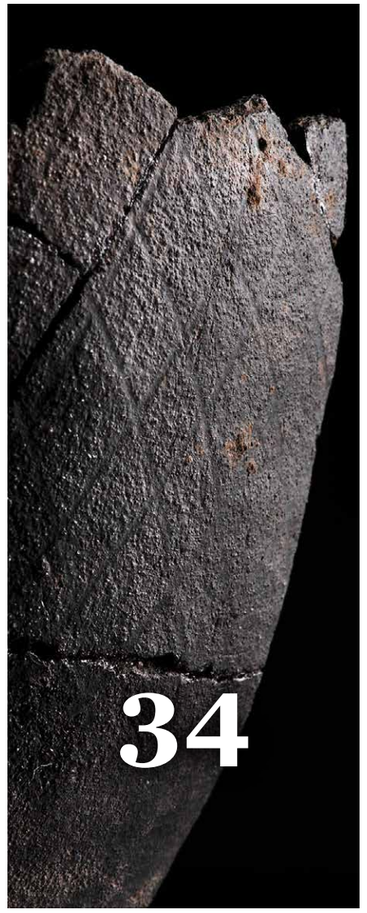

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Wellbeing and the historic environment...

...why bother?

Exploring the relationship between wellbeing and historic places.

Historic England has produced an assessment, **Wellbeing and the historic environment**, that sets out the available evidence for the role of the historic environment in promoting health and wellbeing and explores the ways in which that relationship could be explored further, both by Historic England and more widely. >>

Visitors at Avebury Henge, Wiltshire.
© University of Reading

Wellbeing ‘is quality of life and prosperity, positive physical and mental health, sustainable thriving communities’

What is wellbeing?

Research by the What Works Centre for Wellbeing defines wellbeing as ‘about people, and creating the conditions for us all to thrive. It is quality of life and prosperity, positive physical and mental health, sustainable thriving communities’. It recognises that humans are emotional and that they value non-financial benefits, so how you feel and your quality of life as you experience it matter too.

In 2008 the Government Office of Science published a report on Mental Capital and Wellbeing, in which it promoted the five ways to wellbeing developed by the New Economics Foundation (NEF). These were created as suggestions for individual action to promote the process of wellbeing. Wellbeing and mental capital affects people’s life satisfaction and ability to learn and ultimately is about enabling everyone to fulfil their own potential.

Wellbeing evaluation can directly feed into and respond to more recent Government calls for wellbeing, integration and cohesion (for example, **Culture White paper**, the emerging **Civil Society Strategy**, and the **Integrated Communities Strategy Green Paper**). Government has recognised that Gross Domestic Product is no longer an acceptable indicator of a nation’s wellbeing because, while it is rising, social inequality is increasing. Wellbeing therefore is now a policy issue, politically and conceptually linked with addressing health inequality and social cohesion as long-term government priorities. In our assessment we provide evidence for creating the following:

- A **framework** for considering wellbeing and heritage, designed to help Historic England develop a contribution to the agenda;
- **Strategic objectives** for wellbeing and the historic environment formulated through the Five Ways to Wellbeing (Give, Be Active, Keep Learning, Take Notice and Connect)

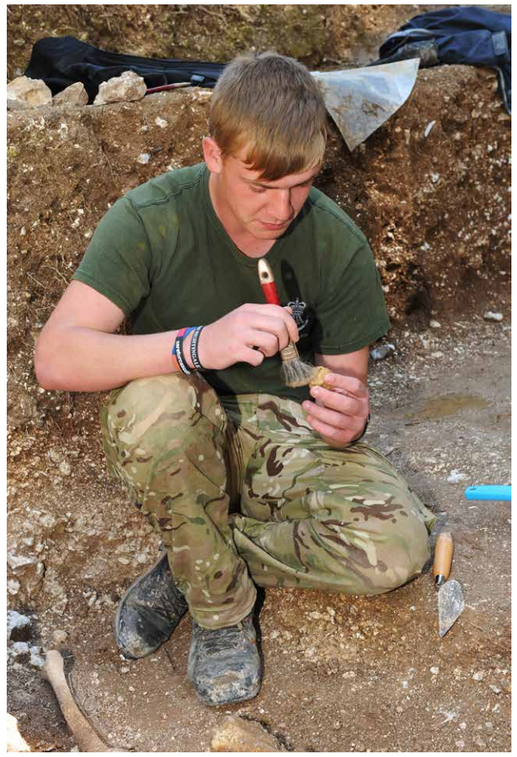
A framework for considering wellbeing and heritage

The framework demonstrates the relationship between wellbeing and heritage in six ways.

Heritage as a process. This is about **doing**, most commonly in heritage circles through volunteering as an active and committed relationship over time, a process that yields wellbeing outcomes. Many volunteer projects tend to capture a limited demographic of (self-selecting) employed, educated and higher socio-economic groups. Examples such as Operation Nightingale and Homeless Heritage provide models for creating opportunities with non-heritage or more vulnerable groups. There is potential to do more along these lines.

Heritage as participation. This is about **visiting** sites of cultural interest. The subject is supported by a large body of research which indicates that cultural engagement is linked to wellbeing. Surveys are useful but limited because the degree of improvement can be too slight to be statistically significant; bias capture of higher socio-economic groups and causality are difficult to determine without greater contextual understanding of a person’s life. It relates best to curatorial practices. >>

A large body of research indicates that cultural engagement is linked to wellbeing



Far left: Five ways to wellbeing. © Historic England

Left centre: Soldier from 3 Rifles at Barrow Clump Wiltshire. © Crown Copyright

Near left: People enjoying the peace and tranquility at St Peter’s Cathedral, The Close, Exeter, Devon. © Historic England Archive, James O. Davies, DP196557

Heritage as mechanism. This is about **using** cultural assets to bring people together for therapeutic or social purposes to provide a common point of interest or experience. Multiple examples exist, including, at a large scale, the British Museum Reminiscences programme and, at a local level, projects such as the memorialisation at the Chattri Indian Memorial, Sussex. This collaboration between the Undivided Indian Ex-Service Association, the Brighton and Hove Hindu Elders Group, members of the armed forces and police, the mayor and local people, maintains the unique and fittingly dignified memorial service to the Indian soldiers that died in the First World War.

The benefits of social interaction, creative opportunities and sharing memories may contribute towards social cohesion through sharing experiences and developing new connections. This has significant potential for the historic environment, especially in community and place-based initiatives.

Above left: The Chattri, Patcham, Brighton, East Sussex. © Historic England, Steven Baker, DP184442

Above right: Handling museum objects can help wellbeing. © Historic England

Heritage as healing. This is about **therapy** through the properties of cultural heritage. Qualitative and experiential assessment of patients on wards handling museum objects revealed a number of transactional benefits such as thinking and meaning-making, self-esteem and positive interactions. Other projects on disadvantaged young people, including those with poor mental health, found that connectedness was the major outcome of project work, but also that they experienced an increase in their self-awareness, self-expression, sense of belonging and ability to relate to others by seeing things from different perspectives. >>

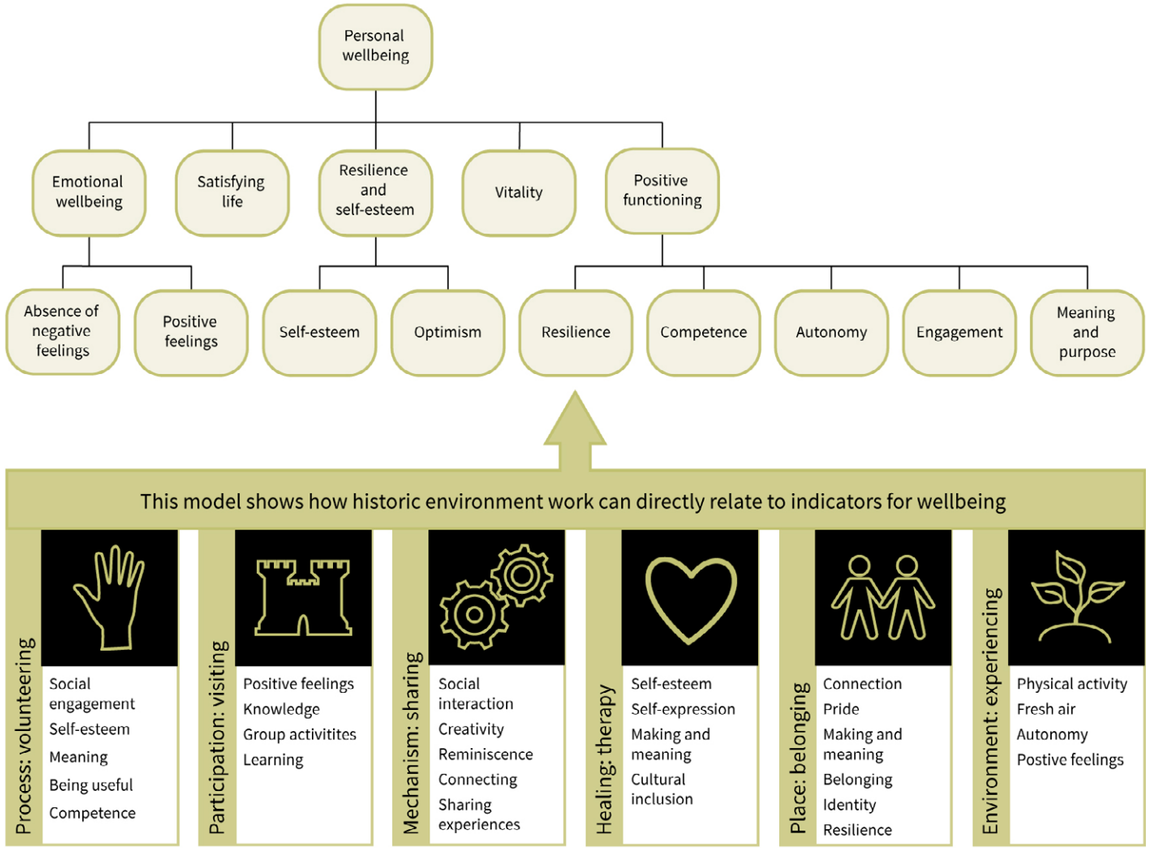
Assessment of patients handling museum objects revealed a number of benefits such as thinking and meaning-making, self-esteem and positive interactions

‘place-shaping’ – ensuring that local people have a voice, feel empowered and feel a sense of belonging

Heritage as place. This is about **reclaiming a sense of place**, which can positively contribute to countering social isolation and environmental degradation. There has been a wealth of research on this subject (see ***Heritage Counts*** for aspects of this) and specific studies have articulated the character of place to the feelings of its inhabitants (for example, *20 Years in 12 Places*). Does the historic character of a place have the potential to support new-found expressions of community and shape an existing sense of belonging into a shared experience? Developing this further, the idea of ‘place-shaping’ naturally emerges; ensuring that local people have a voice, feel empowered and thereby feel a sense of belonging. Culture and heritage generally are understood as key methods of generating belonging.

Heritage as environment. The beneficial link between nature and wellbeing has been extensively researched and some findings can be usefully applied to the historic environment yet the gaps in our evidence need to be filled, primarily in the area of understanding what historic characteristics of a place (building or landscape) best promote wellbeing. >>

Above left: Water Street, Castle Combe, Wiltshire. © Historic England Archive, James O. Davies, DP195136



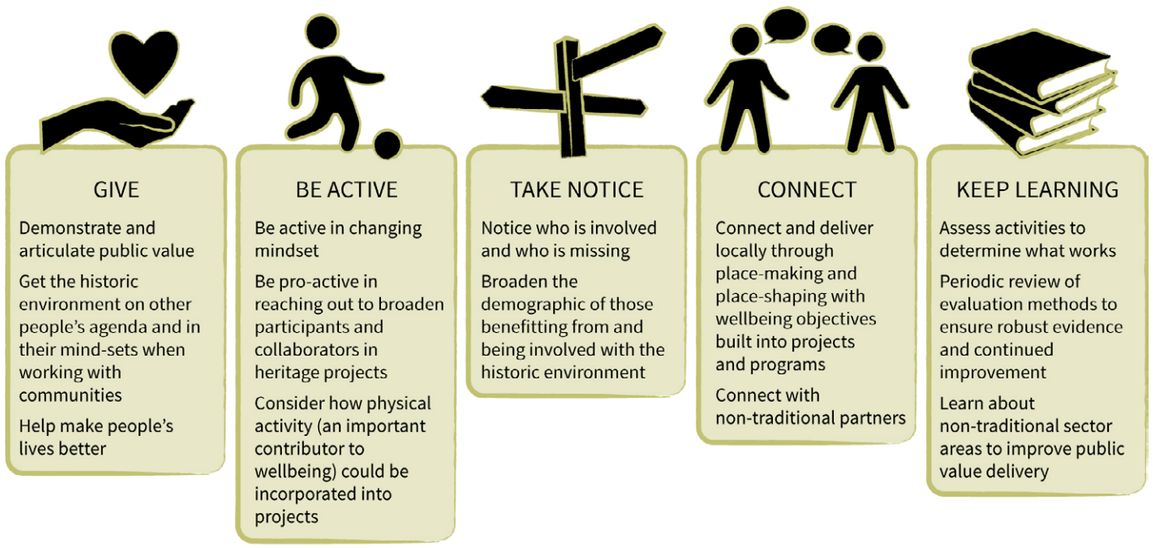
Above right: Model showing how the historic environment relates to wellbeing indicators. © Historic England

Strategic objectives

The role of heritage in improving wellbeing can therefore take many forms. Given our role in supporting successful place making and providing local historic environment advice, we are especially interested in the role of place to a community's sense of identity and belonging.

Some of the ways this relationship may work for individuals and communities are by:

- combining physical activity with outdoors and cultural heritage
- forming a new relationship with the past that creates new perspectives
- utilising and developing skills and feeling meaningful through contributing productively to something
- providing social interaction and creativity that relates to links with the past
- creating a long-lasting benefit through increased self-awareness and social networks
- developing a wider collective sense of community, belonging and equality of inclusion through place-based initiatives.



Above: Diagram showing strategic objectives for wellbeing and the historic environment. © Historic England

Strategically addressing this as an organisation could involve three distinct approaches.

Working with existing and, especially, new partners to consider the historic environment's potential to support wellbeing and life satisfaction, and ensuring evaluation methods are consistent and comparable with approaches being developed by strategic partners such as the What Works for Wellbeing Centre.

Using the Five Ways to Wellbeing (Give, Be Active, Take Notice, Connect and Keep Learning), to articulate the historic environment's potential to support it. An example of this might be a simple model setting out how the Five Ways could act as drivers for a strategic organisational approach.

As an organisation Historic England is *working to ensure the wellbeing of its staff*, and has various iniatives on mental health and staff support. There is clear evidence from a recent staff questionnaire that the wellbeing of staff would be improved further by our work having a demonstrable and intentional impact on society as well as on the historic environment. Clearly the public value of what we do is an integral part of our motivation to work in this sector, so social impact and staff wellbeing are explicitly linked.

What next?

Wellbeing relates most closely to the neighbourhood, whether through local action, connecting with local people and groups or our local environment. By extension, therefore, wellbeing can be best linked with the heritage of the everyday.

Next we will be initiating projects and further research with new stakeholders and partners within the structure of Historic England's Research Agenda in order to test our conclusions and trial methodologies for evaluating impact.

Based on our research we believe planning for wellbeing outcomes can be a mechanism for diversity and inclusion by breaking down barriers of access. We aim to work with local authorities to promote wellbeing and engagement with the historic environment through social prescribing; by developing wellbeing through the historic environment, by achieving local sustainability in new ways, and by building on the relationship between people and place to empower local voices. Might this mean that we achieve the aspiration, as stated by a staff participant at a wellbeing event, that "Wellbeing has the potential to properly fulfil our remit of being for everyone by engaging marginalised and overlooked communities"? ■

Wellbeing can be best linked with the heritage of the everyday

The authors

Dr Linda Monckton, FSA
Architectural Historian with Historic England.

Linda joined English Heritage, now Historic England, in 2003, first as a Senior Investigator and then later as Head of Research Policy for Places of Worship. She is currently Head of Communities Research. Her publications include works on religious buildings from the middle ages to the present day, post-excavation architectural fragments, heritage law and policy, and secular architecture from the sixteenth to the twentieth centuries.

Sarah Reilly
Communities Analyst with Historic England.

Sarah is an archaeologist who joined English Heritage in 1996. Working out of Fort Cumberland she carried out a range of excavations and building fabric recording projects. In 2006 she joined a new 'Local Government Liaison' team, managing our relationships with local government agencies, primarily IHBC and ALGAO, and leading on a range of programmes associated with Heritage Protection Reform, local government service delivery, and Historic Environment Reviews. Now Communities Analyst in the Historic England's Strategic Research and Partnerships Team, she is currently concerned with heritage, communities, wellbeing and measuring impact.

Further reading

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Ministry of housing, communities and local government 2018

New Economics Foundation 2005 *Well-being and the environment achieving 'One Planet Living' and maintaining quality of life*

University College London *Healing Heritage: the impact of museums on health and wellbeing*

What works centre for wellbeing

Reviewing the condition of historic textile mills in the North West

Textile mill surveys in Lancashire and Greater Manchester.

Mills and Boom

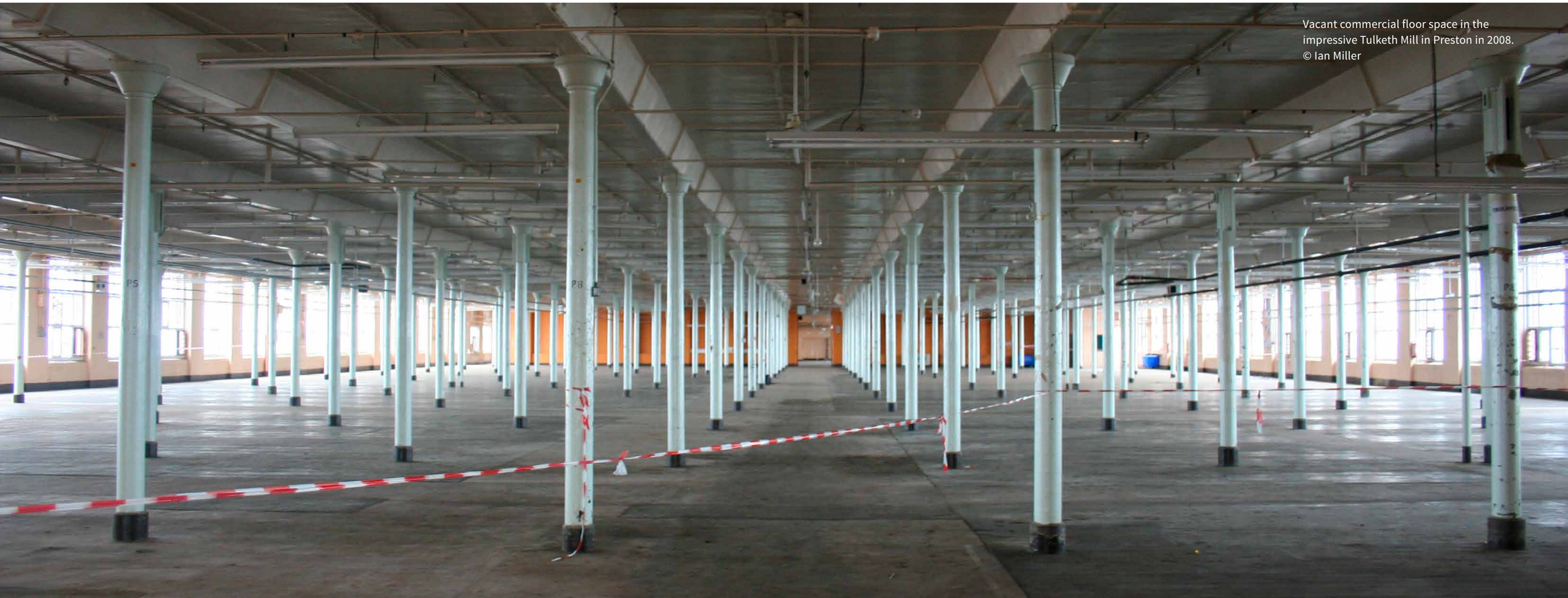
Charles Smith
Assistant NW Planning Director, Historic England.

Textile mills are fundamental to the history, culture and landscape of much of the North of England. They were the powerhouses behind the industrial revolution, triggering technological innovation, stimulating new trade and transforming the transport network. Yet the University of Salford's research tells us that nearly 500 of Greater Manchester's textile mills have been lost in the last 30 years. Many of those that survive stand underused or vacant. The same story rings true for the mills of Lancashire and West Yorkshire.

In response, Historic England has worked collaboratively with property consultants Cushman and Wakefield to produce *Engines of Prosperity: new uses for old mills*. This document sets out how mill buildings can be powerhouses for growth in the 21st century. It cites evidence of their capacity to accommodate new and exciting uses, attracting investment in area-wide regeneration. For example, if you took all the vacant space in textile mills across Greater Manchester and Lancashire, you could accommodate 25,000 new homes or host 133,000 new jobs.

We know that people care about mills. Results from a recent YouGov poll show that 90% of people believe that mills are an important part of England's heritage, story and character and 85% are against their demolition and replacement. This is no surprise as there are many examples of repurposes mills which are playing a positive role in forging local community identity, providing inspiring places in which people can live, work and relax.

Having generated a public debate about the plight of textile mills, Historic England is now working closely at regional and local authority levels to develop effective mill investment strategies, which we hope will result in a brighter future for these important emblems of northern identity.



Vacant commercial floor space in the impressive Tulketh Mill in Preston in 2008. © Ian Miller

The urgency for an assessment of the region's former textile-manufacturing buildings has been recognised for some time, reflecting a growing concern at the rate of loss of this iconic industrial monument type

Recent strategic surveys in Lancashire and Greater Manchester have provided a heritage audit of historic textile mills in the North West, providing a much-needed understanding of their current number, distribution, stock condition and use.

The commanding utilitarian architecture of historic textile mills has become a key characteristic of numerous industrial towns and rural river valleys across north-west England, imparting a powerful sense of place, although the number of mills that survive in the region had not been quantified until recently. The urgency for an assessment of the region's former textile-manufacturing buildings, particularly the stock condition and erosion of historic mills through redevelopment, has been recognised for some time, reflecting a growing concern at the rate of loss of this iconic industrial monument type due to economic pressures. Highlighting the economic and social benefits of repurposing redundant mills is an increasingly important aspect of developing management strategies for historic industrial townscapes, yet much of the baseline data available to gain an informed understanding of the significance of individual sites have for some time been inadequate.

Lancashire Textile Mill Survey

In 2008, English Heritage funded an initial quantitative assessment of the textile-manufacturing sites in the modern county of Lancashire, where the number of surviving (and demolished) textile mills was unknown, and the relative significance of individual sites was in many cases poorly understood. This comprehensive desk-based study identified a total of 1661 sites in the county that had been built for the spinning, weaving or finishing of textile goods, including cotton, wool, silk, flax, jute and oilcloth, together with ancillary works that had been established primarily to produce machinery for the textile industry. Of the total number of sites identified, 619 were found to survive in some built form, and included examples from all branches of the textile-manufacturing industry, although in some cases, such as textile-finishing works and flax mills, very few buildings survive. The majority of the sites were concentrated in the southern and eastern parts of the county, within the boroughs of Blackburn with Darwen, Hyndburn, Rossendale, Burnley and Pendle, corresponding essentially to Pennine Lancashire, although important concentrations of mills persist in Preston, Chorley, Clitheroe and Lancaster, with notable rural examples existing on the periphery of these centres.

Further funding from English Heritage in 2011 enabled a second stage to the project to be implemented, which aimed to provide a qualitative assessment of the surviving textile-mill sites in the county. This entailed a rapid external examination of each surviving mill site to enable a 'Buildings at risk'-type assessment to be completed. This was intended to provide information on the size, condition, occupancy, completeness and relative significance of each site. This was coupled with a rough calculation of available floor space within each site to inform an understanding of their economic potential for re-use. This concluded that the total floor space in historic textile mills across Lancashire in 2012-13 was approximately 4,295,307 square metres (46,234,300 square feet), of which some 77% lay within the Pennine Lancashire boroughs. Several mills were identified during the site visits as being of special historic and architectural interest, and were put forward for assessment for statutory designation. Examples included the early nineteenth-century Holmes Mill in Clitheroe, mid nineteenth-century integrated spinning and weaving mills near Bacup and Chorley, and the late nineteenth-century Queen Street Mill and King's Mill in Harle Syke, Burnley. >>

Britannia Mill at New Line near Bacup in 2009, prior to Grade II listing in 2016. © Oxford Archaeology Ltd

Aerial view of the recently designated Grade I listed Queen Street Mill and the Grade II listed King's Mill in Harle Syke, Burnley. © Historic England, Dave MacLeod

Left: Facit Ring Mill, near Whitworth in 2009, shortly before its demolition. © Oxford Archaeology Ltd

The study concluded that just over 10% of the total stock in Lancashire was ‘At Risk’ in 2012-13, with a further 17% deemed to be ‘Vulnerable’

The study also concluded that just over 10% of the total stock of historic textile mills in the county were ‘At Risk’ in 2012-13, with a further 17% deemed to be ‘Vulnerable’ in view of their deteriorating condition and low level of occupancy. These figures varied between Lancashire’s component boroughs, with higher proportions of mills ‘At Risk’ or ‘Vulnerable’ being recorded in Blackburn with Darwen, Burnley and Rossendale. The majority of mills in the county at that date were considered to be at ‘Low Risk’ / ‘No Risk’, although this did not take into account the increasing economic pressures for redevelopment, and several large mill complexes in this category have been cleared subsequently. Conversely, there are some impressive examples of redundant mills that have been adapted sympathetically for new uses. Hollins Bank Mill in Brierfield, for instance, has been repurposed successfully as the Pendle Village Mill Outlet, whilst Centenary Mill in Preston provides a fine example of adaptation for residential use, and the eighteenth-century Kirk Mill in Chipping is being repaired and refurbished as a boutique hotel. >>

Above: Holmes Mill, Clitheroe. © University of Salford

Above right: The former Hollins Bank Mill, Brierfield, now repurposed as the Pendle Village Mill Outlet © Historic England Archive, James O. Davies, DP196334

Approximately 28% of the total stock in Greater Manchester was considered to be ‘Vulnerable’ to change or loss, whilst another 20% were assessed as ‘At Risk’

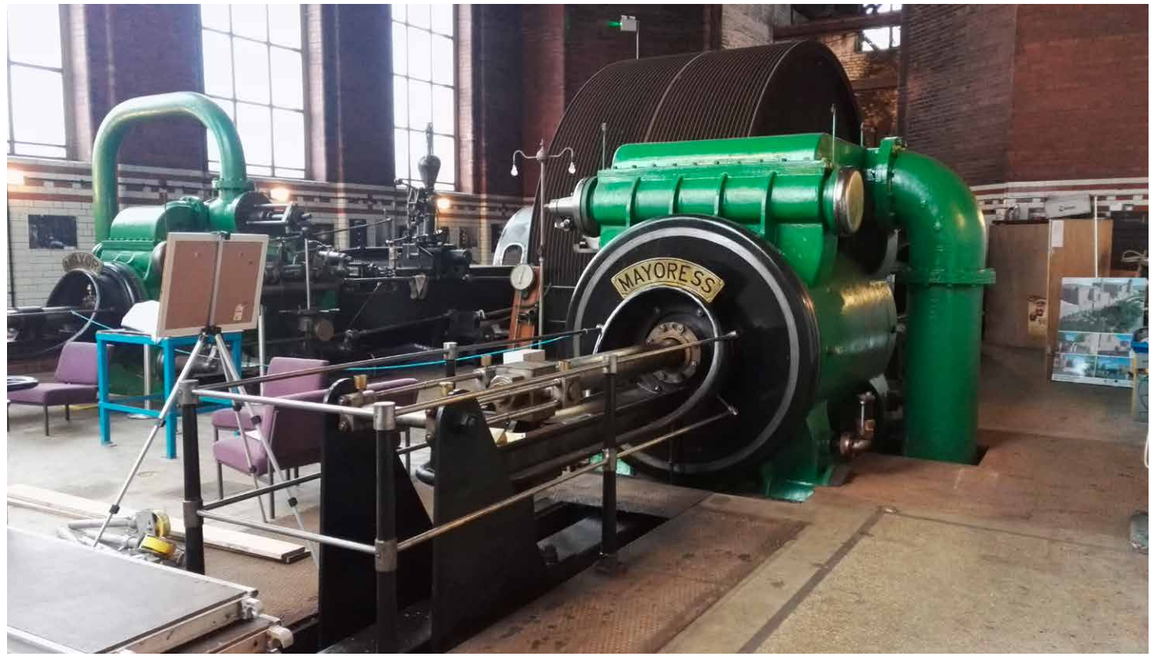
Greater Manchester Textile Mill Survey Review, 2015-18

Following on from the Lancashire Textile Mill Survey, Historic England funded the Greater Manchester Archaeological Advisory Service within the University of Salford to undertake a similar assessment of textile mills in Greater Manchester. These had been surveyed previously during a comprehensive study that was carried out by the RCHME in the late 1980s, although a review was urgently required in response to nearly three decades of change and erosion to the county’s textile mills. Taking the 972 extant mills recorded in the 1980s survey, the review aimed to provide an understanding of the loss rates of historic textile mills across Greater Manchester and provide an up-to-date audit of the number of surviving mills, noting their location, condition, and completeness. This was achieved by employing a similar ‘Buildings at risk’ methodology to that used during the Lancashire survey.

Whilst it was concluded that 432 textile mills in Greater Manchester have been demolished since the 1980s, 540 survive extant (representing an average loss rate of 44%). Of the total number of surviving mill complexes, however, only 6% retain all the structural elements of their steam-power system, comprising engine and boiler houses and a chimney. A very small number of these mills also retain their steam engine intact, with fine examples at Trencherfield Mill in Wigan and Leigh Spinners Mill in Leigh.

Just over half of the former textile mills in the county were considered to be at ‘Low Risk’ / ‘No Risk’, based on their current condition and levels of occupancy and commercial use. This large group included some significant examples of historic mills in urban areas that are currently in sustainable use, including the celebrated group of late eighteenth and early nineteenth-century cotton spinning mills that flank the Rochdale Canal in Ancoats, and the tastefully repurposed mills in Chorlton-upon-Medlock.

Approximately 28% of the total stock was considered to be ‘Vulnerable’ to change or loss, whilst another 20%, equating to one in five mills in Greater Manchester, were assessed as ‘At Risk’. Many of the mills in the more concerning categories lie in the urban centres of Bolton, Salford, Stockport, Dukinfield and Oldham, although small clusters also exist in the Pennine valleys in the boroughs of Rochdale and Tameside. >>



Above left: The horizontal cross-compound steam engine that survives *in-situ* at Leigh Spinners Mill within the recently repaired engine house. © University of Salford

Above right: The derelict Hartford Mill in Oldham, a Grade II listed building beyond economic repair after being subject to a series of fires and vandalism. © University of Salford

Above: The Grade II* listed cotton mill in Miles Platting, Manchester, aptly described as 'a building of great presence and a landmark in the area', which has been successfully repurposed for mixed use. © University of Salford

The repurposing of historic mills in the Ancoats area provides a model for the regeneration of Manchester's satellite towns

The total floor space in the county's mills was calculated to be approximately 3,759,800 square metres (40,473,164 square feet), of which nearly a third appeared to be vacant or under-used. The occupancy rates varied between boroughs, with approximately 82% of the floor space in mills in Oldham in economic use, compared with 47% in the borough of Wigan. However, several empty mills with large floor plates are in the process of refurbishment for residential use, with a particular focus in Central Manchester. The repurposing of historic mills in the Ancoats area of the city, as an example, has enabled a thriving new community of residents to become established in this depopulated district, providing a model for the regeneration of Manchester's satellite towns.

Informing the future of the region's mills

It is hoped that the dataset generated from the studies in Lancashire and Greater Manchester has provided an invaluable baseline for the creation of a mills strategy for the North West, which has considerable potential to inform and support spatial and economic planning frameworks ■

The author

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Ian has specialist knowledge of the historic textile industry and its buildings in north-west England. He led the Lancashire Textile Mills Survey in 2008-15, and was closely involved in the subsequent county-wide review of the historic textile mills in Greater Manchester. He is currently leading a similar review of textile mills in West Yorkshire on behalf of Historic England.

Further reading

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University of Salford Greater Manchester Archaeological Advisory Service 2017: *Historic Textile Mills of Greater Manchester: Survey Review and Heritage Audit*

University of Salford Greater Manchester Archaeological Advisory Service 2017: *Historic Textile Mills of Lancashire*

Archaeological palaeoenvironmental archiving: the challenges and opportunities

Raising awareness of England's archived palaeoenvironmental resource.

England's museums and repository services have accrued a considerable collection of palaeoenvironmental materials. Samples from these collections have recently been analysed as part of synthetic research projects using bioarchaeological techniques which were not available at the time of excavation. But are current attitudes towards the collection, retention, selection and curation of palaeoenvironmental materials changing with the times and allowing for a satisfactory archive for future scientific research?

An on-going research project – *Archaeological Palaeoenvironmental Archiving: the Challenges and Opportunities* – is part of a Historic England supervised Collaborative Doctoral Partnership. The project intends to explore what the often undervalued archived archaeological palaeoenvironmental resource can offer in its ability to enhance academic research and public science engagement. Although at an early stage, the research has identified a combination of practical and theoretical requirements. These can be exemplified as skills and awareness limitations on a sectoral level and recognising what theoretical and practice-based frameworks are required to articulate the importance of palaeoenvironmental materials and archaeological science more widely.

Opposite page top right: Fishbourne and Chichester District Council Archaeology Store. A typical crowded storage facility. (Image taken by Professor Martin Bell and used with permission)

The increase in the quantities of finds and samples has not been matched by a commensurate growth in capacity for museums and other repository services

Archaeological archives

A profusion of materials collected from almost three decades of developer-funded archaeology has endowed the archaeological sector with a rich and varied archived resource. The growth in the quantity of formal archaeological investigations and the proportionate increase in the quantities of finds and samples have not been matched by a commensurate growth in capacity for museums and other repository services. Many museum stores are now crowded and often unable to receive any more archaeological archives. Furthermore, cuts to public services since the 2008 financial crisis have resulted in redundancies across the sector and funding for museums still remains desperately low. Many museums continue to be understaffed and reliant on volunteers, and all too frequently do not have an archaeologist on staff to deal with archaeological collections.

In response to the challenges experienced by the museum and archives services, artefact specific guidance documents, intended for an audience of specialists and contractors, have been drafted. A leading example is 'A Standard for Pottery Studies in Archaeology', produced by a group of ceramicists covering prehistoric, Roman and medieval fabrics. Guidance of this nature is expected to prove to be extremely valuable as it allows depositors the opportunity to improve the quality and size of an archive prior to deposition. >>

Archaeological palaeoenvironmental archives

Procedures which support how archaeological palaeoenvironmental remains are archived have, by contrast, received less attention. There are two possible reasons for this. Firstly, the diversity of materials. Archaeological palaeoenvironmental materials can include remains as disparate as seeds, insects, molluscs, mounted microscope slides which contain pollen, and intact sediment samples, to name a few. The associated difficulties in dealing with some of these materials (particularly those which are waterlogged, and need to be refrigerated or preserved in vials with flammable liquid) make them potentially awkward to conserve and curate. Identifying a comprehensive solution for the curation of such a diverse collection of materials is therefore, understandably, complicated.

The second and perhaps more damaging reason could be the falsely held perception that these remains offer little research value once the initial analyses have been completed. This notion underestimates the role which palaeoenvironmental materials can offer for re-analysing published excavations and further enhancing our understanding of past climates, environments and economies. It is conceivable that the failure to appreciate the value of the resource persists due to a limited understanding across the sector of what can be achieved with the recent developments in bioarchaeological techniques.

The perception that the palaeoenvironmental archive has little sustained value is increasingly being challenged, particularly as scientific techniques that might not have been available or were not well-developed at the time of the original excavations are being applied to archive materials more and more. For example the *Feeding Anglo-Saxon England* project, co-ordinated by the universities of Oxford and Leicester, is using weed seeds and crop evidence (including the application of isotope analyses and radiocarbon dating) from the archived assemblages of long-since completed excavations to further the understanding of agricultural techniques, such as crop rotation and productivity.

The varied storage conditions which excavated palaeoenvironmental materials demand can present curatorial challenges, especially when compared to more robust materials such as ceramics or lithics which are regarded as being resistant. For example, intact sediment cores can require cold storage, insect remains can require storage in an ethanol solution, and charred or mineral-replaced materials must be stored in dry, cool conditions or risk degradation. >>

Scientific techniques that might not have been available at the time of the original excavations are being applied to archive materials

Left: Charred seeds recovered from archive. *Feeding Anglo-Saxon England*. (Image taken by Mark McKarracher, Oxford University, and used with permission)

Right: Organic material currently being analysed by the *Feeding Saxon England* project. (Image taken by Mark McKarracher, Oxford University, and used with permission)

Unfortunately, some museums may struggle to provide appropriate controlled storage conditions. With many stores refusing to accept waterlogged materials and dry organic remains being maintained in sub-optimal conditions, the need to identify correct methods of storage and implement them is vital if we expect to have a functional archived resource in the future. Recent excavations at Must Farm and Star Carr, which recovered an abundance of well-preserved palaeoenvironmental remains, demonstrate the demand for facilities which can receive organic materials and prepared samples for both short and long-term durations. Available space within museums in which to install specialist equipment such as cold stores and flammable liquid cabinets is something which has seldom been seen as a priority and something most facilities cannot currently financially afford.

The next stage

As a first step, the research project dispatched two short survey questionnaires to 350 of England's museums. This was crucial in identifying a sample of museums with appropriate collections. From this initial long list, 15 museums with palaeoenvironmental collections, from across five regions of England, have been selected for the next stage of qualitative data collection. In order to adequately assess the working practices of museums and the condition of the palaeoenvironmental collections themselves, visits to collecting institutions and interviews with museums professionals will constitute a key element of the project. Interviews and visits will take place throughout the autumn of 2018.

Additionally, the project aims to raise the level of awareness concerning the value of palaeoenvironmental materials across England's museums and archaeological contracting companies. This can be achieved by the publication of guidance, directed at specialists, contractors, researchers and museum professionals, designed to demonstrate how the archived palaeoenvironmental resource can be used to greater effect and to set out best practice regarding its curation. Guidance needs to be applied holistically to the entire life of a project rather than simply treating the archive as an entity which exclusively exists at its end. The aim is to develop an approach which can both answer today's research questions and provide tomorrow's research material.

Conclusion

Projects such as *Feeding Anglo-Saxon England* are using bioarchaeological applications on material from published excavations and are demonstrating the current, and perhaps increasing, value which palaeoenvironmental archives possess. As new scientific techniques are developed and existing procedures become more affordable, access to the palaeoenvironmental resource is expected to become more prevalent. It is therefore important that consideration is given to methods of preservation and storage capacity if we expect to provide researchers with access to high quality archives in the future ■

The project aims to raise awareness of the value of palaeoenvironmental materials across England's museums and archaeological contracting companies

The author

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The theme of research follows on from interests which Paul developed during an MSc in Palaeoeconomy and Environmental Archaeology undertaken at the University of Sheffield in 2013-2015. Prior to the appointment to the doctoral research post, Paul worked as a project manager for a commercial archaeology organisation and witnessed first hand many of the challenges which face the perception of palaeoenvironmental materials.

Waking the Birdoswald dead

Analysing five funerary vessels from the Roman cemetery.

Funerary Roman vessels feature at the newly opened Birdoswald Fort visitor centre on Hadrian's Wall. They originate from the cemetery associated with the fort, situated at the top edge of the cliff overlooking the River Irthing. Rapid erosion threatened the site. To mitigate the loss of archaeology, the Historic England (HE) Excavation and Analysis team excavated part of the cemetery in 2009. This represents the only large-scale investigation of any military cemetery on Hadrian's Wall and allowed us to explore cremation practice at the northern edge of the Roman Empire. >>

Fig 1 (left): Vessel SF33516: loss of rim to ploughing. X-rays show bone and objects at base. © Historic England, Karla Graham

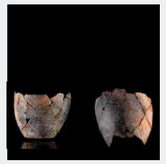
Burial Number (small find)	Vessels *in-situ*	After conservation	Burial type	Vessel type	Individual buried
33516	 Table 1 (left)	 Table 5	Cremation vessel	Black Burnished ware, Hadrianic-Antonine	Female, young adult
33517	 Table 1 (right)	 Table 6	Cremation vessel	Black Burnished ware	Child (c 5yrs)
33711	 Table 2	 Table 7	Cremation vessel	Black Burnished ware	Young adult
33723	 Table 3	 Table 8	Cremation vessel in stone lined cist	Black Burnished ware, Hadrianic-Antonine	Adult
33762	 Table 4	 Table 9	Beaker accompanying cremation in a wooden box	Nene Valley ware	Male, young adult

Table 1

Analysis of the contents by our team of archaeological scientists has built our understanding of each individual and the practice of cremation

Investigating the vessels

The five vessels range in size and decoration. Four are cremation vessels in a type of black burnished ware and one is a Nene Valley ware beaker accompanying a cremation in a wooden box (Table 1). They all date to the mid-late second century.

Four vessels broke into many pieces whilst in the ground, with one losing its entire rim due to ploughing (Fig 1). The fifth vessel survived intact, protected by the stone-lined cist it lay in. All were block lifted and X-rayed prior to excavation under controlled conditions. Analysis of the contents by our team of archaeological scientists has built our understanding of each individual and the practice of cremation. This work has, in turn, informed the English Heritage Trust displays in the new visitor centre.

Examination revealed information about the vessels' treatment prior to burial. The largest had a hole repaired with lead (Fig 2). The one intact vessel appears to have been 'ritually killed' before placing in the cist; a small hole had been deliberately cut out of the base (Fig 3). Evidence suggests that the four cremation vessels might have been placed near to the funeral pyre before the cremated remains were placed inside; warming, possibly by the pyre, has slightly eroded the surfaces and left soot on one (Fig 3). >>

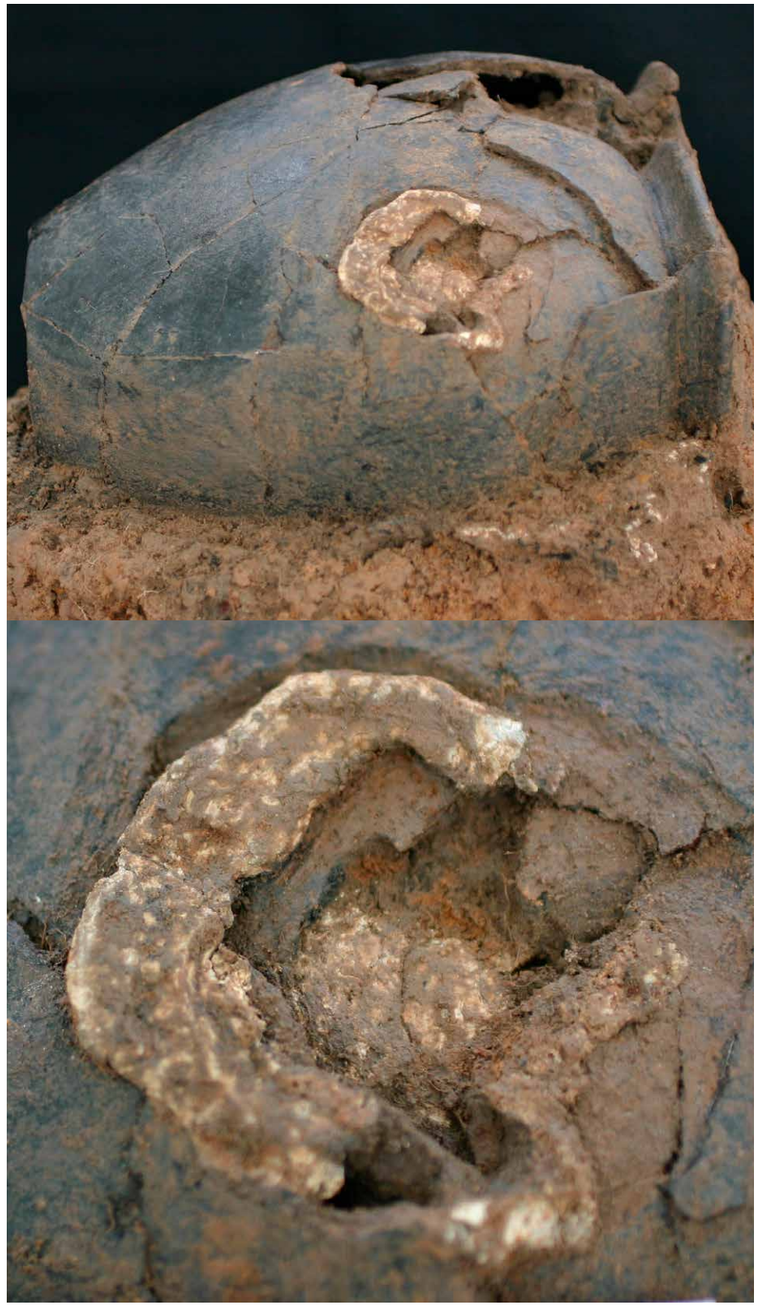


Fig 2 (above): Vessel SF33711: lead repair.
© Historic England, Angela Middleton

Vessel SF33516

X-radiography was a key tool for recording and examining the condition of the contents before micro-excavation. Surprisingly, for one vessel, the X-rays showed a collection of objects underneath the cremated remains (Fig 1). Once the bone was removed, it became apparent that the objects were fused together by iron corrosion. Unable to disentangle them, we turned to a variety of imaging tools to investigate what was present.

Computed radiography and micro-computed tomography (CT) scanning led to surprising results. It appears that the base of the vessel had been lined with a piece of chain mail armour into which nine other objects had been placed (Figs 4 and 5). The cremated bone was then placed on top. The presence of chain mail may commemorate a soldier but the amount is small and can only represent a portion of armour. This suggests a male, but dress accessories usually associated with a female are present: a bracelet or armlet (Fig 6), rings and beads (Fig 7) and pendants. Part of a glass vessel rim was on top of the bracelet and may be from a vessel containing liquids used in the cremation ceremony. >>

Fig 3 (left): Intact vessel SF33723: evidence of sooting and 'ritual killing'. © Historic England, James O. Davies

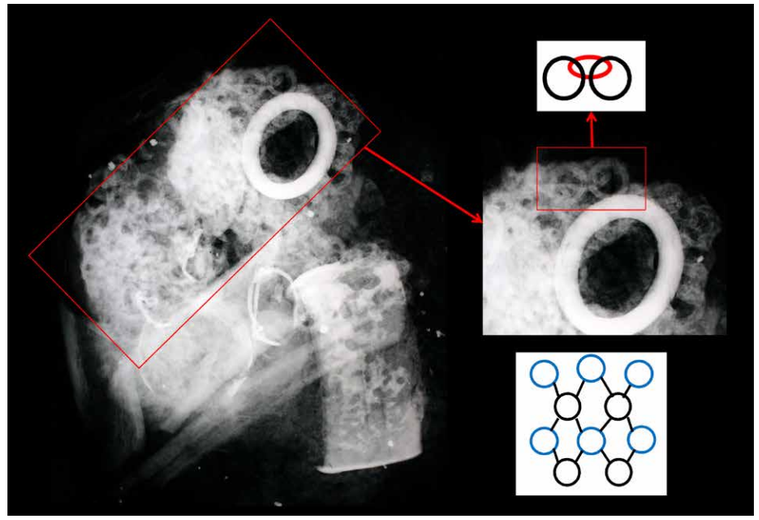


Fig 4 (top): Vessel SF33516: X-ray of the chain mail and construction of the links. © Historic England, Karla Graham

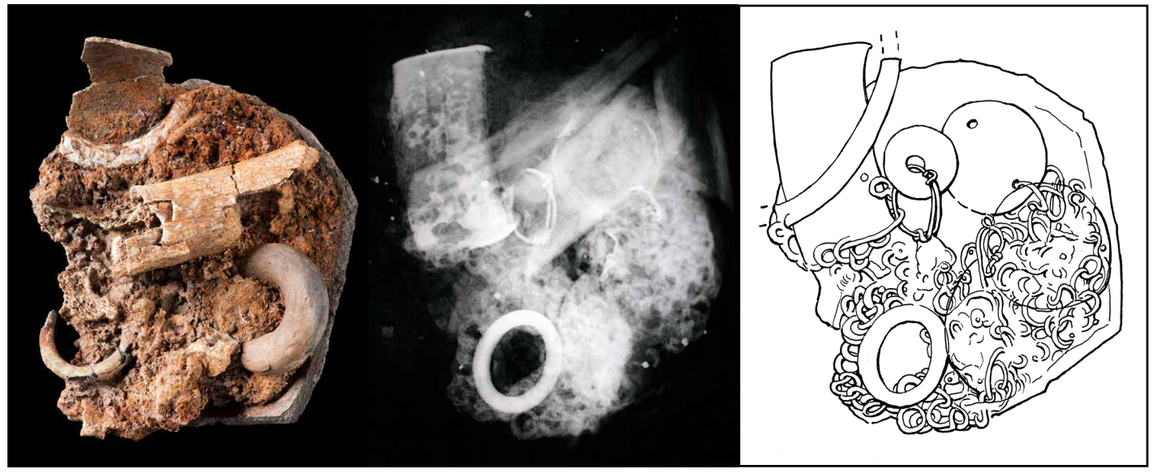


Fig 5 (bottom): Vessel SF33516 excavated showing objects alongside the X-ray and reconstruction drawing. © Historic England, James O. Davies, Karla Graham, Judith Dobie

Fig 6 (above): Objects inside Vessel SF33516: bracelet with glass vessel rim lying on top. © Historic England, Karla Graham

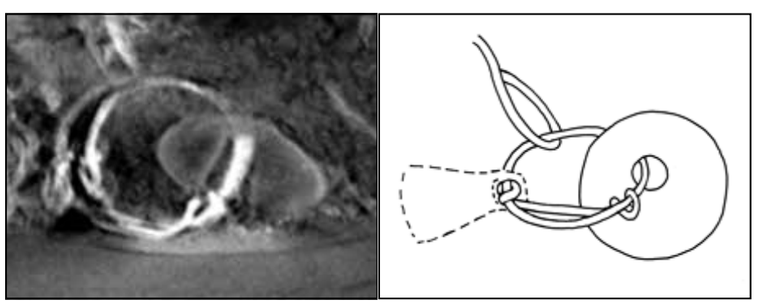


Fig 7 (right): Object inside Vessel SF33516: Dress accessory (bead and wire rings) discovered through X-ray and CT. © Historic England, Judith Dobie/ University of Cranfield

Fig 8 (above): Object inside Vessel SF33516: horse harness fitting. © Historic England, Karla Graham

One of the more challenging objects to identify was a large circular ring (Fig 8). A multidisciplinary approach was required to determine what it was made from. It was not metal as it was nearly X-ray transparent and therefore barely visible in the images. Using portable X-Ray Fluorescence (XRF) the elements potassium, aluminium and silicon oxides were detected. Crystalline grains resembling mica could be seen under microscopy suggesting a fine-grained sedimentary stone such as shale. This was confirmed using Fourier Transformed Infra-Red Attenuated Total Reflectance Spectroscopy (FTIR). The material and size suggests it is from a horse harness. >>

The human remains

Upon cremation, bones shatter into fragments, and in all five burials most fragments were less than 2cm long. Furthermore, the burning process destroys or degrades the organic component precluding DNA and most stable isotope analyses. This severely limits the information that can be obtained, but by using a combination of tried and trusted techniques, and new methods, we were able to extract some useful data.

Each of the five vessels seemed to contain the remains of only one individual. Four were adults (one male, one female, two of unknown sex) and one was a five-year old child (Table 1). Each burial contained only about 10-35% of the amount of the bone one would expect from a whole skeleton. In part this may reflect losses due to disturbance or poor survival, but it seems inescapable that much less than the full amount was buried. This is not unusual for cremations in Roman Britain: similar quantities of bone were found in burials at nearby Brougham, Cumbria. In Roman times, it seems that it was not thought important to bury all the remains. >>

Each of the five vessels seemed to contain the remains of only one individual

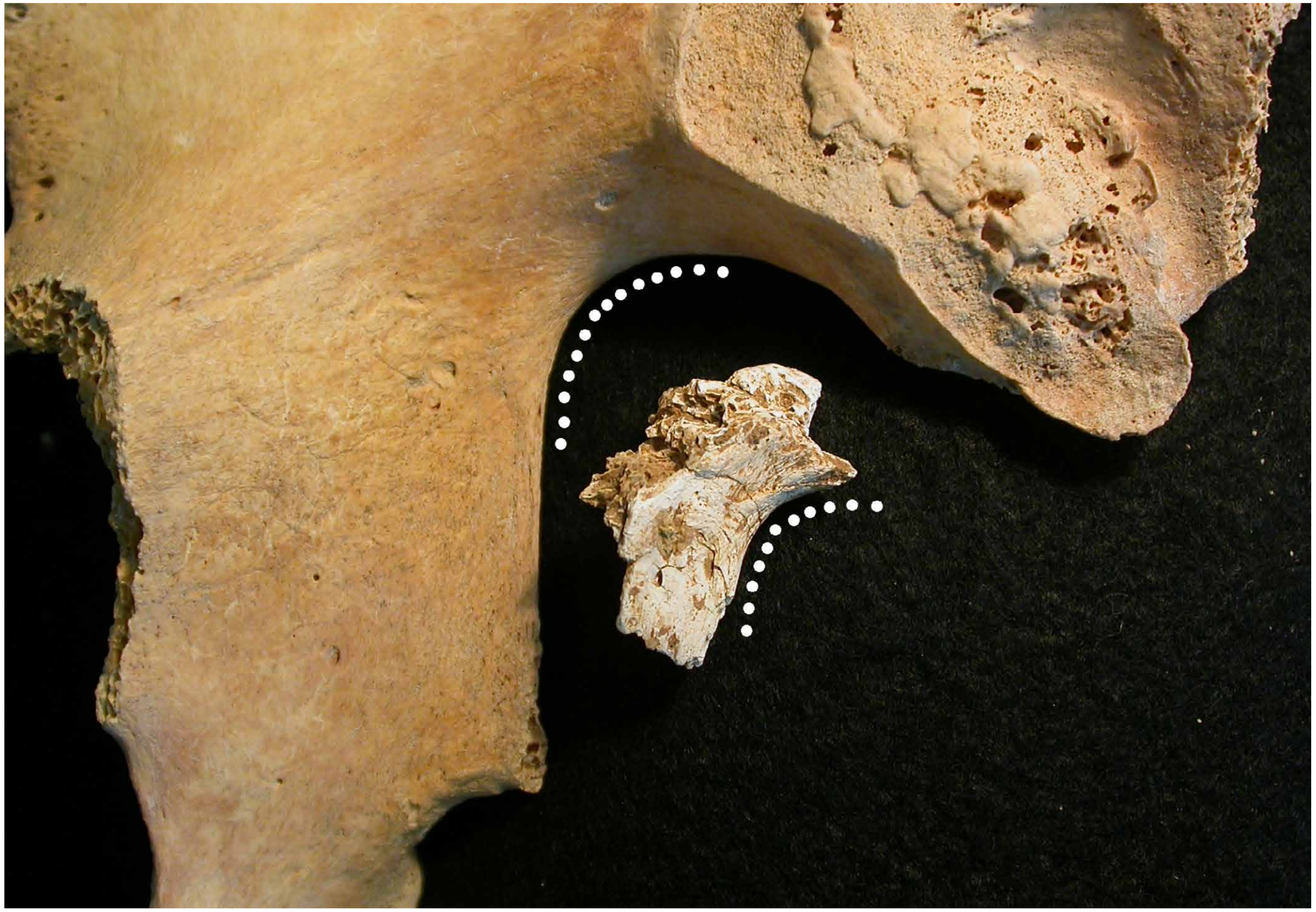


Fig 9 (above): Vessel SF33516: bone fragment from the pelvis, alongside female pelvic bone. The curvature of the greater sciatic notch (dotted line) in the cremated fragment matches that expected of a female pelvic bone.
© Historic England, Simon Mays

Fig 10 (above): Vessel SF33516 as reconstructed with the contents visible. © Historic England, James O. Davies

When subject to heat, bone undergoes a sequence of microstructural changes which can be detected by spectroscopic methods. We used FTIR to assess the intensity of firing of the bone to help elucidate the practice of cremation at Birdoswald. Results revealed a diversity of cremation practices. In three of the burials (the male and the two unsexed adults) there was a uniformly high intensity of burning, with prolonged exposure of remains to temperatures in excess of 600 degrees Centigrade. There was an evenness of firing of remains from front and back parts of the body, consistent with placement of corpses on top of the pyre.

The other two burials (the adult female and the child) showed more varied firing with some elements exposed to lower temperatures (*c*.300-500 degrees Centigrade). There was a tendency for the internal surfaces of bones to be less well fired than exterior surfaces, for example the inside surface of skull fragments were often less well fired than the outer surfaces. Because bones shatter into fragments during combustion, this pattern is consistent with a shorter duration of firing. In the adult female, upper parts of the body were also less well fired than the lower parts, suggesting insufficient fuel for uniform combustion or that the pyre may have been poorly managed.

The human remains analysis provides new possibilities of unlocking information and enables us to describe past practices in new ways

Conclusion

The study of the objects and human remains from these vessels has been illuminating. Vessel SF33516 containing the collection of objects has revealed an unparalleled level of information. Micro-CT enabled us to both identify what is present and the process of deposition. More intriguing is that the human remains analysis and the objects suggest a female and that this burial was in close proximity to that of a child. Further analysis of the soil from the vessels revealed charcoal fragments indicating hardwoods native to the British Isles were used on the pyre. The human remains analysis provides new possibilities of unlocking information hidden within archaeological remains and enables us to describe past practices in new ways.

Working with our curatorial colleagues in the English Heritage Trust we reconstructed the vessels for display (Fig 9). In the case of the vessel containing objects, we felt it was important for the public to see the contents as well as the external lattice work decoration. We used an 'open book' reconstruction allowing visitors to look inside and view the CT scans alongside the vessel (Fig 10). The vessel with the lead repair was so distorted from the weight of the lead and soil that it was reconstructed in two halves and a special mount made ■

Acknowledgements

Rob Collins (University of Newcastle) and Sophie Beckett (University of Cranfield) for their work on the vessel SF33516. Emily Carrol (University of Reading) for her FTIR work on the cremated bones. To our colleagues in the English Heritage Trust, Frances McIntosh and Leesa Vera-Stevens; and HE specialists working on this project.

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Angela joined Historic England as an Archaeological Conservator in 2007. She has a special interest in the conservation of waterlogged organic materials and has responsibility for providing advice, undertaking research and investigative conservation on material retrieved from land and marine sites.

Further reading

Birdsowald conservation project

Birdoswald Fort, English Heritage Trust

Exeter's Cathedral Yard fire and surrounding buildings

Destruction and a reawakening.

The destruction immediately provoked a fierce reawakening of popular interest in the city's remaining historic buildings

The fire in Exeter's Cathedral Yard on 28 October 2016 has had one unexpected legacy: there has been an unprecedented revival of public interest in the city's historic built environment. Two buildings were destroyed and many more had severe or incidental damage. The fire developed into an international news story because it concerned `England's oldest hotel'. No single event in Exeter has had such extensive media coverage since the Second World War. In Devon, and particularly in Exeter, the main building (the Royal Clarence Hotel) was an iconic structure and its loss is keenly felt. Because of this the destruction immediately provoked a fierce reawakening of popular interest in the city's remaining historic buildings. This curiosity had evolved into a palpable desire to engage with the future of Exeter's built heritage.

The research response

A considerable number of arts projects have taken place since the fire but the St Martin's Island Project, supported by Historic England, preceded them and culminated with the publication of a lengthy book in November 2017. The research focused on the five structures which were mainly affected along with another thirty-seven which are situated alongside them. These form a block of buildings which encompasses nearly the entirety of the ancient parish of St Martin. The project rebranded this block `St Martin's Island'. Their position between the cathedral and High Street has made them highly familiar to the public although little was generally known about their history.

The Island is particularly appropriate to study for a number of reasons other than the outbreak of the fire. Firstly, Exeter has nearly two dozen ancient parishes and that of St Martin is one of the best documented. An extensive range of deeds, leases and other papers survive in the city's two main archives and other relevant ones were identified and used for the first time in Somerset. Moreover, Exeter has the largest collection of historic images in Devon and many drawings, sketches, maps, building plans and photographs have survived for the 42 buildings in the study. These have been used to show the development of individual building plots over four hundred years.

Secondly, the Island was untouched by the Blitz of 1942. In April and May of that year the city centre was targeted in three nights of bombing during which some twenty per cent of the buildings were destroyed. The bombs fell to the immediate west and east of the Island, leaving it undamaged. Further losses in the city in the 1950s, 1960s and 1970s dramatically reduced the number of Exeter's historic structures. Four historic buildings, including two which were listed, were destroyed in the 1960s and an arson attack in the 1970s was responsible for the loss of three eighteenth-century buildings. The Island now has four twentieth-century buildings with two of them being particularly distinguished. >>

Further losses in the city in the 1950s, 1960s and 1970s dramatically reduced the number of Exeter's historic structures

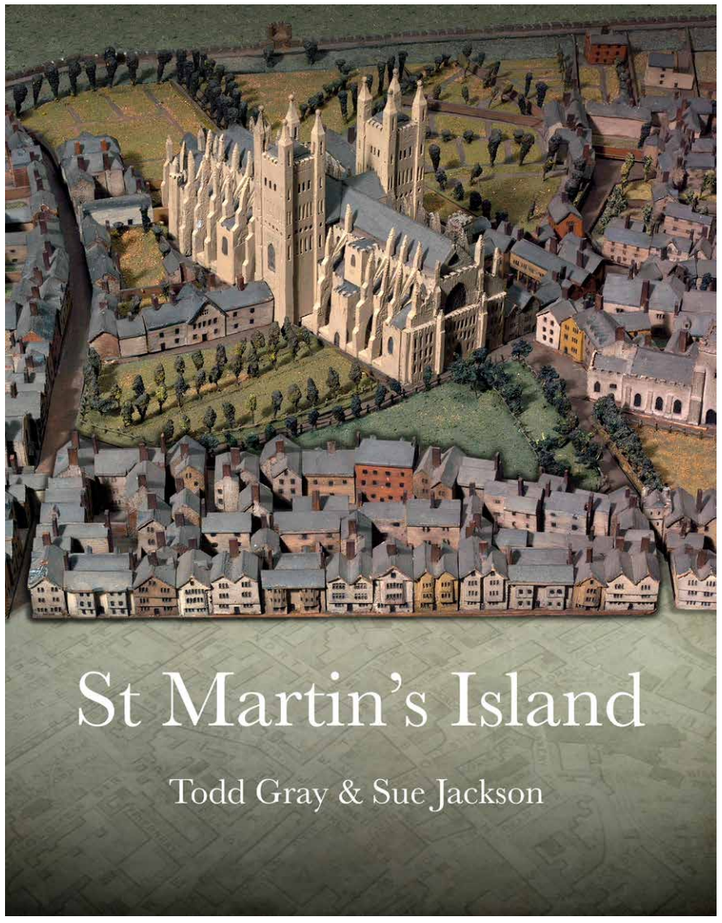
Left: Cathedral Yard with the buildings destroyed or damaged by fire to the right. © Todd Gray

New discoveries

The Island is one of the oldest sites in Exeter. The buildings rest on Roman remains, and Anglo-Saxon graves have been found under the Royal Clarence Hotel. Archaeological work in summer 2018 should start to reveal additional artefacts. The St Martin's Island Project has uncovered the earliest date known in the country for the rebranding of an inn as a 'hotel': this was in the summer of 1769. Research has also shown that two neighbouring buildings, now known as The Well House, were rebuilt and enlarged throughout the seventeenth century.

Other less assuming buildings have been studied. One has been revealed as having been built in 1907 by John Boot for his national chain of chemist shops. The elaborate timber carving on the front was the work of Harry Hems & Son, a national carving firm which was located in Exeter. These grotesques had, until now, been ignored by Exonians.

The fire originated in The Mansion House, a building which was erected in 1870 by an eccentric dentist. He appears to have claimed that the design, derided at the time, was `in a sort of French chateau style'. The elaborate interiors were lost in the fire. >>



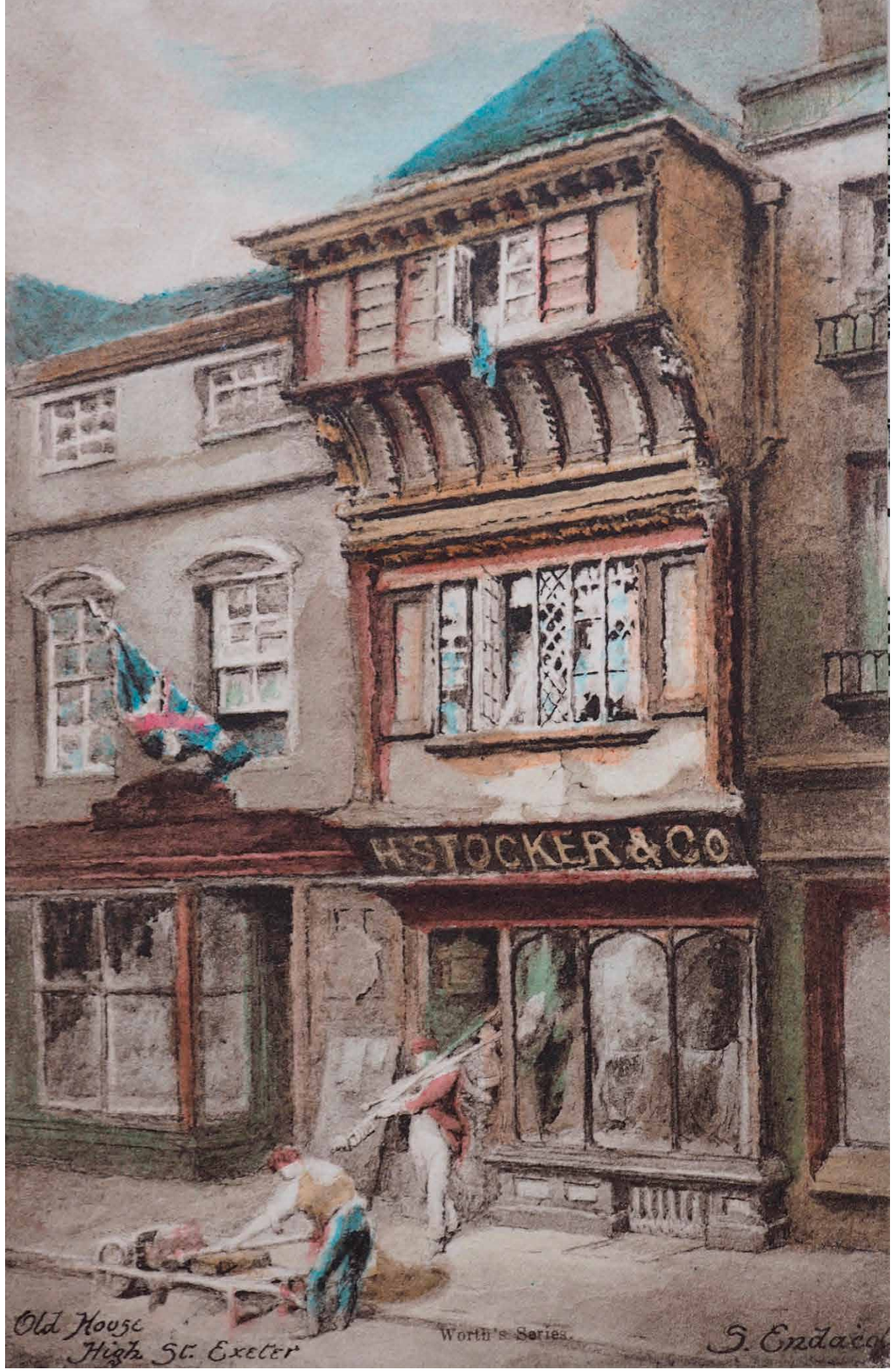
Above: Front cover of St Martin's Island book. © Todd Gray

Opposite page: One of Harry Hems' grotesques at 53 High Street. © Todd Gray

Some of the Island buildings were built in the sixteenth and early-seventeenth centuries, and they survive substantially behind unremarkable later fronts

An unexpected feature of the Island is the survival of a number of early buildings facing onto High Street. Some had already been studied by building archaeologists and further work is now being undertaken. Exeter largely fell asleep in the late-eighteenth century after three hundred years of considerable prosperity, achieved through what had been a booming woollen cloth industry. By 1800 the High Street as a whole, including the buildings on the Island frontage, looked unfashionable. Some of the Island buildings were built as pairs in the sixteenth and early-seventeenth centuries, and they survive substantially behind unremarkable later fronts. The most obviously Elizabethan building has been shown to have been occupied by a series of apothecaries for at least three hundred years. It is tempting to think that one room, with a shallow warming dish and toilet, could be an early medical treatment room. A very early toilet seat survives. Another structure retains its medieval hall roof and internal Gothic panelling. A rear block has two chimney stacks over which rest seventeenth-century roofs. Each of these buildings is situated in the very heart of the city centre.

One of the features of the project has been the compilation of lists of occupiers for at least two hundred years for each building. These have proved to be a focus of attention for local people and have also generated a wealth of original recent and Victorian material from the homes of Exonians. The lists have provided insights into the development of buildings. For example, in the early 1800s a preponderance of the first floors in the High Street buildings were used to sell bonnets and other items of women's clothing. A row of buildings in Martin's Lane were rebranded in the early 1800s as `Luxury Lane': these small retail spaces were ideal for offering delicacies. Likewise, smaller buildings facing the cathedral were used in the nineteenth century for the sale of Honiton lace.



Above: Painting of 45 to 47 High Street, by Sidney Endacott, late 1800s. © Todd Gray

The continuing prosperity of Exeter rests partly on the pleasing environment which is provided by its built heritage

Appreciating our built heritage

The study of the Island has brought into focus the sharp differences between the built environments of the centres of Devon's two cities. In Plymouth much of the main central area is post-1945 while in Exeter there is a cluster of historic buildings within the ancient walls. The continuing prosperity of Exeter rests partly on the pleasing environment which is provided by its built heritage. The study has revealed architectural surprises and treasures which demand not just lasting protection but genuine appreciation.

The public response to the project has been overwhelming and it is now a common sight to see Exonians and visitors stopping in the main street to point out features of the buildings which were previously unsuspected. It is not so much a testament to the ability of academic work to reach all strands of society in a compelling manner but evidence of the public's genuine interest in and support for its historic buildings ■

The author

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Todd is a historian and author of several books on Exeter including, with Sue Jackson, *St Martin's Island; An introductory history of forty-two Exeter buildings*. His other books include *Exeter Unveiled* and *Exeter Engraved* (in two volumes) and *Devon's Ancient Bench Ends*.

Further reading

Gray, T and Jackson, S 2017 *St Martin's Island; An introductory history of forty-two Exeter buildings*. Exeter, The Mint Press

Gray, T, Jackson, S and Allan, J, forthcoming 2019 *Exeter's Lost Buildings*. Exeter, The Mint Press

Historic England