Institution: University of Exeter		
Unit of Assessment: UoA 15 Archaeology		
Title of case study: Transforming the understanding and presentation of perishable material culture using experimental archaeology		
Period when the underpinning research was undertaken: 1 January 2000 and 31 December 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name: Linda Hurcombe	**Role (e.g. job title):** Professor of Archaeology	**Period employed by submitting HEI:** 1996-2020
Period when the claimed impact occurred: 1 August 2013 to 31 December 2020		
Is this case study continued from a case study submitted in 2014? No		

1. Summary of the impact

The majority of material culture is perishable and seldom survives archaeologically. This presents an interpretation and presentation challenge for the heritage sector. Hurcombe's use of experimental archaeology has generated innovative multi-sensory approaches to both understand and display this intangible heritage. Collaborating with conventional and open-air museums, as well as traditional skills specialists, across 14 countries in Europe and North America, Hurcombe has achieved the following impacts:

1. **Innovating and enhancing the presentation of heritage** in museums through the introduction of new media and touchable interactive objects.
2. **Developing the skills and knowledge** of professional staff, volunteers, re-enactors and crafter communities associated with open-air museums, as well as the ancestral skills and bushcraft specialists and instructors involved in public engagement.
3. **Boosting the role and status of archaeological open air-museums** within the international heritage sector and improving the quality of their visitor engagement.

2. Underpinning research

Hurcombe's research has demonstrated the importance of perishable material culture, such as organic objects and textiles, which form the 'missing majority' of the archaeological record because they rarely survive **[3.3].** Where such artefacts do preserve it is usually in a discoloured, fragmentary and fragile condition**.** Presenting the significance of this material culture to the public is a challenge for the heritage sector. Drawing on her expertise in experimental archaeology and leadership of transdisciplinary projects, Hurcombe has spent the last 15 years helping the sector develop knowledge about perishable material culture and the means to engage with deteriorated materiality of past societies from across the globe.

Between 2005 and 2008, grant funding from Lejre enabled Hurcombe's detailed trials of nettle processing, based on evidence from stone tools. This was achieved in collaboration with their expert weavers and before a public audience **[3.2].** These trials highlighted the importance of an engaged transdisciplinary approach, working with and for the heritage sector as well as involving the public as active participants in the research. An EPSRC-AHRC Science and Heritage network grant followed, '*Touching the Untouchable*' (2009-2011), in which Hurcombe directed an interdisciplinary team of geographers (led by Mark Paterson, Exeter), computer scientists (led by Steve Brewster, Glasgow) and physicists (Ian Summers, Exeter) to explore how fragile ancient objects could be made 'touchable'. Through a series of international workshops, the project demonstrated the potential for using computer interfaces and technologies such as 3D printing and craft replicas to engage visitors with museum collections in multi-sensory ways **[3.1].** Hurcombe's AHRC project, '*Touching the Past'* (2013-14; Co-I Mark Wright, Information Science, Edinburgh), advanced the agenda by recording public reactions to traditional-crafted replicas and a variety of IT-mediated experiences within museum settings (including 3D prints, a haptic mouse delivering sensations to a fingertip via a pin array, and 3D projection experiences).

Both *Touch* projects involved proof-of-concept public trials (2011-14) which were conducted in partnership with Scottish museums (Sanday Heritage Centre; Bute Museum; the Museum nan Eilean, Stornoway; and National Museums Scotland). This also led to a new collaboration with Plymouth Museum, delivering insights from public evaluation and resources for multi-sensory presentation of heritage **[3.6].**

Beyond traditional museums, Hurcombe's expertise has found vital application in the Archaeological Open-Air Museums (AOAMs) sector. AOAMs deal first-hand with the 'missing majority', as they strive to present the past as it might have been in life, with a rich material culture of structures, furnishings and artefacts. Experimental archaeology is the best way of helping them resurrect the tangible from the ephemeral, since unfamiliar processes and materials are especially challenging to present. As a leading figure in experimental archaeology, Hurcombe was the only university-based partner to participate in the EU-funded *OpenArch* project (2011-2015) which brought together best practice and used research (such as workshops and experimental activities, chiefly driven by Exeter) to raise the professional standards in, and the status of AOAMs.

The consortium included nine European AOAMs and EXARC, the key organisation representing the AOAM sector and an International Council of Museums-affiliated body. Hurcombe led three of *OpenArch's* international workshops, including one (Dec 2013) that focused on '*Touching the Past*', as well as co-organising the Dialogue with Science international conference in Finland. This combination of workshops and conference led to an output **[3.5]** which theorised the research agendas and practice of structures within AOAMs as an open-access collaborative monograph developed with and for the sector. Hurcombe also produced an open-access paper explaining the unique contribution of AOAMs to the heritage sector **[3.4].**

Both *Touch* projects and *OpenArch* researched multi-sensory heritage. They were conducted in tandem, at an international level, and engaged a broad group of specialist researchers, heritage professionals and end-users to bring the past to life.

3. References to the research

3.1. Hurcombe, L. 2007. 'A sense of materials and sensory perception in concepts of materiality,' *World Archaeology* 39 (4), 532–45. DOI: 10.1080/00438240701679346.
3.2. Hurcombe, L. 2008. 'Organics from inorganics: using experimental archaeology as a research tool for studying perishable material culture', *World Archaeology* 40 (1), 83–115. DOI: 10.1080/00438240801889423.
3.3. Hurcombe, L. 2014. *Perishable Material Culture in Prehistory: Investigating the Missing Majority.* London: Routledge. *(Routledge bestseller across classics and archaeology titles for 2014)*. ISBN: 9780415537933.
3.4. Hurcombe, L. 2015 'Tangible and intangible knowledge: the unique contribution of Archaeological Open-Air Museums'*, EXARC Journal* 2015(4):1-3, http://exarc.net/issue-2015-4/aoam/tangible-and-intangible-knowledge-unique-contribution-archaeological-open-air-museums.
3.5. Hurcombe, L. and Cunningham, P. (eds) 2016 *The Life Cycle of Structures in Experimental Archaeology: an object biography approach.* Leiden: Sidestone Press. (open access). ISBN: 9789088903656.
3.6. Pitt, F. And Hurcombe, L. (2017) 'Digital Interaction in the exhibition "Whitehorse Hill: A Prehistoric Dartmoor Discovery" – how Prehistory met the Gamers and Scanners', in *With Fresh Eyes: Society of Museum Archaeologists, Conference proceedings Portsmouth 2013 and Colchester 2014, Portsmouth and Colchester. Society of Museum Archaeologists, The Museum Archaeologist* 36, 110-124. ISBN: 9781871855265

4. Details of the impact

Hurcombe's work has generated impact across three main areas: helping museums enhance presentation of perishable material culture; the development of skills and knowledge of specialists and professional staff associated with the AOAM sector; and improving the professional standards and raising the status of AOAMs.

1. Innovating and enhancing presentation of perishable material culture
The *Touch* projects disseminated approaches to the display of perishable material culture in presentations and a portable exhibition in Britain, Europe, and USA. Drawing on this experience Hurcombe and her team contributed ideas, samples and support to four further museums in three countries, to help create more multi-sensory presentations and increase quality of visitor engagement using 3D and crafted replicas.

In the UK, Hurcombe built on public trials from the *Touch* projects to produce two replicas of unique perishable artefacts, a bracelet and a textile panel, originally crafted for a BBC programme 'Mystery of the Moor' (airing Feb-May 2014 on BBC1 SW, BBC2, and BBC4) **[5.1]**, and created a touchable 3D print installation of a basket – an international first – for a three-month exhibition (Sep-Dec 2014) at Plymouth City Museum. The exhibition attracted 17,191 visitors, prompting comments such as: '*[t]ouching the past is fascinating – really nice to be able to feel the basket'* and *'the replicas brought the finds to life'* **[5.1]**. The replicas influenced Plymouth Museum's development of permanent displays in its new iteration as The Box (opened 29/9/20, following a £40Million refit and redevelopment). Displays there now include multi-sensory exhibits such as crafted replicas and samples of nettle cloth planned to form a touchable installation (the latter delayed by Covid-19), all made by Hurcombe**. [5.1]**

In the Netherlands, Hurcombe gave a lecture and an interview (Oct 2014; 23,015 views since appearing online), and presented displays (Nov 2015), at the Hunebedcentrum prehistoric centre near Borger. The museum acknowledged Hurcombe's influence in their development of 3D print-mediated installations as part of its new galleries: "*the ideas of 3D printing are picked up from* [her] *visit"*. They are now using the installations and the multi-sensory approach in their work with 600 Dutch schools as an innovative way of teaching about the past, and planning to develop 3D models with visitors with visual impairment in mind. **[5.2]**

In Denmark,12 crafted replicas of different tanning technologies (described in **3.3**) were lent to the Danish National Museum for their exhibition 'Fur, an Issue of Life and Death' (Oct 2014-Feb 2015) which attracted c. 50,000 visitors. The museum subsequently commissioned further crafted replicas **[5.3].** In Roskilde, the Viking Ship Museum hosted a travelling international Viking exhibition (Apr 2014-Jul 2015, attracting 146,891 visitors) alongside which Hurcombe's 3D print objects were used in related educational experiences. Museum testimony states: *"[It is] the first such 'printed reproduction' taken into use in an education and outreach capacity at the museum and has proved to be a successful endeavour. The objects have stayed with the museum at our request and are still in use today."* **[5.4]**

2. Developing the skills and knowledge of AOAM professional staff, volunteers, re-enactors, and traditional skill specialists (TSS)

Hurcombe and her team have contributed to the development of practitioner competencies and expertise, crucial for the preservation of perishable culture among the user communities across the globe. They have delivered 63 events in 14 countries in Europe and North America since Aug 2013, to develop the knowledge and skills of museum staff and volunteers, and the TSS communities often associated with AOAMs **[5.9]**. TSS communities is a term used here for craft specialists, volunteers, historical interpreters, re-enactors and bushcrafters in Europe, and ancestral skills specialists, survival instructors and indigenous craftspeople in North America, where 're-enactors' can imply cultural appropriation.

Hurcombe and her team have worked at three Europe-based annual events with c. 520 re-enactors from all over the world and were involved in the establishment of the annual international European Stone Age Gatherings re-enactors event which has met since 2016. **[5.2]** The science camps and workshops delivered there have provided, at Lejre '[c]*rafted replicas and 3D-prints…to explain technologies and processes, and present tangible evidence of the material world of the past. … Instructors, Stone Age re-enactors, volunteers and the public are all beneficiaries.'* **[5.5]**

These demonstrations have enhanced the skills of museums' staff and volunteers. At Foteviken, Sweden, they have enabled them to ensure that *'staff, students and volunteers…act appropriately within the Viking town. … The staff [have] elevate[d] the quality of the information being passed onto the visitors as a result. This knowledge is also passed on to our volunteers and trainees.*" **[5.2]** Archaeological-Ecological Center Albersdorf (AOZA) note that their model of staff and volunteer training and development created through the collaboration with Exeter has *"influenced other museums in the region and wider community which are currently taking up some of the ideas".* **[5.2]**

For the TSS communities, the workshops have ensured that these specialists "*see the process and talk about the possibilities of historical tanning*", as for a Czech professional historic shoemaker, or to use the knowledge "*for presenting prehistoric techniques to every kind of public"*, as in the case of Sapiens Origins, a traditional skills school in France, or even to start a private elementary and high school with ancient skills as curriculum, like for one Dutch educator, the workshops give the chance to "*inform other people about the importance that we are still able to work with our hands instead of just our heads*" (Dutch re-enactor). **[5.6]**

In the very different US context, Hurcombe's archaeological craft perspective has benefited ancestral skills instructors and indigenous skills practitioners. She was honoured to be approached to help the basketry knowledge-keeper of the Cherokee Nation to recreate their lost technology for creating clothing from mulberry tree bast fibres. A primitive skills instructor working with the Cherokee elders confirms '*a few women of Cherokee descent are attempting resurrection of long ago mulberry sourced clothing. We started along this amazing project with Linda's help, advice, research and knowledge. […] With Linda's knowledge and understanding we were able to ID 3 yr approx. 1" stalks served best to produce fibers …We are grateful to be a part of bringing this traditional knowledge, once lost, back into Cherokee life in present day'.* **[5.6]**

3. Improving the professional standards – and status – of AOAMs

Through workshops, the introduction of crafted replicas and 3D prints, and dissemination of information and best practice, Hurcombe and her team contributed to the improvement in the AOAMs' working standards, and the sector's status and visibility more generally **[5.7]**. This was achieved via the *OpenArch* project but also through independent collaborations. For example, Hurcombe helped initiate an annual Science camp at Leijre (Denmark) in 2015 which the Head & Manager of Lejre Prehistoric Areas considers *"created a great and concrete change, as visitors began to come specifically for it"* […] *"I would put emphasis on the declared intention, every year, by some visitors to come back and to revisit the genuine Stone Age museum collections 'with new eyes', after having experienced the fabrication process, the use and vivid design of these artefacts 'in situation' LIVE."* **[5.5]** Additionally, a video presentation incorporating Hurcombe's nettle-processing **[3.2]** has been shown in the entrance cinema at the museum since 2013 and is seen by most of the 60,000 annual visitors, as well as having had 36,233 YouTube views since 2014, demonstrating the wider appetite for such approaches**. [5.5]**

The *OpenArch* project was successful in its aim to raise the professional standards of AOAMs and increase their role in the heritage sector via museum interactions and best-practice sharing, experimental activities, workshops, and open-access resources **[3.4;3.5].** By 2018, their representative body, EXARC, whose board Hurcombe joined in May 2018, saw a 39% increase in institutional membership compared to 2013. Footfall also increased, with nine project partner museums seeing 1.2 million annual visitors and the sector as a whole in Europe an estimated 19 million visitors per year **[5.7]**. In the words of Hunebedcentrum director: **'***We are not only local, not only provincial, but we are now national and international: Openarch was part of that growth.'* **[5.2]**.

For the Viminacium Archaeological Park in Kostolac, Serbia, the project *"helped experimental archaeology gain validity within Serbia*" and become *"more accepted as an approach to research*

and public presentation in the region". For Bjorn Jakobsen, director of the Foteviken Viking Museum in Sweden, Hurcombe and her team's hands-on engagement with the museums and its staff and volunteers enabled *"access to knowledge of very high standard … allowing us to get the university level of knowledge into more of what we do, and what we present to visitors*". **[5.2]**

For some of the participating AOAMs, including the German AOZA, Hurcombe and her team's involvement led to concrete plans to change practice, based on the quality of visitor engagement created by the collaboration. According to their Executive Director, "*[t]he overall positive response from the park's visitors in reaction to the university's unique style of presenting science as multisensory heritage for the public has led the museum to plan further experimental weeks. … The roadshow with science has inspired the park with its multisensory approach to heritage. [We plan] to put together a similar travelling display for markets and other venues for educational purposes."* **[5.2]**

In addition to open-access research outputs **[3.4, 3.5]** used by staff, volunteers and re-enactors within the sector and beyond, *OpenArch* further delivered four manuals for AOAMs, covering dialogue with visitors, management and communication issues, and relationships with traditional museums (5,160 downloads as of 2019) **[5.7; 5.8]**. The project also featured direct public engagement via the above cited 'Exeter Dialogue with Science Roadshow', a series of annual events held since 2015 at ten venues across Denmark, Netherlands, Germany, Spain, Sweden and the UK. The events disseminated the multi-sensory and experimental archaeology approach **[3.1, 3.2, 3.3]** to a wider number of museum staff and volunteers, and presented material directly to the public (c. 20,000 visitors in 2015 and more than 10,000 in subsequent years).The EXARC director testifies that [**3.5**] is valued in the sector for its '*clear bringing together of hands on knowledge within the academically acceptable framework*' and that Hurcombe's and her team's workshops that '*brought people within the visitor-facing staff together to learn things that they were able to pass on back in their own museum situation […] made a significant difference to bring the science to the museums*'. **[5.7].** Exeter is setting a trend to put current science directly back into heritage arenas; to quote the prehistory manager from Lejre (2019) – '*the academics are back!'* **[5.5]**

5. Sources to corroborate the impact

5.1. Plymouth City Museum and Art Gallery file (HLF report 24/8/15; visitor feedback for the Whitehorse Hill Exhibition; The Box new permanent display photographic evidence and explanation; BBC programme screenshot and producer email on viewing figures 10/2/14).
5.2. OpenArch museum testimonials (Director, Hunebedcentrum 13/2/19 and screenshot of online interview 18/12/20; Senior Research Associate, Institute of Archaeology, Serbia; Executive Director, Archäologisch-Ökologisches Zentrum (AOZA) 26/2/19; Director, Foteviken Viking Museum 11/11/19); First EU Stone Age Gathering set up-email 22/9/15.
5.3. Danish National Museum Senior Researcher, Collections and Conservation.18/2/19.
5.4. Viking Ship Museum (Denmark) Curator. 20/2/19.
5.5. Sagnlandet Lejre (Denmark) Head & manager of the Prehistoric Areas. 22/2/19; screenshot of YouTube video 18/12/20.
5.6. Traditional skills events file (record of events Aug 2013-Dec 2019; participants' feedback via questionnaires).
5.7. EXARC testimonial, Director 13/2/19.
5.8. OpenArch Horizon 2020 project report.
5.9 List of events delivered to, and with, AOAM staff and to TSS.