



Edited by
PAMELA JORDAN,
SARA MURA AND
SUE HAMILTON

New Sensory Approaches to the Past

*Applied methods in sensory heritage
and archaeology*

 **UCLPRESS**

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and Sue Hamilton

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List of abbreviations

ERC	European Research Council
ESRI	Environmental Systems Research Institute (Esri)
GIS	Geographic information systems
GPR	Ground penetrating radar
ISO	International Organization for Standardization
UNESCO	United Nations Educational, Scientific and Cultural Organization
VR	Virtual reality

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Neha Khetrapal (O. P. Jindal Global University, India, and Royal Historical Society, UK) has examined language development in children with autism. After gaining her PhD at Macquarie University, Sydney, she worked in Singapore and Budapest. Through those years, she gradually moved beyond her work on cognitive development and became interested in allied fields. She takes her inspiration from her passion for travelling. Presently, Neha is involved in developing two distinct research portfolios at Jindal Institute of Behavioural Sciences. She is interested in the interaction of religion with various aspects of environmental humanities. Her recent research elucidates the aesthetics of commemorative practices, as gleaned from built styles. Here, she takes a cross-cultural approach to highlight how commemoration may take on different 'visual' forms in the form of peace and war memorials. At JGU, Neha has taught courses on the spiritual brain, environmental psychology and psychology of religion and spirituality.

Robert Kirkbride (Parsons School of Design, New York, USA) explores the interplay of memory, identity and the constructed environment. He directs Studio Patafisico, an architectural design and research practice, and is Professor of Architecture and Product Design at Parsons School of Design/The New School, where he received the University Distinguished Teaching Award and was Dean of Parsons School of Constructed Environments. Dr Kirkbride is also spokesperson and a trustee for PreservationWorks, a national non-profit organization advocating the adaptive reuse of Linear 'Kirkbride' Plan psychiatric hospitals, devised in the mid-nineteenth century by Dr Thomas Story Kirkbride, a distant relative. In addition to releasing the music, *Always Becoming* (2023),

Robert has been a visiting scholar at the Canadian Centre for Architecture and architect-in-residence at the Bogliasco Foundation in Genoa, Italy, and his multimedia book, *Architecture and Memory*, received the Gutenberg-e Prize.

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Preface

Pamela Jordan and Sara Mura

This volume is the outcome of a three-year exchange between members of the interdisciplinary research group Sensing the Past, based at the University of Amsterdam (NL) from 2021–4. Seeking out ways to connect with sensory-based scholarship during the COVID-19 pandemic, Jordan and Mura first organized an online symposium called ‘Sensing the Past: a workshop in applied sensory archaeology and heritage assessment’ (7–9 October 2021). A simple prompt was offered: scholars from varied disciplines, at all stages of their careers and from across the world, were invited to share their approach to sensory study in the ‘existing built environment’. We intended this description to include any physical place (instead of a simulation) where human hands had made an impact at any point in time, encompassing anything from neolithic settlements to a modern building. What we could not anticipate was the wealth of different approaches scholars and practitioners had to offer, alongside an interest in discussing the applied forms of sensory work in a rigorous, open-minded way. The shared goal, born in this symposium, was to look beyond the findings and understand *how* researchers structured their investigations and fieldwork. It was such a fruitful exchange that an online conversation series continued the group dialogue, as did the subsequent online Sensory Decay Symposium (2–3 November 2023; see <https://shaarp.network/events>). The contributors to this volume are drawn from those events and activities.

Reflecting the purpose of our research group, this volume aims to advance sensory research as a perspective for understanding existing places with rigorous, repeatable approaches. Also representative of the group, this work does not fall under the sole purview of one discipline – the sensed built environment is approached by historians, cognitive

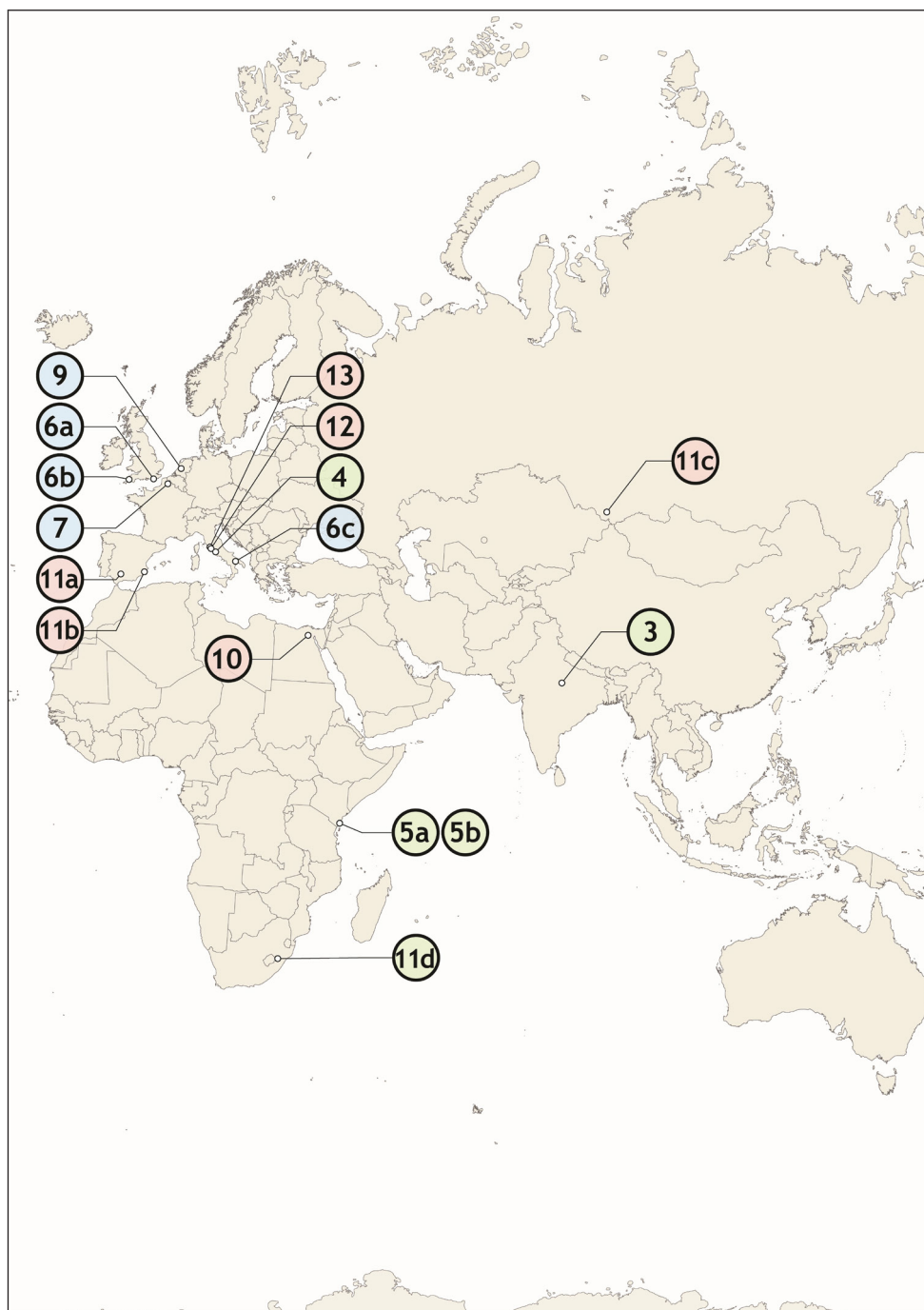
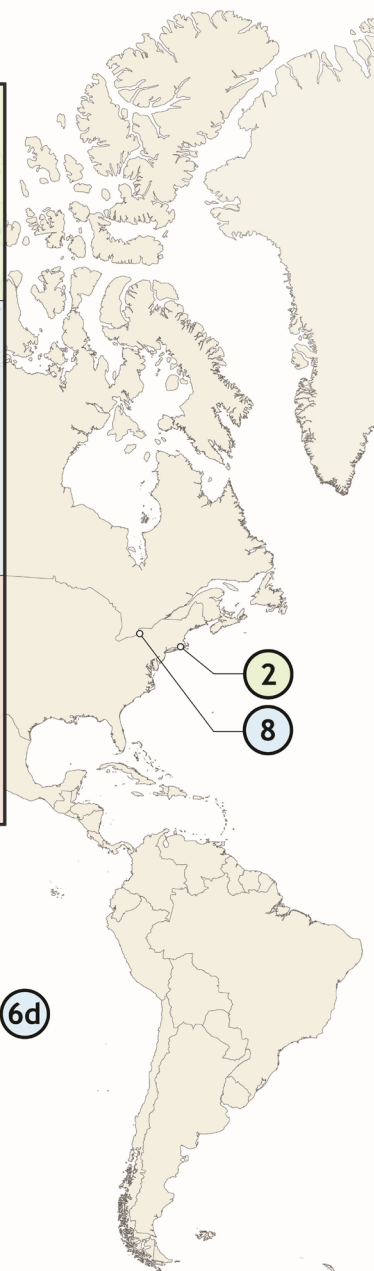


Figure 0.1 World map with locations of authors' research marked.
Source: authors.

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	11c	Altai Republic, Russia
	11d	Drakensberg, South Africa
	12	Tarquinia, Italy
	13	Vulci, Italy



scientists, architects, tourism scholars and archaeologists alike. Bridging the research languages of such disciplines, rather than simply allowing them to occasionally overlap without comment, is a key motivation for putting the contents of this volume in dialogue. Each chapter focuses on detailed discussions of the research methods used rather than research results; the ‘how and why’ of fieldwork is rarely spelled out in many traditional archaeological and heritage-based projects. By doing so here, the volume allows for disciplinary transparency that can serve as a common foundation for readers to replicate and augment investigations.

Many of the methods presented include well-worn tools, such as GIS (geographic information system) visualizations to create maps, and resonance testing to determine acoustic properties of a space. The logic behind their choice and application, however, means that the reader can examine and compare their efficacy between projects instead of simply accepting their use. Moreover, we believe one of the strongest collective innovations of this volume lies in the way the researchers themselves approach the environment that they study, with a sensitivity to both scope and different kinds of connections between people and setting. To highlight this, the texts are organized based on the types of human–environment connectivity employed during research efforts rather than chronological time period. Sensory perspectives rarely incorporate this framing and we hope the collected works here help bridge the gap towards future study along these lines.

Accordingly, the research contributions in this volume are organized into three parts, based on the evolution of the applied methods and the primary means of data gathering used by the authors: individual self-registered sensing research, collected self-registered sensing research, and externalized sensing research. [Part I](#) includes research methods that focus on a single, informed researcher who uses their own embodied experiences as the primary tool for expert data collection and analysis. The resulting research is centred on how one person perceives and feels within the subject’s contemporary condition, and how they extensively interpret this data through their cognitive and/or physical process. Sarah Bell opens this part by illustrating how sensory archaeology requires innovative, embodied criticality, especially in challenging contexts like the COVID-19 pandemic. She uses autoethnography and archaeological surveys to explore the body’s sensory responses to absence and ruin at Rocky Point Amusement Park in the United States, tailoring methods to her specific experience. Neha Khetrapal’s research shifts focus to the role of scent in Hindu worship, an often-overlooked sensory aspect of spatial and ceremonial engagement. Through personal encounters at active and

inactive temples, and museum collections, in India, she highlights how olfaction shaped religious practices, calling for greater collaboration between archaeologists and religious scholars to restore these sensory dimensions. Emma-Jayne Graham narrows her study to the sensory experiences at the Roman Sanctuary of Juno, focusing on kinaesthesia and movement. Her desktop-based research introduces the concept of sensory assemblages, blending past and present sensory experiences to deepen understanding of religious rituals when examining archaeological data. Finally, Monika Baumanova bridges solo and collaborative research in her study of precolonial East African towns. She combines individual surveys, for nuanced sensory analysis, with team-based work, for validation and varied insights, showcasing flexible methodologies that span both approaches.

The projects presented in [Part II](#) draw from the embodied sensory experiences of multiple researchers or participants, who individually or collectively respond to a common situation or standardized form of questioning. The focus of these authors is the aggregation of responses rather than that of a sole individual. The research thus incorporates a wide range of sensory inputs, offering a varied understanding of the subject matter through the combination of multiple personal, subjective interpretations. Beginning the section is Sue Hamilton's research into social space through *in situ* sensory interactions. Diverse teams of researchers explore and interact with these different sites, sometimes over many years, with each individual precisely noting their embodied feedback according to certain parameters. Together, the results are structured datasets that can be placed in dialogue with findings from other archaeological methods. Matthew Leonard's project provides local community members with carefully managed access to the British Great War tunnel system near Hulluch, Hauts-de-France. Due to the inherent dangers of exploring such sites, the experience is guided, to ensure participant safety, while still allowing for direct sensory engagement. This interaction turns participants into co-creators of heritage meaning, bringing the historical significance of the tunnels to life. In the next chapter, Robert Kirkbride's research focuses on how olfactory experiences shape both personal and collective memories at Kirkbride Hospitals, via the interrogation of the abandoned Kirkbride Hospital in Buffalo, US. Participants, dubbed 'explorer-preservationists', self-record their sensory encounters as they freely navigate the site. Kirkbride, acting as a facilitator, deepens the connection between the individuals and the hospital, advocating for its preservation as a culturally significant site rather than just an architectural relic. Concluding [Part II](#), Pamela Jordan and Sara Mura take an

alternate approach, to Leonard and Kirkbride, with their public sensory study of the Fort bij Uithoorn in The Netherlands. Instead of mediating the experience in some way, Jordan and Mura remained removed from participants. Participants self-directed their own engagement and utilized a standardized survey form to trace their sensorial encounters with the site. Survey data and post-study interviews revealed trends in how people relate sensory attributes of the Fort to its history, underscoring the importance of integrating sensorial experience to material conservation questions.

Part III brings together authors who externalize the act of sensing to devices that collect data according to narrow parameters. The external device offers a different way of standardizing the collection and analysis of data, focused on a specific type of sensory data (sound, vision, or a combination of the two). The methods are applied in sites where material remains are well preserved and the format of collected experience allows its direct input into various systems of digital reconstruction. Aliaa el-Dardiry, Ahmed El Antably and Ahmed Ali Elkhateeb showcase how digital reconstruction and auralization enhance understanding of the Ottoman Sabīl wa Kuttāb Ismaʿil al-Maghlawī, a water source and community meeting point in Cairo, Egypt. By integrating soundscapes with architectural reconstructions through a digital game platform, their research offers an immersive view of the site's historical and daily auditory experiences, complementing traditional visual approaches. Margarita Díaz-Andreu, Lidia Álvarez-Morales and Neemias Santos da Rosa trace the evolution of archaeoacoustic research, from basic observations to advanced empirical methods. Following the application of evolving technologies like Ambisonics and GIS, they highlight the benefits of interdisciplinary approaches for studying the sonic dimensions of palaeolithic rock art sites. Their analysis of methodological strengths and limitations provides valuable insights into the evolution of the field and for applying these techniques effectively. Jacqueline Ortoleva applies attention to the acoustics of painted Etruscan tombs, combining fieldwork with digital and live simulations to explore how sound has been experienced within these structures. By analysing the acoustic properties of the interiors alongside visual depictions of musical instruments, her research offers a comprehensive view of how sound and visual art intersected in Etruscan funerary practices, enriching our understanding of ancient sensory experiences. Antonio LoPiano concludes this part by demonstrating how integrating GIS and GPR technologies can transform both research and visitor experiences at archaeological sites. By offering real-time views of subsurface features, these tools make hidden aspects of ancient

landscapes accessible, deepening public engagement and providing a dynamic approach to cultural heritage management.

Readers will note a mixture of approaches to sensory work in this volume, some of which focus attention on one sense, while others take a multisensory approach to understanding holistic experience. We have intentionally commingled these. Of note as well is the inclusion of visual material throughout the chapters and some supplemental material available online. Such portrayals with diagrams, figures and various forms of ‘reconstruction’ are not typical in sensory work and demonstrate how a visual language of research communication is still evolving across disciplines.

As can be seen on our accompanying world map, sites of the research represented in this volume are located all around the globe (Figure 0.1). The research chapters of this volume are framed by a reflexive introduction, by Sue Hamilton, entitled ‘Pathways to a new sensory past: a summative critique’ and an epilogue by David Howes, both distinguished scholars in sensory work. Hamilton sets the scene for the multidisciplinary volume, discussing the trajectory and growth of sensory enquiry in archaeological and built heritage disciplines up to the present day. Howes closes the volume in a reflective mode, opening windows to new directions and possibilities for future work. In this regard, some opportunities await greater research attention. First, the contributors to this volume and those who participated in the research group reveal how vital non-Western perspectives are in sensory work, both as a matter of researcher profile and as a region and culture of enquiry. Additionally, the domestic sphere is rarely addressed in sensory-led research and awaits concerted attention. And, as readers will note, each chapter in this volume ends with more research questions posed by the research that came before. They are thus a testament to the collaborative spirit and the collective intellect of our contributors. We believe that this book will not only reflect the initial energy and enthusiasm of our research group but also serve as a valuable resource for readers interested in sensory-based research in both theory and practice.

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As this book goes to press, we would like to express our deepest gratitude to every individual who contributed to the project over the past few years, including the authors, workshop participants, SHAARP network members and guest speakers. It has been a remarkable collaboration, suffused by a maturity of purpose and shared passion for our subject matter. We hope this is a beginning.

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We extend immense gratitude to David Howes, who participated as a respondent in the online writing workshop organized for this collective volume on 13–14 February 2024. As a leading voice in sensory studies, he has brought a wealth of experience and a multidisciplinary perspective to our collaboration. In addition to authoring the volume's epilogue, David also provided invaluable support and insightful comments to the authors, enhancing the quality of their contributions and enriching the overall project.

For enthusiastically responding to our call for papers, with their academic rigour and dedication, we extend our heartfelt thanks to the authors of this volume. They are all dedicated researchers who have worked collaboratively, not only with us but also with one another, to bring this project to fruition. Despite juggling the demands of teaching, conducting fieldwork and pursuing their own graduate studies, they have come together to share insights, refine their contributions and support each other throughout this journey.

We also want to acknowledge the behind-the-scenes heroes that helped manifest this a joyful project. Thank you to UCL Press for believing in this undertaking from the very beginning and offering firm support at all stages of its development – we greatly appreciate the

opportunity to share the work with a wider audience. Our anonymous peer reviewers offered their counsel and knowledge with supportive precision that helped each of us. And we are lastly, serenely, grateful to our stalwart families that offered their resilience as every new wave of the project rolled in.

Pathways to a new sensory past: a summative critique

Sue Hamilton

It is widely stated that the twenty-first century study of the past is experiencing a ‘sensorial turn’ (Moyes, 2023: 310) or ‘sensory turn’ (Howes, 2019). In some senses, *re*-turn might be a better term. This chapter places and analyses contemporary sensory-based archaeological investigation in a historical context. Publishing and presenting investigations of past things in a manner that imbues experiential atmosphere to the process of discovery and the associated findings has its origins in the eighteenth and early nineteenth centuries. The present focus on the senses still recognizes and uses the vibrancy of the senses to present the past, but now with a growing theoretical core that establishes their essential role in influencing meaningful behaviour and social patterning. This trajectory is readily tracked within Western traditions of archaeological research. How ‘modern’ archaeology as a discipline developed out of antiquarianism in Europe is a much-rehearsed part of Western semantics. Following a sensory lacuna in the late nineteenth and early twentieth century, when archaeology was largely dominated by cultural historical and/then processual approaches, sensory archaeology began to come into formal being. While today’s archaeology and heritage studies are globalized in assimilating diverse cultural and disciplinary influences (Urwin, 2021), non-Western ways of understanding and constructing the past remain largely unaddressed in sensory considerations.

Archaeology and heritage’s modern recognition of the role of the senses can be summed-up as three intentions: to evoke the elusive sensory experiences of the past; to use body-centred sensory experiences as an interpretative and presentational tool; and to promote sensory enquiry as a key interdisciplinary methodological tool to better understand past places, social practice and objects. Today, there is an increasing

sophistication in establishing the theory and the mechanisms of human sensory perception. Present archaeologists and heritage specialists are indebted to expanding research across multiple disciplines into how the human senses function physiologically, socially and culturally. Sensory archaeology and the sensorial presentation of heritage is practised in conjunction with the material information provided by the mosaic of preserved past things. It is used to isolate and present what may have characterized place, time, group- and person-specific sensory experiences. These considerations both enhance and challenge our knowledge of the past and aim to contextualize the human condition more holistically. The evidential data of deeper time societies in turn extend the perspectives available to the chemical and physical sciences, social and medical sciences, and the work of civic planners in charting and improving the sense-based qualities of contemporary life.

Sense-based investigation is recurrently positioned as a secondary embellishment of ephemera to investigations of humanly constructed pasts. The case is here made that it should be recognized as a core generative mode of data collection. In the present chapter I study the unchartered disciplinary trajectory of sensory archaeology and heritage to elucidate its current role in heritage-related theory and practice. Interest in the sensory has followed more than one approach. These enquiries are not generally recognized as being part of the same endeavour. In part, this is because the methods of research variously deployed in sensory archaeology and heritage can be individually rooted in diametrically opposite philosophies. Each has something to offer and should not be placed in obstructive conflict.

Sense and antiquarians

Archaeology's earliest published sensory-rich writings and illustrations are found in the works of eighteenth- and early nineteenth-century antiquarians and antiquities explorers. In these the events of discovery and excavation unfold in descriptive narratives, accompanied by atmospheric illustrations, that variously evoke the sequence, sights, noise and smells, and charisma of discovery.

An example of a flamboyant, sensorially charged account of discovering antiquities is Giovanni Belzoni's *Narrative of the Operations and Recent Discoveries within the Pyramids, Temples, Tombs, and Excavations, in Egypt and Nubia*; a proto-Egyptological text on his travels and tomb-robbing activities. He graphically describes the rising

dust of an Egyptian tomb, which choked the nose and mouth, and the struggle to resist the mummy effluvia (Belzoni, 1820: 156). In contrast to a dominant reliance on heightened literary expression, the UK's early antiquarian investigators are portrayed as precursors of the twentieth-century discipline of landscape archaeology (Needham et al., 2010). While their writings relay a sense of personal experience of ancient sites, their narrative is juxtaposed with empirical description and surveyed maps of monuments and their settings. It is much noted that William Stukeley's (1743) surveying and field observations at Avebury, Wiltshire, brought together in his *Abury, A Temple of the British Druids*, evidence an early concern for accurate recording and measurement. In tandem, Stukeley's *Abury* is interspersed with illustrations of Avebury that have a visual impact of awe and grandeur. This was achieved by depicting unrealistically small silhouettes of people proximate to the monuments, and vistas which used 360-degree perspectives that place the viewer in the experiential epicentre of the setting (Hamilton et al., 2006). Such scenes lie within the stylistic trope that European eighteenth-century artists used to enhance the majesty of stately homes and their landscaped gardens (Gillings and Pollard, 2015). Likewise, Richard Colt Hoare's (1812) *The Ancient History of Wiltshire* combines narratives of his personal experiences of the sequence of 'uncovering' in the numerous barrow excavations carried out on his behalf by William Cunnington, with Phillip Crocker's accurate surveyed maps and to-scale watercolour illustrations of artefacts. As Ian Hodder (1989) noted, these publications cannot simply be dismissed as works of antiquarian charm and romance; they offer a hybrid form of sensory presentation both relating to personal experience and its evocation, and empirical data. In effect, these antiquarians are actors in the discovery of the past. The process of discovery is presented as an *in situ* physical experience and not as an exploration of how the sites might have been sensed by their original builders and users. These works offer the reader a sensory closeness to the process of excavation and its findings, via what can be dubbed a phenomenology of reading immersion (Poulet, 1969). Their associated tradition of detailed, textured artefact drawings that strive to convey their sensory characteristics of touch and lustre, sporadically extends into the mid-twentieth century (Hamilton, 1996). However, a personal, engaged style, and text that mirrors the sequence of discovery and sensory responses to encounter with places, lost favour and was deemed inappropriate for disciplinary writing in the later part of the nineteenth century, through to the mid-twentieth century.

Post-antiquarian loss of sense

The emergence of archaeology as a discipline in the mid-nineteenth century is associated with the shift of attention from discovery and collection to establishing general artefact typologies, chronologies and stratigraphic sequence. With this, the worth of recognizing bodily senses was submerged. Alongside the modes of archaeological writing becoming depersonalized, opportunities to handle collections of antiquities and curiosities of the natural worlds were narrowed and controlled.

With the growth of antiquarianism in eighteenth-century Europe, private persons and societies built up collections of ancient artefacts and natural curiosities which were often kept in private homes. By the nineteenth century, such collections were being brought together and formally placed in newly created public museums such as the Dutch National Museum of Antiquities, Leiden, Holland and the Musée d'Archéologie Nationale at St-Germaine-en-Laye, France. The earliest of these was the British Museum, London, which was established in 1753. The setting-up of public museums marks the transition from keeping objects in readily opened pull-out drawers and in display cabinets that allowed interested guests easy tactile access to objects, to museums' securing of objects in locked, glass cases to protect them from theft, damage, deterioration and the public. Constance Classen (2007: 895) describes the change as one of 'sensory restraint'. This new visual regime was part of a Western trend from the mid-nineteenth century towards 'spectacular consumption' or overt visual expressions of wealth (Crary, 1990; Noordegraaf, 2004). It is one in which the physicality of material things is suggested to the viewer by purely optical clues. This foreshadowed an archaeology in which, until the mid-twentieth century, the acquisition and dissemination of knowledge was dominated by visual descriptions and presentation of relics.

During the nineteenth and earlier twentieth centuries, sensual text narratives were subsumed by the growing remit of archaeology to first isolate and describe 'facts', followed by interpretation (Hamilton and Barrett, 2018). The use of the 'personal' faded in the wake of a systematization of scientific enquiry. The primary focus on empirical data diverted attention away from exploring the sensory aspects of past societies. This demise of traditions of antiquarian writing and an associated spurning of atmospheric individual styles of archaeological illustration, occurred with the establishing of formal procedures of archaeological

field practice and recording. The beginnings of this stretch back to the late nineteenth-century field and finds-recording methods of Pitt Rivers and are subsequently established in W. M. Flinders Petrie's 1904 book, *Methods and Aims in Archaeology* (Bowden, 1991: 55ff.). The same interest in formalizing recording methods intermittently occurred in early twentieth-century Continental Europe (Pavel, 2010). In the United States, the influence of George Reisner's Harvard excavations at Samaria, Palestine (1908–10), with their detailed recording of archaeological stratigraphy, are credited with leading to the standardized, preprinted site record forms used by Robert Heizer (1949; Pavel, 2011: 262). In the UK, widespread uptake of preset recording procedures occurred with the postwar construction boom of the 1960s and 1970s and the growth of development-led commercial archaeology (Hamilton and Barrett, 2018). In the wake of this, a wealth of preformatted field recording sheets was developed, together with formal excavation and report-writing manuals (Stewart, 2013). Their effect was to exclude sensory observation, responses and embellishments, and the narration of the experiences and the sequence of discovery of the persons involved, from formal fieldwork recording and publication. The erasure of sensory considerations from the practices of modern archaeology remained through the primary phases of culture-historical, then processual archaeology. It was only with the emergence of post-processual/interpretative archaeologies in Western archaeology in the 1970s and 1980s that sensory concerns were revived and afforded new avenues of fieldwork, writing, publication and museum practice.

Modern re-cognizing sense in archaeology

Key concepts, phenomenology and sensory archaeology

Since the mid-twentieth century, the 'experiential' and the archaeology of the senses have been resuscitated as a significant element in the understanding and interpreting of past human endeavours. As a literary genre, the modern excavation report continues to frame what is 'proper'/'professional' evidence, particularly in the context of commercial fieldwork (Bradley, 2006; Hamilton and Barrett, 2018; Nyland, 2019: 348–50). However, the formulae for writing-up excavations and their associated field methodology are being increasingly challenged by new styles of fieldwork, writing and museum presentation (Lucas, 2019). This reorientation runs concurrently with a deep polarization in the intellectual background of Western archaeology that is widely characterized

as a split between, on the one hand, objective, scientific and generalizing traditions of enquiry and, on the other hand, subject-centred, interpretative, particularizing approaches. There is no single trajectory for the ways in which sensory archaeology and heritage practice developed thereafter. As is discussed in the body of this introduction, sensory archaeology and heritage in its widest sense now bridges the processual/interpretive schism.

From the 1990s, a growing number of archaeologists have taken an overt interest in past human understandings of the world as mediated through multiple senses: sight (visual), hearing (auditory), touch (haptic), taste (gustatory), smell (olfactory), vestibular (movement) and proprioception (body position). The senses through which the body receives experiential information have received very extensive individual characterization of their qualities and social and cultural functions (see Classen, 1993; Houston and Taube, 2000). Recently, sensory-focused archaeology and the role of the sensory in heritage presentation have utilized a diverse battery of cross-disciplinary influences and technologies.

The uptake of sensory considerations and research in archaeological fieldwork and heritage-linked interpretative theory runs parallel with/emerged out of the establishment of phenomenological approaches. Phenomenological approaches in archaeology use body-centred experience from the point of view of the subject as the guiding mechanism for understanding ancient landscapes, sites and objects. Holley Moyes (2023: 310) notes that a popular critique of the archaeology of the senses is that it is 'just doing phenomenology under another name'. In fact, the distinctions between the two remain unexpounded by their practitioners. This chapter makes the case that the body-centred aspects of phenomenology are part of an 'archaeology of the senses', while sensory studies in archaeology and heritage are wider and more diverse in intention and methods.

All studies of materiality, temporality and the social use of space incorporate elements of sensory consideration and analysis, irrespective of whether their approach is phenomenological in method. There are three key methodological routes towards interpretation in sensory enquiry. These are:

1. The investigator's embodied experience and body-scale perception and self-reflexivity.
2. The use of tools to map/record and/or later replicate embodied experience.

3. The use of analytical tools/archaeological science to characterize lost or no longer humanly discernible sensory qualities of archaeological artefacts and places.

The first two can be considered as *in situ* (1, above) or direct (2) data gathering, with a greater (1) or lesser (2) degree of simultaneous interpretation. (3) deploys scientific methods to extract data and some would question whether using archaeological science to discern the colour of degraded painted surfaces on pottery, or pollen analysis to establish what flowers were present and thereby the colours and scents of a funerary garland, count as sensory archaeology. I suggest that the answer is flexible and based on how such data is integrated into a wider sensory consideration of the past. Recent currents of sensory archaeology include (Dudley, 2012):

1. A move to considering the full set of senses over a preceding concentration on ocular viewing.
2. An interpretative focus on person-centred interaction in place of the consideration of broad socio-economic classifications and its fixation on presenting chronology, morphology and provenance.
3. A valuing of the role of feeling in interpretation, instead of primary disinterested scrutiny.

Issues of embodied phenomenological practice

Field archaeology facilitates learning, thinking and understanding through the immersion of working in a particular place for an extended period. However, it is recurrently questioned how sensory observations registered by present-day investigators can be projected back to interpreting the experiences of prehistoric life (Brück, 2005). It is a fallacy that an embodied way of working and interpreting is subjective. It is not; it is subject-centred. The extent to which the essential human body, irrespective of time and place, is universal and possesses key unchanging physical sensory parameters is the central issue or concept. For example, what is discerned by an individual as being in front, to the rear and to the side of their body, and how far in maximal conditions a person can hear, see and smell specific things, do have absolute parameters, here referred to as 'sensory affordances' (Hamilton and Whitehouse, 2020: chapter 3; Hamilton, Chapter 6, this volume). Age, physical strengths/disability and gender will impact on the existence, precise deployment and interpretation of these parameters, but there is a tangible range of variability within which these interactions can practically take place. It is the

idea that all bodies and materials have innate sensory affordances (Lash, 2019) that allows us to explore the sensory qualities of the past using our present-day bodies as tools of enquiry. What separates phenomenological embodied fieldwork from other forms of sensory archaeology and heritage is its simultaneous conjunction of sensory experience and interpretation, and the isolation of this as a human embodied-led process (Tilley, 1994; 2008; Tilley and Cameron-Daum, 2017: 6–9). Embodied enquiry is not necessarily or only reliant on the personal experiences and interpretations of one individual; it can be done by and interpreted in teams (Hamilton and Whitehouse, 2020; Hamilton et al., 2006). The in-the-field isolation of repeated patterns of sense-based affordances can be as robustly documented, repeated and assessed by others as in any other form of field archaeology. While Tilley (2008; 2019; Bender et al., 1997: 166) famously eschewed contemporary mapping technologies and formulaic recording methods as getting in the way ‘of the moment’ in interpretive embodied study, his work is repeatable and rigorous. He detailed his methods of walking, moving around and note-taking (see Tilley, 1998; 2016) and it is possible to return to the locales and review/challenge his described experiences (*contra* Fleming, 1999). Similarly, for example, Hamilton and Whitehouse’s (2020) investigations of the social sensory parameters of the communities of the neolithic ditched villages of the Tavoliere Plain, southern Italy, are wholly explicit about their methods and extensively tabulate their results. These forms of sensory documentation and interest in the sensory past are not necessarily an end in themselves. They can be foundational to prompting new avenues of investigation and widened interpretive possibilities in different or related contexts, for instance relating to social organization or the role of natural features in past cosmologies.

At issue is not only the universality of the human body, but the likelihood that past people’s engagement with places happened in very different landscapes, and contexts of cultural, cognitive and sensory understanding, to those of today. In the beginning phenomenological landscape archaeology was primarily interested in vision and the inter-visibility of past sites, monuments and landscape features. Fieldwork was mostly focused on archaeological monuments in present-day open landscapes that at the time of construction were likewise devoid of trees. Tilley (1994) additionally argued that despite any localized changes the most significant skeletal parts of a landscape (notably, the hard geology) would remain unchanged. A present-day on-foot experience of the inter-visibility of sites, monuments and people in a landscape, does not of course exclude taking account of extant pollen data on past vegetation

cover, or the subsequent use of GIS (geographic information systems) to further inform consideration. The possible dissemination and reception distances associated with specific senses can be added as digital map layers to facilitate consideration of multisensory space (Gillings, 2012; Eve and Gillings, 2023). However, there is the sociocultural cognitive issue of what is technically humanly possible, for example to see, hear or smell, versus the de facto cultural filter and actuality of being able to discern and understand details and particular actions. This includes being able to visually recognize specific body movements, and facial and clothing details, and whether intercommunication by a shout or chatting is intelligible, as well as being discernible as a human voice. This has been explored by Hamilton and Whitehouse (2020; see also Hamilton et al., 2006), is discussed further in this volume (Hamilton, Chapter 6) and is developed in Susanna Harris's (2017; 2019) work on the sensory communication aspects of cloth and clothing. Such studies on the parameters of embodied sensory communication are important in placing sensory information within the practices of everyday life and counterpositioning them with the enhanced sensory environments and practices associated with ritual, or the controlled and curtailed sensory affordances of industrial environments.

Writing and 'arting' the senses

The sensory experiences of past people are recognized to be ephemeral, intangible, difficult to measure and problematic to write about. In recent decades two fundamentally different routes have emerged in extracting, analysing and presenting the sensory components of past societies. They have unlike texts. They can be characterized as 'desktop recreation' (texts created from office-based appraisal using existing documented data) versus '*in situ* embodied interpretation' (interpretation and text generation by being on site or in direct contact with past objects and places). Neither can be simplistically described as imagining what the past might have been like. Rather, they both constitute thinking about what the past was like. The 'desktop' route to reviving sensory 'facts' in archaeology and heritage publications uses the recovered archaeology to deduce the past presence and characteristics of the missing sensory components. These revived sensory components are potentially rendered less speculative by using the rationale of building from facts produced by previous fieldwork and subsequent analysis of finds and environmental samples. They thus move towards a possibly authentic but dissociated third person written reconstruction (Methany, 2022).

Desktop, post-fieldwork recreations of the sensory spectrums of past sites, cultural traditions and places have produced innovative writings and perspectives that are exemplified by John Robb's (2007) summation, in *The Early Mediterranean Village*, of the colours of neolithic cuisine, and Robin Skeates's evocation of barking dogs and sense-affective narrative of the experiences of a suggested past day, in *An Archaeology of the Senses: Prehistoric Malta* (Skeates, 2010: 131). Desktop recreations describe and characterize what specific times and past places smelled, looked and sounded like, to offer a 'real' multidimensional reconstruction. At its most developed rendition, this constitutes what Clifford Geertz (1973) described as 'thick description', which moves beyond facts to qualitative considerations of emotion, social relations and contexts that link people to each other and the wider world (Denzin, 1989). These types of texts, at their most detailed, access a nuanced range of sensory descriptors; for example, for taste this involves the sweet, salty, bland, sugary and flavourless being placed within the mosaic and rhythms of sociability (Robb, 2007: 119–59). Augusta McMahon's (2019) sensory work on ancient Mesopotamia highlights the multiplicity of sources that are open to the effective desktop creations and interpretations of past sensory worlds. Her interweaving of the sensory information from archaeological findings, art and material culture, and Babylonian and Assyrian texts, significantly moves beyond description and recreation to co-exploration of visual, aural, haptic and olfactory stimuli of the cultural ideas and memories that the sense-scapes of the ancient Middle East were collectively deployed to activate.

The development of interpretive, self-reflexive field practice from a broad phenomenological perspective has affected or necessitated a different writing modus operandi for practitioners (Hodder, 2003; Kuzmanović, 2023). Phenomenological fieldwork as an in-the-field writing and documenting process involves direct transcription for publication and leans heavily on the interpretative account and the vocabulary of embodiment (Tilley, 1994). This has resulted in publications that include a diversity of writing formats, including diary entries, poetry, narrative text in the first person and boxed text sections (Bender et al., 2007). Alternative modes of visual re-presentation both in the field and for publication are experimented with; *in situ* visual prompts and artistic captures are deployed to highlight or evoke embodied experiences of field archaeology. In part, this can be regarded as a return to ways of seeing and feeling associated with the European Romantic tradition of the eighteenth and early nineteenth centuries. Here paintings and writings presented new attitudes towards the self-experience of the

human body and prioritized the experience of the individual. As already discussed, this was played out in landscape paintings by the creation of an illusion of a personal (the viewer's) horizon with the infinite beyond, and an artistically magnified sense of atmosphere (see above; Edmonds, 2006). Subsequently, in the twenty-first century the idea of representing personal experience was realized in a dramatically different way through conceptual art, where it is an idea, and its 'arting' (process of creation) that is central to the work. The philosophic stance of conceptual art has influenced the process of communicating the experiences generated by working on and interpreting archaeological and heritage sites. This has been realized by diverse artistic renditions in the field, nonrepresentational photography, and on-site installations. Examples of the latter include the wrapping, then painting, of megalithic stones and the raising of brightly coloured flags on key interpreted locales in the landscape, to enrich the expression and understanding of embodied experience (Dann and Jollet, 2018; Tilley et al., 2000). This move to visual re-creation alongside new forms of text highlights that the practice of phenomenology and sensory heritage archaeology looks different in the doing and recording of field practice, as well as being published differently.

Maps and geographical information systems (GIS)

The traditional map form for presenting landscape space uses a 2D restricted dimension. The mass of aerial photographs that became available with the development of aviation in the early twentieth century further enhanced the tradition by revealing archaeological sites in plan views. In common with the depersonalization of text in twentieth-century archaeological writings, map plan views give the sensory perspective of an 'outsider' from an omniscient elevated position. They provide the opposite of the human sense of scale acquired as a participant at a site locale. With the establishment of interpretative archaeology in the mid-twentieth century and the growing use of the percepts of phenomenology in archaeological theory, this disembodied form of representing archaeological space and heritage landscapes attracted critique. Julian Thomas (1993) notably described maps as Cartesian views that separate mind from body. Likewise, on site, traditional topographic mapping, which involves physically traversing land and could therefore be a sensorily embodied process, instead focuses surveyor's attention on the technology of recording.

Sight has long proved to be the easiest sense to consider in landscape archaeology; visibility being easy to map in the field, and

viewsheds (the geographic area that is visible from a location) are the commonest form of sensory presentation generated by GIS (Gillings, 2009; 2012). Christopher Tilley's (1994) *A Phenomenology of Landscape* was a radical rejection of traditional mapping as the primary process of distilling and thinking about visual sensory space. His book is seminal in seeking to understand and spatially consider past sites and their landscape contexts through first-hand embodied sensory or empathetic fieldwork. Philosophically it draws upon the phenomenological treatises of Martin Heidegger (1996) and Maurice Merleau-Ponty (1962) and was developed using studies in the social construction of landscape by small-scale societies. The impact of body motion on acquiring visual perspectives has been central to phenomenological studies in landscape archaeology – for example, the changing viewpoints experienced by people as they approach and enter monuments and walk and manoeuvre between sites and task places (Ingold, 1993; Thomas, 1993; Tilley, 1994; 2008). Here, the self-reflexive person-interpreter is the sensory scale for humanizing and mapping landscape space and for the recognition of spatial patterns.

GIS now provides a major technology for analysing multiple aspects of embodied experience at a landscape's scale, while being removed from directly experienced aspects of the contextual information that it utilizes (Sullivan, 2017). To some, GIS mapping creates a false objectivity in that it is antithetical to the actuality of experiencing an embodied subject-centred space. It lacks finesse in representing the sensory characteristics at the exact 'person-point' or 'body-point' of experience and presents a secondary form of sensory information. Its sensory role is as a very powerful aggregation and layering tool that enables thinking through the melange of sensorial components of specific places. There is value in comparing the results and interpretations of embodied fieldwork with those of GIS within a single project of enquiry. Rather than contradicting one another, these various interpretations allow a nuanced consideration of the complexities of people's idea of cultural identity at a landscape scale (see Garland, 2020, on UK Iron Age *oppida*; Rennell, 2012, on Iron Age sites in the Outer Hebrides).

Beyond vision, mapping 'scapes'

Archaeology lingered behind other disciplines such as architectural planning and musicology, in sensory 'scaping'. A 'scape' is the summary of the geographic scale of the flow and pattern of certain activities and the associated relationships between people and places that they

encompass. The contemporary use of the suffix includes urbanscapes, waterscapes, industrialscapes, ethnoscapes, mediascapes, technoscapes, finance-scapes and ideoscapes. The original use of the 'scape' suffix derives from the emergence of landscape painting in the sixteenth century. In this metier a panoramic depiction of the environment and natural scenery surrounding the viewer/person was used to evoke a visual sense of a place to which the viewer belonged. The modern idea of nonvisual experiential 'scape' was first developed in musicology in the concept of 'soundscape' – the term coined by R. Murray Schafer in the late 1960s in his 'World Soundscape Project'. This project explored ways of documenting sonic 'scapes' and introduced the method of a participatory sound walk to produce written records that capture and map the complexity of selected everyday sonic surroundings (Schafer, 1977). The concepts and methods of sensory 'scaping' are now well-established, and they are used and experimented with by architects and town planners (see Quercia et al., 2015, for work on urban smellscapes). Likewise, Tim Ingold's (1993) use of the term 'taskscape', to refer to the entire ensemble of tasks or actions that a society, community or individual performs at places or moments, has become part of the language of heritage studies. However, it is only recently that the idea of scaping as a practice of archaeological fieldwork and exploring heritage sites, and its developing methodology, has gained momentum (Hamilton et al., 2006; Hamilton and Whitehouse, 2020; Jordan and Mura, Chapter 9).

Archaeoacoustics, that is the study of the auditory properties of archaeological and heritage sites and their associated sound producing activities and artefacts, exemplifies the development of the 'scape' concept (Till, 2020; Scarre and Lawson, 2006). Audioscaping variously brings together the concepts and technologies of anthropology, architecture studies, musicology, physics and more. Context-specific studies of ancient soundscapes range from those inside a cave or tomb or domestic structure, to those of a larger scale that characterize the acoustic qualities of whole settlements, and the sonorous components of archaeological landscapes (Darvill, 2022; Reznikoff and Dauvois, 1988; Waller, 1993). The deployment of digital audio technology in the spatial mapping and characterization of sonic qualities is typical in twenty-first-century sensory studies in archaeology (for rock art see Díaz-Andreu, 2012; Díaz-Andreu et al., 2014; Jiménez et al., 2008). Its equipment is portable and adaptable to field situations; audio electronic signalling outputs reproduce sound types and a receiver processes and decodes the impulse response (Till, 2020). In addition, the psychoacoustic aspects of sound, that is, the way humans perceive and understand sound, can be

technologically accommodated. Qualities that are attributed to a sound, such as whether it is dominant, annoying, dramatic or soothing can be digitally characterized and analysed. This use of digital technology contrasts methodologically with an *in situ* phenomenological experience of a person-generated sound and a personal registering of the sonorous qualities of an ancient monument or place. The latter has a different, body-centred methodology of soundscaping (see above: sound walks and *in situ* assessment of sensory affordances). But I see digital and phenomenological methods as offering complementary data for two-way analysis, however uncomfortable the juxtaposition of these different philosophies of acquiring understanding may be.

Sensory studies of the past often focus on a single sense. Yet, it has become easier to bring the full range of socially experienced senses together in a single study and/or publication. For at least twenty years, paper and online publications have had access, and an increased disciplinary freedom, to deploy new ways of using text, artistic works and digital-generated records (as discussed above). Current experimentation with multimedia field exploration and presentation of sensory data is paralleled in the provision of multisensory visitor experiences in museums and heritage parks. This is a recognition that sensory considerations are a necessary holistic component to studying and presenting the past, rather than an 'optional extra'.

Remaking sense in museums and heritage parks

The demolition of 'museums of sensory absence' quickened in the mid-twentieth century. Most conspicuously the value of 'touch' as an essential means of acquiring knowledge was returned; even the smallest museums set up display areas where visitors are encouraged to touch selected artefacts (Black, 2005: 265). More widely, encouraging people to handle old objects is established as a social therapy tool, and as a cultural communication platform, prompting memories and providing a topic of conversation (Schaepe et al., 2017). Acquiring information through direct experiential encounter has been core to the visitor's sensory experience of open-air museums and so-called living history museums for more than a century, although it was not then articulated as 'sensory heritage' but as concurrently preserving and giving people a sense of past times and lost traditions. The incremental wave of experimentation with ways of presenting a fuller range of the senses in museum and heritage park presentations is now recognized in the term 'sensory

museology' (Howes, 2014). In addition to the educational aim of more fully presenting knowledge in all its forms, the inclusion of sensory elements is used to make archaeological displays and exhibitions more attractive to visitors by providing an affective/memorable experience (Howes et al., 2018). These range from artificially recreated past sounds and smells and actions at one end of the scale to technologically complex digital virtual-reality presentations at the other. There is however a lack of disciplinary discourse between those focusing on presenting sensory knowledge in museums and on-site experiences and those using and theorizing sensory enquiry to document and interpret the past. As is highlighted below, the contexts of presenting sensory knowledge importantly afford research possibilities for exploring how particular sensory impacts may have influenced past cultural and social behaviour.

Walk-through immersive experiences: visitor centres and themed museums

The earliest conception and growing sophistication of a sensory experience being a foremost attraction for visitors to heritage centres can be traced through the various incarnations of the Jorvik Viking Centre, in York, UK. Established in 1984, the centre has a 40-year-old history in the formulation of experiential museum visitor tours. It was created to present the site and findings of the Coppergate excavations, in the centre of the historic city of York, was refurbished in 2001, 2010, and then rebuilt and presented again in 2017. As part of the Jorvik experience, its famous Time Ride takes each visitor group in a small carriage on a 20-minute-long trip back a thousand years, stopping at life-scale 3D dioramas that variously reproduce the sights, sounds and smells of Viking Age York. A commercial company working with the archaeologists has created artificial odours that replicate the smell of smoke and fumes created by the city's metalworkers, the tallow candles used for lighting and the fishy smell of a river quay – to name but a few. Identifying, characterizing, and recreating the specific odours of the pungent past is a chemical research science and making heritage scents for use in heritage visitor attractions has become a thriving business (Bembibre and Strlič, 2017). The Jorvik experience maintains a distanced observer tradition in packaging its sensory experiences and there is no direct physical interaction between the visitor and displays. The life-size scale and movements of today's animatronic characters, which have replaced the attraction's former mannequins, achieve a credible, lifelike experience, but the visitor remains an 'outsider' contained in a raised cart and has

an ‘outsider’, rather than an ‘insider’ perspective. Immersion from an ‘insider’ perspective is key to the role of phenomenological (body-centred) experience in interpreting the past, a role that is foundational to sensory research archaeology as field practice. The Jorvik visitor is taking part in *inactive* phenomenology, a bodily-received sensory experience as an outsider in a sensorily displaced setting. There are repeated statements (here and more widely in heritage visitor attractions) of the attention paid to the detailed accuracy of reconstruction and its basis of known recovered archaeology, to provide and instil a more in-depth understanding to the visitor. This is desirable and educationally valuable. We should, however, be clear that, in a phenomenological disciplinary sense and in its access to a sensory understanding of the past, what is being presented is an ‘imitation experience’. Real and replicated archaeological objects, animations and sensory creations, are deployed to suggest a semblance of their original contexts.

Worldwide, in the twenty-first century, there has been a boom in museums and heritage parks seeking to provide body-centred, multisensory experiences. In these, the visitor encounters original and replica objects, rooms, and three-dimensional (3D: length, breadth and width) spaces as a walk-through experience that engages the entire physical person and is variously sensory-enhanced by artificial smells, noises, air movements and VR (virtual reality). China’s famed museum at Taizhou, Zhejiang inaugurated in 2016 (Wang, 2020), includes a typical ancient fishing village that has been physically moved into the gallery, thereby allowing technology to generate accompanying multi-sense-based visual, olfactory and audio contextualizations, including the sound of waves, the touch of sea breezes and the odour of fish. The UK’s renowned heritage ship museums have likewise created sophisticated walk-through experiences of the vessels’ original physical structure, sometimes in combination with VR reconstructions. These include the SS Great Britain, launched in 1843 as the largest passenger ship in the world, and now turned into a museum in Bristol Docks. Visitors walk through areas and rooms of the actual vessel where they encounter artificially reproduced context-specific smells such as those of the engine oil in the dockyard, bacon being cooked in the galley, and horse manure in the forward hold. A visitor tour of the sixteenth-century warship Mary Rose in Portsmouth Docks incorporates walk-through and 4D (3D + time) VR-generated, sensorily enhanced experiences. The Mary Rose’s conserved structural remains comprise its lower hull, and the full Mary Rose experience is generated technologically: visitors walking through the museum are provided

with backpacks that automatically trigger scent at places and key moments in the evolving Mary Rose story. The culminating 4D VR presentation centres the visitor in a cinematic all-round vision and sound experience that recreates the real-time effect of being on the Mary Rose as she sank. Beyond being highly successful visitor attractions, the array of sensory reconstructions exemplified here have a great potential for a 'research phenomenology'. They offer multi-animated immersion in lost experiences (Goodwin and Lecari, 2023). As such, they will prompt new questions about the past that can be further investigated in other specialist research contexts.

Sensory encounters in open-air museums

Open-air museums have provided a life-sized way of breaking out of the sensory touch/feel gap of the traditional museum display and a lessening of control over access to what is being presented. They belong to a European educational trajectory that goes back into the late nineteenth century and the Skansen museum on the island of Djurgården, Stockholm, Sweden, which, established in 1891, was the model for subsequent European open-air museums. Their inaugural mission was that of heritage preservation, namely, to rescue representative examples of past vernacular architecture. Rescued buildings are brought to these open-air museum parks from all over a country or region, for example the UK's Weald and Downland Museum, West Sussex, established in 1979. Alternatively, some open-air museums are based on the *in situ* musealization of a complete living village, such as the UK's earliest open-air museum, Cregneash Village, Isle of Man (established 1938).

More generally, an increased mechanization of labour in the Western world and beyond during the nineteenth and twentieth centuries crystalized a wish to counteract the loss of the experience (touch, feel, smell and so on) of traditional crafts and ways of agriculture. Some open-air museums combine public access with formal long-term research experiments relating to the practices and experiences of building and using ancient constructions, technologies and farming methods (for example, Butser Ancient Farm, West Sussex, UK). Influenced by these European roots, Japan became an early world leader in establishing open-air museums. World War II and subsequent industrial development in the 1950s and 1960s had decimated much of Japan's mainly wooden architecture, and in response more than 40 outside museum heritage villages were set up throughout Japan. For example, Japan's largest open-air museum, Meiji Mura, exhibits more than 60 transplanted buildings from

across Japan, dating to the Meiji Period (1868–1912) (Meparishvili and Ohara, 2015). Likewise, in the global south, India stands out in widely embracing the open-air museum tradition (Chakravarty, 2010). DakshinaChitra, India's first living history museum, established in 1996, brings together more than 18 reassembled heritage houses to present the architecture, crafts and lifestyle of India's south, from the late eighteenth to mid-twentieth century (Thiagarajan, 2022).

While not the primary role or aim of any open-air museum or heritage site, they are an underused resource for data on the role of specific senses in past cultural behaviours, traditions and technologies. The architectural structures in open-air museums, both original and reconstructed examples, have potential for establishing the sensory permeability or amplification of sounds and smells afforded by the fabric of traditional and prehistoric buildings and considering how this might impact on our archaeological interpretations of their social and functional configurations (Hamilton, Chapter 6, this volume). Within the realm of experimental archaeology, phenomenological perspectives acquired during experimental reconstructions of UK Bronze Age and Iron Age roundhouses, point to how Bronze and Iron Age societies were domestically organized. The fabrication and assembling of each structural component involved haptic and kinetic skills that variously required accessing the workmanship of a sole individual, a family or village group, or experienced crafts people (Townend, 2007).

Being in a moment: living history museums

Many historic houses that are open to the public have artificially sensorily enhanced settings (in National Trust and other heritage houses in the UK, for example). The dominant focus is on the indoor sensory spheres, such as the pseudo experience of the artificially created smells, for example artificial cigar smoke piped into the billiard room at Cragside, Victorian house in Northumberland. In addition to re-sensing their lost sensory past these houses provide a resource for social-historical research on the sensory conditions and resultant perspectives acquired of the differing sensory worlds of a past household's members, for instance related to age, gender and social hierarchy (Naumova, 2015). In contrast, living museums have a more ambitious remit. They take us from such patchy recreations of the sensory elements of the past to a more complete sense of being in the past. They take us full circle from direct experiences of the excavated, ruined, or reconstructed physical remains of the past, considered in earlier sections of this chapter, to 're-presencing' the

largely complete remains of the historic past in a direct experiential moment of present-day time.

Living history museums aim to recreate the settings and the conditions of culture, the environment and period characteristics of places in the past via their preserved architecture and crafts, *and* live costumed interpreter-performers (Magelsson, 2007). The United States has a long tradition of living history museums. This commenced in 1929 with the restoration and opening of the 102-hectare town site of eighteenth-century colonial Williamsburg, Virginia. Living history museums are now widely present in Europe. While compromise in historical accuracy and authenticity may be inevitable for the sake of tourism and entertainment, their overarching aim is to foster understanding and enliven a fuller appreciation of life, in all its senses, in former times (Anderson, 1982). The tasks undertaken, materials used, and the fabric and scope of the structures imbue a sensory richness of sight, sound and smell to the surroundings that the visitor directly encounters. Many of these museums provide hands-on interactive experiences (trying out crafts, eating historically authentic victuals, such as at Beamish, County Durham, UK). The presence of costumed actor-interpreters is central to the perceived reality of the experience. They give information to the visitors and answer questions in the present tense about the historic place and lifestyles that are being presented. This mode of presentation gives the visitor a phenomenological sense of being ‘in the moment’. In addition, living history museums can provide valuable contexts for research-led experiments drawing on the experiences that the actor/interpreters gain via sustained physical interaction with these conserved, re-enlivened pasts. For example, the haptic restrictions that the interpreters experience, in wearing and working dressed in certain types of clothing, are relevant to understanding how past lifestyles and individuals’ roles were constrained by their culturally ascribed attire (Oberg, 2021).

A new sensory archaeology and heritage

We make sense of the world through all our senses. The precise sensory experiences of people in the past will doubtless elude us. However, the ways in which people in the past set up worlds that made sense to them, is made more accessible through an appreciation of the sensory and social impacts of the objects, places and architectures that formed the fabric of their lives.

Tracking multisensory relationships between people and things is complex and messy. One of the challenges of sensory studies is that its discourse and practice still largely remain within disciplinary boundaries. Today, the sensorial is explored, rationalized and deployed in design and daily life to control, mask and enhance the spheres in which people live. Studying the senses is transdisciplinary and the sensorial past has grown to encompass a staggeringly wide field of study. A focus on using the senses as a method of enquiry has the potential to be one common point of cross-disciplinary research. We need to consider not only what sensory work in other disciplines has to offer archaeology and heritage but also what archaeology and heritage have to offer to other disciplines. For example, materials science can be used to measure and explain the physical and chemical properties of the materials that underlie the perceptual and aesthetic characteristics of artefacts. In turn, the study of past artefacts offers a deep-time resource for better understanding the mechanics, roles and parameters of the senses in our human society's making and using of material worlds. An increasingly multi-character, multi-method sensory archaeology and heritage needs to embrace the unavoidable tension between using the universal – thinking about general sensory categories and human sensory affordances – and thinking about the person, things and contexts at a micro scale.

There remains considerable room to build a more cohesive cross-disciplinary body of developed and compared approaches, in terms of methods and theory relating to the sensory. In this chapter I have engaged with defining the fundamental concepts and disciplinary trajectories of archaeology and heritage in incorporating and thinking about the sensory past. Isolating and interpreting period, place, or society-specific forms of the sensory parameters of past human behaviour, is in its infancy. The heuristic and holistic study of the sensory past requires systematic methods of enquiry. The applied methods and theory behind assessing the role of multiple senses on past human activities and organization are rarely made explicit, nor are they generally presented to be open to 'testing'. As Linda Hurcombe (2007) notes, at the most basic, we need to explore the technical language and vocabulary that we use to describe grades and types of sensory experience. A greater consistency of language for characterizing, archiving and sharing sensory data would aid better communication between practitioners. Alongside this, there is still much to be explored in comprehending and presenting the museum object and archaeological sites, and mapping places through multiple sensory modalities.

The requirement for contextual rigour, and an internally consistent logic in the presentation and interpretation of the data of specific sensory pasts, is beyond dispute. Yet methodologically we need to widen what we ask and think about. It is increasingly stated that we must move away from analysis embedded in regional traditions of sensory scholarship if we seek to deepen understandings of past sensory culture. Despite a groundswell of historical scholarship on the senses by Western researchers, there remains a need to disconnect from the Western fixation on the visible form (Howes et al., 2018: 319). The geographic range of the sensory turn beyond the confines of Western discourse is immense in the 2020s, compared to earlier years of the twenty-first century. Hannah Gould et al. (2019) highlight the potential contribution of Japanese sensory anthropology to rethinking and diversifying considerations of sensory culture and cosmologies. In a similar vein, Christian Lange (2022) posits that the multiple sensory discourses embedded in the conventions and traditions of Islam deserve more examination. This includes the roles of taste in mystical experience, and of acoustic devotional phenomena in urban soundscapes. Tim Thomas (2019) highlights the underutilization of Pacific islands' sensory anthropology and related ethnographies. For example, his studies of traditional material culture from New Georgia in the Solomon Islands, Melanesia, elucidate how cultural and sensory perceptions of land and sea facilitate understanding of connections between material culture and its technologies and social structures. In Oceania there is (but not always) a greater continuum between present-day descent populations and an archaeology of the recent past. Thomas (2019) makes the case that this may provide starting points from which we can gain insights relating to the sensory experiences of the deeper past, which is not possible by using the archaeological record alone.

What follows in this book are recent examples of innovative practice in the application of sensory archaeology and heritage, both as a primary tool and in use alongside other methods of field and object-centred investigation. Interdisciplinary data is fundamental to developing the current sensory turn in archaeology and heritage. The increasingly diverse forms of sensory data collection and presentation in archaeology and heritage, which use human performance, installation 'art', film and digital reception and reconstruction, to name but a few tools of analysis, are developed in this book's chapters. Clearly, no one model, theoretical stance, method, regional tradition or language can or should fit all situations.

References

- Anderson, J. (1982) 'Living history: Simulating everyday life in living museums', *American Quarterly*, 34: 290–306.
- Belzoni, G. (1820) *Narrative of the Operations and Recent Discoveries within the Pyramids, Temples, Tombs, and Excavations, in Egypt and Nubia*. London: John Murray.
- Bembibre, C. and Strlič, M. (2017) 'Smell of heritage: A framework for the identification, analysis and archival of historic odours', *Heritage Science*, 5(2): 1–11.
- Bender, B., Hamilton, S. and Tilley, C. (1997) 'Leskernick: Stone worlds; alternative narratives; nested landscapes', *Proceedings of the Prehistoric Society*, 63: 147–78.
- Bender, B., Hamilton, S. and Tilley, C. (2007) *Stone Worlds: Narrative and reflexivity in landscape archaeology*. Walnut Creek, CA: Left Coast Press.
- Black, G. (2005) *The Engaging Museum: Developing museums for visitor involvement*. London: Routledge.
- Bowden, M. (1991) *Pitt Rivers: The life and archaeological works of Lieutenant-General Augustus Henry Lane Fox Pitt Rivers DLC, FRN, FSA*. Cambridge: Cambridge University Press.
- Bradley, R. (2006) 'The excavation report as a literary genre: Traditional practice in Britain', *World Archaeology*, 38(4): 664–71.
- Brück, J. (2005) 'Experiencing the past? The development of a phenomenological archaeology in British prehistory', *Archaeological Dialogues*, 12(1): 45–72.
- Chakravarty, K. (2010) 'The living museum movement in India: From heritage interpretation to heritage action? (In dialogue: India – Berlin)'. In L. Guzy, R. Hatoum and S. Kamel (eds), *From Imperial Museum to Communication Centre? On the new role of museums as mediators between science and non-Western societies*. Würzburg: Königshausen & Neumann, 137–50.
- Classen, C. (1993) *Worlds of Sense: Exploring the senses in history and across cultures*. Abingdon: Routledge.
- Classen, C. (2007) 'Museum manners: The sensory life of the early museum', *Journal of Social History*, 40(4): 895–914.
- Colt Hoare, R. (1812) *The Ancient History of Wiltshire*. London: William Miller.
- Crary, J. (1990) *Techniques of the Observer: On vision and modernity in the nineteenth century*. Cambridge, MA: MIT Press.
- Dann, R. and Jollet, E. (2018) 'Looking for trouble: Archaeology, art and interdisciplinary encounters', *The Senses and Society*, 13(3): 299–316.
- Darvill, T. (2022) 'Mythical rings? Waun Mawn and Stonehenge stage 1', *Antiquity*, 96(390): 1515–29.
- Denzin, N. (1989) *Interpretive Biography*. Newbury Park, CA: Sage.
- Díaz-Andreu, M. (2012) 'A hundred years of Post-Palaeolithic rock art studies in Spain'. In J. Arranz, H. Collado and G. Nash (eds), *The Levantine Question: The development of Spanish rock-art*. Budapest: Archaeolingua, 23–53.
- Díaz-Andreu, M., Benito, C. G. and Lazarich, M. (2014) 'The sound of rock art: The acoustic of the rock art of southern Andalusia (Spain)', *Oxford Journal of Archaeology*, 33(1): 1–18.
- Dudley, S. (2012) *Museum Objects: Experiencing the properties of things*. London: Routledge.
- Edmonds, M. (2006) 'Who said romance was dead?', *Journal of Material Culture*, 11(1–2): 167–88.
- Eve, S. and Gillings, M. (2023) 'More than modal? Exploring affect, affordance, invitation, and solicitation'. In G. Landeschi and E. Betts (eds), *Capturing the Senses: Digital methods for sensory archaeologies*. Cham: Springer, 9–36.
- Fleming, A. (1999) 'Phenomenology and the megaliths of Wales: A dreaming too far?', *Oxford Journal of Archaeology*, 18(2): 119–25.
- Flinders Petrie, W. (1904) *Methods and Aims in Archaeology*. London: Macmillan.
- Garland, N. (2020) 'The origins of British oppida: Understanding transformation in Iron Age practice and society', *Oxford Journal of Archaeology*, 39(1): 107–25.
- Geertz, C. (1973) 'Thick description: Toward an interpretive theory of culture'. In C. Geertz, *The Interpretation of Cultures: Selected essays*. New York: Basic Books, 3–30.
- Gillings, M. (2009) 'Visual affordance, landscape and the megaliths of Alderley', *Oxford Journal of Archaeology*, 28(4): 335–56.
- Gillings, M. (2012) 'Landscape phenomenology, GIS and the role of affordance', *Journal of Archaeological Method Theory*, 19: 601–11.

- Gillings, M. and Pollard, J. (2015) 'General introduction'. In M. Gillings and J. Pollard, *Landscape Archaeology: Critical concepts in archaeology*. Abingdon: Routledge, 1–14.
- Goodwin, G. and Lecari, N. (2023) 'Reconstructing past experience using virtual reality'. In P. Londen, J. Yoshimi and P. Walsh (eds), *Horizons of Phenomenology: Essays on the state of the field and its applications*. Cham: Springer Nature, 325–36.
- Gould, H., Chenhall, R., Kohn, T. and Stevens, C. (2019) 'An interrogation of sensory anthropology of and in Japan', *Anthropological Quarterly*, 92(1): 231–58.
- Hamilton, S. (1996) 'Reassessing archaeological illustrations: Breaking the mould', *Graphic Archaeology* 1996: 20–6.
- Hamilton, S. and Barrett, J. (2018) 'Theory in the field'. In A. Gardner, M. Lake and U. Sommer (eds), *The Oxford Handbook of Archaeological Theory*. Oxford: Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780199567942.013.003>.
- Hamilton, S. and Whitehouse, R. (2020) *Neolithic Spaces*. Volume 1: *Social and sensory landscapes of the first farmers of Italy*. Specialist Studies on Italy. London: Accordia Research Institute, University of London.
- Hamilton, S., Whitehouse, R., Brown, K., Combes, P., Herring, E. and Seager Thomas, M. (2006) 'Phenomenology in practice: Towards a methodology for a "subjective" approach', *European Journal of Archaeology*, 9(1): 31–71.
- Harris, S. (2017) 'From value to desirability: The allure of worldly things', *World Archaeology*, 49(5): 681–99.
- Harris, S. (2019) 'The sensory archaeology of textiles'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 210–32.
- Heidegger, M. (1996) *Being and Time*, trans. by J. Stambaugh. Albany: State University of New York Press.
- Heizer, R. (1949) *A Manual of Archaeological Field Methods*. Millbrae, CA: National Press.
- Hodder, I. (1989) 'Writing archaeology: Site reports in context', *Antiquity*, 63(239): 268–74.
- Hodder, I. (2003) 'Archaeological reflexivity and the "local" voice', *Anthropological Quarterly*, 76(1): 55–69.
- Houston, S. and Taube, K. (2000) 'An archaeology of the senses: Perception and cultural expression in Ancient Mesoamerica', *Cambridge Archaeological Journal*, 10: 261–94.
- Howes, D. (2014) 'Introduction to sensory museology', *The Senses and Society*, 9(3): 259–67.
- Howes, D. (2019) 'Multisensory anthropology', *Annual Review of Anthropology*, 48: 17–28.
- Howes, D., Clarke, E., Macpherson, F., Best, B. and Cox, R. (2018) 'Sensing art and artifacts: Explorations in sensory museology', *The Senses and Society*, 13(3): 317–34.
- Hurcombe, L. (2007) 'A sense of materials and sensory perception in concepts of materiality', *World Archaeology*, 39(4): 532–45.
- Ingold, T. (1993) 'The temporality of the landscape', *World Archaeology*, 25(2): 152–74.
- Jiménez, N., Picó, R. and Redondo, J. (2008) 'The Parpalló Cave: A singular archaeological acoustic site', *Journal of the Acoustical Society of America*, 123(5): 3608.
- Kuzmanović, Z. (2023) 'Self-reflexive turn to ontological debates in archaeology'. In S. Babić and M. Milosavljević (eds), *Archaeological Theory at the Edge(s)*. Belgrade: Faculty of Philosophy, University of Belgrade, 55–71.
- Lange, C. (2022) 'Introduction: The sensory history of the Islamic world', *The Senses and Society*, 17(1): 1–7.
- Lash, R. (2019) 'Movement, materials and intersubjectivity: Insights from Western Ireland'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 130–48.
- Lucas, G. (2019) *Writing the Past: Knowledge and literary production in archaeology*. Abingdon: Routledge.
- Magelsson, S. (2007) *Living History Museums: Undoing history through performance*. Lanham, MD: Scarecrow Press.
- McMahon, A. (2019) 'The sensory world of Mesopotamia'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 396–412.
- Meparishvili, N. and Ohara, K. (2015) 'Open air museums in Japan: Gaze from Europe'. In *Open Air Museums 2015 International Yearbook*. Old Village, Sirogojno, Serbia: Open Air Museum, 129–39. Accessed 4 January 2025. https://www.researchgate.net/publication/354683735_OPEN_AIR_MUSEUMS_IN_JAPAN_-_GAZE_FROM_EUROPE.
- Merleau-Ponty, M. (1962) *Phenomenology of Perception*, edited by Donald A. Landes. New York: Routledge.

- Methany, K. (2022) 'Connecting archaeological practice with the senses and past bodily experience: Introduction to sensory engagement in historical archaeology', *Historical Archaeology*, 56(3): 1–12.
- Moyes, H. (2023) 'The life and afterlife of phenomenology in archaeological theory and practice'. In J. Yoshimi, P. Walsh and P. Londen (eds), *Horizons of Phenomenology: Essays on the state of the field and its applications*. Cham: Springer, 307–24.
- Naumova, A. (2015) 'Touching the past: Investigating lived experiences of heritage in living history museums', *International Journal of the Inclusive Museum*, 7(3–4): 1–8.
- Needham, S., Lawson, A. J. and Woodward, A. (2010) "'A noble group of barrows": Bush Barrow and the Normanton Down Early Bronze Age cemetery two centuries on', *The Antiquaries Journal*, 90: 1–39.
- Noordegraaf, J. (2004) *Strategies of Display: Museum presentation in nineteenth- and twentieth-century visual culture*. Rotterdam: NAI Publishers/Museum Boijmans Van Beuningen.
- Nyland, A. (2019) 'Sensory archaeology in Scandinavia and Finland'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 338–53.
- Oberg, C. (2021) 'A Phenomenological Study of Costumed Interpreters and the Wearing of Period Clothing at Living History Museums'. PhD thesis, University of Minnesota: University Digital Conservancy.
- Pavel, C. (2010) *Describing and Interpreting the Past: European and American approaches to the written record of the excavation*. Bucharest: University of Bucharest Press.
- Pavel, C. (2011) 'Recording the excavations in Troy: 1855–2010', *Studia Troica*, 19: 255–83.
- Poulet, G. (1969) 'Phenomenology of reading', *New Literary History*, 1(1): 53–68.
- Quercia, D., Schifanella, R., Aiello, L. and McLean, K. (2015) 'Smelly maps: The digital life of urban smellscape', *Proceedings of the International AAAI Conference on Web and Social Media*, 9(1): 327–33.
- Rennell, R. (2012) 'Landscape, experience and GIS: Exploring the potential for methodological dialogue', *Journal of Archaeological Method and Theory*, 19(4): 510–25.
- Reznikoff, I. and Dauvois, M. (1988) 'La dimension sonore des grottes ornées', *Bulletin de la Société Préhistorique Française*, 85(8): 238–46.
- Robb, J. (2007) *The Early Mediterranean Village: Agency, material culture, and social change in Neolithic Italy*. Cambridge: Cambridge University Press.
- Scarre, C. and Lawson, G. (eds) (2006) *Archaeoacoustics*. Cambridge: McDonald Institute for Archaeological Research.
- Schaepe, D., Angelbeck, B., Snook, D. and Welch, J. (2017) 'Archaeology as therapy: Connecting belongings, knowledge, time, place, and well-being', *Current Anthropology*, 4: 502–33.
- Schafer, R. M. (1977) *The Tuning of the World: Toward a theory of soundscape design*. Philadelphia: University of Pennsylvania Press.
- Skeates, R. (2010) *An Archaeology of the Senses: Prehistoric Malta*. Oxford: Oxford University Press.
- Stewart, G. (2013) *Archaeological Recording Practices: Guidelines for archaeological excavation and recording techniques*. Hexham: Northumberland National Park.
- Stukeley, W. (1743) *Abury, a Temple of the British Druids, with Some Others Described*. London: W. Innys, R. Manby, B. Dod, J. Brindley.
- Sullivan, E. (2017) 'Seeking a better view: Using 3D to investigate visibility in historic landscapes', *Journal of Archaeological Method and Theory*, 24(4): 1227–55.
- Thiagarajan, D. (2022) 'Chennai's DakshinaChitra Museum: Managing heritage as a lived experience – a personal journey of discovery', *Journal of Heritage Management*, 7(1): 83–98. Accessed 9 August 2024. <https://doi.org/10.1177/24559296221083389>.
- Thomas, J. (1993) 'The politics of vision and the archaeologies of landscape'. In B. Bender (ed.), *Landscape: Politics and perspectives*. London: Routledge, 19–48.
- Thomas, T. (2019) 'Sensory archaeology in the Pacific'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 539–55.
- Till, R. (2020) 'Sound archaeology and the soundscape'. In G. Kolltveit and R. Rainio (eds), *The Archaeology of Sound, Acoustics and Music: Studies in honour of Cajsa S. Lund*. Berlin: Ekho Verlag, 31–54.
- Tilley, C. (1994) *A Phenomenology of Landscape: Places, paths and monuments*. Oxford: Berg.
- Tilley, C. (1998) 'Rocks as resources: Landscapes and power', *Cornish Archaeology*, 34: 1–53.
- Tilley, C. (2008) *Body and Image*. Walnut Creek, CA: Left Coast Press.

- Tilley, C. (2016) 'Phenomenological approaches to landscape archaeology'. In D. Bruno and J. Thomas (eds), *Handbook of Landscape Archaeology*. Walnut Creek, CA: Left Coast Press, 271–6.
- Tilley, C. (2019) 'How does it feel? Phenomenology, excavation, and sensory experience: Notes for a new ethnographic field practice'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 76–93.
- Tilley, C. and Cameron-Daum, K. (2017) *An Anthropology of Landscape*. London: UCL Press.
- Tilley, C., Hamilton, S. and Bender, B. (2000) 'Art and the re-presentation of the past', *Journal of the Royal Anthropological Institute*, 6(1): 35–62.
- Townend, S. (2007) 'What have reconstructed Iron Age houses ever done for us?', *Proceedings of the Prehistoric Society*, 73: 97–111.
- Urwin, C. (2021) 'Archaeology: Western science or global practice', *Current World Archaeology*, 107: 40–5.
- Waller, S. (1993) 'Sound reflection as an explanation for the content and context of rock art', *Rock Art Research*, 10: 91–101.
- Wang, S. (2020) 'Museum as a sensory space: A discussion of communication effect of multi-senses in Taizhou Museum', *Sustainability* 12(7): 3061. Accessed 4 January 2025. <https://doi.org/10.3390/su12073061>.

Part I

Individual and self-registered sensing research

2

Sensing the void: exploring fragmentation through the senses at Rocky Point Amusement Park, Rhode Island, USA

Sarah Bell

In a volume dedicated to methodological approaches to sensory archaeology, it seems unnecessary to begin this chapter arguing for the existence of senses outside of the five that Aristotle originally identified in *De Anima*. The field of sensory archaeology has moved well past the critical observation that the affordances of the human body, and of the material world, allow for collisions, confrontations and points of meeting between the individual body and the environment surrounding it, that far surpass experiences of sight, smell, taste, touch and hearing. In fact, many would acknowledge that we have yet to reach the limit of our understanding of the ways in which the human body can interact with the world around it. Rather than questioning the limits of sensation itself, however, this volume concerns itself with a far more practical and pertinent question: is it possible to transform the qualitative experience of sensation into quantitative archaeological data? If so, what are the methodologies by which this can be accomplished? How do responses to sensation become materialized, and how can we quantify them? If we consider that archaeological assemblages are produced through human agency, then the question becomes clearer: how and in what ways can sensation produce a purposeful will to act in the human body (one powerful enough to manifest itself in the material record in such a way that we can connect this tangible material output directly to the ephemeral and intangible catalysts that we call the senses)?

This chapter proposes that, while new methodologies for addressing these questions exist – some brilliant examples of which are presented in this volume – an archaeology of the senses does not always require that we

do things differently, in terms of how we structure projects or collect data. Rather, it requires that we *think* differently, both about the ways in which elements of the material record might be produced as active responses to sensation, and about what we are willing to accept as valid points of data, forms of enquiry and methods of interpretation. This may involve the creation or application of new theoretical frameworks, and/or it may, as Sue Hamilton suggests in [Chapter 1](#) of this volume, require us not just to accept, but to actively find value in data that appears, initially, ambiguous, merely because it is subject-centred or based on previously discounted ways of knowing. Most importantly, thinking differently may ask us to draw on our own experience of being human and alive in the world as it exists in the present moment, and to believe in the validity and interpretive power of those experiences. In other words, an archaeology of the senses may also require us to *be* different as scholars. Rather than accepting the academic demand that we alienate ourselves from the subject of our study – an alienation which Buchli and Lucas have identified as traditionally lying at the heart of archaeological method – we can embrace the idea that innovative scholarship can and, on occasion, *should* result from the confrontation between academically rigorous research and our own sensorial capacities, lived experiences and humanity (Buchli and Lucas, 2001: 10).

The case study that forms the basis of this chapter is the result of just such a confrontation. Living through the era of the COVID-19 pandemic has meant witnessing a collision between the academic mindset and the absolute reality of human experience. The project detailed here was conceived of, designed and carried out as a response to that collision, as a way of witnessing, finding insight and seeking healing in understanding and acknowledging the sensorial cost of this unprecedented global trauma. As an archaeologist who works in prehistoric contexts, confronting material that must be interpreted without the benefit of textual records or ethnographic evidence is familiar ground. Never before, however, had I found myself required to confront the archaeology of the contemporary world in quite the same way – completely outside the realm of discourse, in the midst of a profound silence. I was faced with a very real problem: how do you study a material phenomenon, occurring in real time, in a situation in which you, yourself, are implicated, where you cannot ethically do ethnographic research, and where the trauma at the root of your observations is too new and raw to have solidified into any relevant text?

The methodology for this project was crafted as a response to this dilemma. The result was an in-depth archaeological survey, which

utilized my own personal sensory responses and experiences in the form of autoethnography, both as a basis for the formation of a new theoretical framework and as a means of understanding how sensation might be translated into objective material data. My own experience of the pandemic was the inspiration for the project, the springboard for the theory, and – transparently – the lens through which I viewed the data that the survey produced. The validity of this approach depends entirely on what you are trying to achieve. My goal was an archaeology of healing – an archaeology of understanding – an archaeology that sought to comprehend the incredible sensorial impact of a global pandemic on the human body, and the material and emotional responses that impact provoked, even while these responses remained cloaked in silence. I believe that I succeeded in achieving these goals, despite the fact that, in different circumstances, the project might have been approached in more traditional ways. To begin with the assumption that it was possible, during a global catastrophe, to achieve the level of alienation from the subject at hand that archaeologists and anthropologists habitually try to achieve would have compromised the results at the outset. Instead, I chose to accept both the inherently subject-centred nature of the data and the exploded gap between myself, as an archaeologist, and the material and context under study, as a critical component of the project.

It is an objective fact that, during the pandemic, many of us became deeply acquainted with the reality of radical shifts in the way that our bodies interacted with the world. Masks affected our awareness of the previously (to most) unconscious process of breathing and changed our ability to visually assess the emotions of others. Plastic gloves, face shields and other means of protection created barriers between us and our normal sensorial interactions with people and with places and with things. The inspiration for this project arose from the fact that, at the same time that we were all experiencing these shifts in our sensory perceptions, we were also experiencing what was essentially a sensorial contradiction. The reality of an invisible virus was being made materially visible through the *absence* of material things. It looked back at us from empty shelves at the grocery store and from empty bank accounts. We felt it in empty offices and empty streets. For most of us, the pandemic did not manifest itself through new material presences in the form of ventilators, ambulance stretchers or portable morgues outside of hospitals – although the material record of our own contemporary moment has been manifestly impacted by these and other material presences. Instead, it looked – it *felt* – like Times Square empty on a Saturday night: unsettled. Uncanny. Sensorially wrong.

The suggestion that an awareness of absence – and thus, conversely, of presence – should be considered as one among the almost infinite number of senses with which we are endowed, is a notion that grew directly from a scholarly engagement with this globally shared and yet also deeply personal human experience. Missing friends, empty shelves, empty streets ... we *felt* these things profoundly. Not only did we feel them, the awareness of absence that these sensations triggered created within us a need to act – a need to do something to redress the absence – and these actions, in many instances, had an impact on the material world. Existing – *being* – sensing as a human being *and* as a scholar during a pandemic, therefore, led to the realization that, paradoxically, it is sometimes in the accumulation of material presences that a sensorial awareness of absence can be archaeologically located.

Taking the remains of the abandoned Rocky Point Amusement Park in Warwick, Rhode Island, as a case study, I explored this hypothesis by documenting the ways in which the material environment of the fragmented site is continually being altered by visitors, through wilful acts of presencing such as mark-making and graffiti. These physical manifestations of ephemeral responses to things that are no longer there, recorded through survey, formed the quantitative data set for an archaeological study of human sensation – in this instance, the sensation of absence. In the following pages, a short history of the park will be given, followed by a brief explanation of the initial question, the theoretical framework that this question inspired, and that framework's impact on the methodological approach. The chapter will conclude with a summary of the results and a critical assessment of the methodology.

Rocky Point: a brief history

Rocky Point Amusement Park was first established as a scenic destination in the 1840s. Over the following century and a half, with the addition of a restaurant, bathing pavilion and, eventually, carousels, rollercoasters and amusement stalls, it became one of the most popular entertainment destinations in New England (Bettencourt and Chauvin, 2009). In 1996, however, struggling with financial losses, Rocky Point closed its gates for the last time (Merrick, n.d.). After its closure, residents of Warwick mourned, as many of the rollercoasters and rides were sold to other amusement venues across the country, and then they watched for over twenty years as the rest of the abandoned park sat on its bit of beautiful shoreline, slowly collapsing into itself. Repeated efforts to raise funds to

reopen the park failed and eventually the property was purchased by the State of Rhode Island. The remaining structures on the site were largely demolished (Loviglio, 1997).

In 2014, with much fanfare, Rocky Point was reopened to the public, this time as a passive-use State Park (Rocky Point Foundation, n.d.). Here and there, however, spread throughout the 120-acre landscape, remnants from the area's storied past were left in place, continuing to crumble into dust – their presence serving as a reminder of a vibrant past now gone eerily silent. The huge metal supports of the Skyliner gondola and the Circle Swings, the steps that led up to the haunted house, a large stone water tower, one of the 11 arches from the World's Fair held in 1964, a series of natural caves once incorporated into an attraction, and the railroad tracks from the old park train, all remain on the site, most rusted and decaying. Some of these fragmentary elements were marked by signage that explained something about what had once stood in that spot, but many others were left with no explanation at all – broken remnants in a strange and uncanny landscape (Figure 2.1). Until 2020, Rocky Point was a popular place to have a picnic or take a hike while communing with these ghosts of times gone by. In the spring of that year, however, by mandate of the State, the park was closed to visitors in response to the global COVID-19 pandemic (City of Warwick, 2020). During the time that the research for this study was conducted, self-isolation mandates were still in place. Social gathering of any kind was forbidden. Rocky Point Park remained closed – but material markers of human presence still continued to accumulate.

Asking the question: creating a theoretical framework for a sensorial archaeology of absence

Every project begins with a question, and the question that inspired the Rocky Point Park project originated from the experience I had the first time that I visited the park – an experience that I recorded as a form of narrative autoethnography, as follows:¹

When I left the house on a rainy day near the end of March 2020, climbed into my car and just started driving, my actions were entirely driven by a need to process the emotions that I was experiencing – not only as an archaeologist and an academic, but as a partner, as a mother, and, on a more basic level, a human being suddenly thrust into an unfamiliar landscape. My world, like



Figure 2.1 The Skyliner gondola supports and graffiti at Rocky Point Park, 2020. *Source:* author.

everyone else's, was upside down, and I felt a pressing need to do something – anything – that could help me regain some sense of emotional balance. That is how I first found Rocky Point – driving aimlessly down empty streets on a rainy day in the middle of a pandemic. The public parks were not yet barricaded, though they shortly would be, and so I drove past the sign at the entrance and up a cracked and rutted road flanked by trees still missing their leaves. I parked my car in a gravel parking lot, put the hood up on my raincoat and opened my car door. Stepping out into the drizzle, I stepped out into another world.

Rocky Point is surrounded on three sides by the sea which, at high tide, threatens to pour in and erase what remains of the amusement park that sat here for over a century and a half.

'What remains' is a graveyard of broken bones. From where I stood, I looked out across a plain of lush green grass, through mist that rose from the damp ground in spirals, and into the past. Here and there, in odd places, the well-tended landscape of the park sprouted rusted metal spires that reached into the sky, still coated in layers of cracked and peeling paint. On a slight rise of ground to my left stood the remains of a stone tower, sporting a rainbow-hued proliferation of graffiti. Here and there, stairways led up out of sight and into nothingness. It was an uncanny and a haunted landscape, full of fragments that hinted at untold stories. I stood in the rain, the smell of the sea filling my nostrils, the sound of the raindrops pattering on my hood echoing in my ears, and I felt something – something that I had been sensing in the upside-down world around me for weeks without being able to give it a name. I felt the spectral presence of all of the things and all of the people that had once been there in that space, in the same way that I had felt all of the things and all of the people that had, until recently, been a part of my life. I felt it through their absence.

Are our bodies capable of sensing absence? That was the question that arose from my first experience at Rocky Point. Answering it required understanding its possibilities from a theoretical point of view, which, in turn, required breaking the original question into a hundred other questions: What is absence? How do we define it? What is its relationship to time, and how do we understand its position in space? What role does it play in the way we experience fragmentation, and how does that experience differ from the way we perceive wholeness? If this is, indeed, a sensory capacity, are there places where material reactions to these sensations can be found? What form might they take, and why? All of these unknowns begged to be explored through the wide range of interdisciplinary theoretical literature available on the topics of fragmentation, absence, the power of material traces and the sensorial impact of decay (Armstrong, 2010; Buchli, 2010; Chapman, 2016; Dawdy, 2016; Edensor, 2007; Hamilakis, 2010; McAtackney, 2014; Navaro-Yashin, 2009; Olsen and Pétursdóttir, 2014). The result of this exploration was a theoretical approach that addressed the majority of my questions and, more importantly, provided me with a working hypothesis – a theory about how a sensorial awareness of absence might be materially manifested at the park, and how I might be able to quantify the material impact of this sensation, archaeologically.

Theoretically, it is necessary to begin by pushing back against the idea of absence and presence as two mutually exclusive states. Western philosophy habitually uses manufactured dichotomies like these as a way of making things easier to categorize and digest – so much so that we tend to accept them without question (Harris and Cipolla, 2017: 5). These dualities can only ever be approximations of how things and people actually exist in the world, however. The reality is that an infinite range of subtleties exist between any two related extremes. Between freezing and boiling, for example, are many points that cannot be defined as either pole, but that, critically, gain their meaning through their relative proximity to both. The material world is made up of ‘things’ that exist on a spectrum in just this way – the endpoints being wholeness and presence on the one hand, and disintegration and absence on the other – and the inherent instability of the material world ensures that this position is never fixed, but is, instead, constantly in flux (Buchli, 2010: 187).

The unstable space stretching between presence and absence is the realm of fragments such as the ones that sprinkle the landscape of Rocky Point. Here, in this liminal ‘backroom’, decaying objects have the ability to act as signs or symbols of the initial whole that once contained them (Stephen, 2022). Their status as fragments is, in fact, defined by the absence of the wholeness that they have come to represent – a wholeness that can be apprehended, despite its nonexistence, through the symbolic capacities of the fragments that remain (Buchli, 2010). The power of fragments is that they alert our bodies to the fact that there was once something beyond what currently meets the eye – a part of the story that is not visibly perceivable, but is, at the same time, manifestly still *there* – still present in its absence.

The liminal space between absence and presence is a space of temporal, as well as material, splintering. Fragments openly defy the idea that time is linear and sequenced, because things left behind belong, simultaneously, to their own temporal moment and to our own (Gonzalez-Ruibal, 2016: 147, 159; Kindynis, 2019: 32). They inhabit a space that is both here and gone – both past and present – at the same time. The realm of the fragment is, therefore, an unstable one on multiple planes, and because of the copresence of all of these seemingly contradictory aspects, the fragment is a space of rupture that carries with it an uncanny aura – a hauntedness that originates from the fact that it cannot be assimilated into any one category. It is this quality of monstrosity – perhaps even of blasphemy – arising from the crossing of boundaries and the penetration of interstitial spaces, which not only allows for, but openly provokes affective responses through the senses

(Buchli and Lucas, 2001: 12–13; Cohen, 1996). Robert Kirkbride notes a similar quality of liminality or uncanniness that can be felt in abandoned asylums – one which he associates with a feeling of contagion – a ‘miasma’ that is signalled through the scent associated with decay and fragmentation (see [Chapter 8](#), this volume).

While it is possible that the ability to provoke these feelings exists, as an objective and fundamental characteristic of the decayed and the fragmented, it is a capacity that can only be perceived within a subject-centred context – through the medium of the encounter between the fragment and a sensorially-enabled witness. It can only be proven to exist within this space, and so we can only study it through subject-centred research. In Kirkbride’s case study, he was able to access and understand these sensations by recording the impressions of urban explorers who had experienced them. In the case of Rocky Point, the only accessible witness was myself, and as I stood in the falling rain at Rocky Point Park, staring up at the peeling metal support of what was once the Skyliner gondola, I found that I was not just standing in the middle of a wet, muddy field. I was standing in the liminal space that stretches between times and between states of being. The sense of uncanniness – of hauntedness – was palpable, but it was a thing produced, relationally, between the liminal nature of the fragments and myself, transmitted through the medium of our confrontation. It was dependent on both the ability of the fragments I was encountering to actively function as a sign or symbol of the absent wholes that they represented and my own ability and willingness to interact sensorially with the environment in which I found myself (Bell, 1997: 831; Navaro-Yashin, 2009: 14). Each of us, the fragments and myself, brought things to this encounter – agency, materiality, memory, emotion, sensation – and in that moment of confrontation, the multinodal webs of experience, belonging to each of us independently, became entangled, creating what Yannis Hamilakis has called a sensorial assemblage – an intricate mesh of sensorial factors, rich and affective, but also completely unique to this individual moment of interaction (Hamilakis, 2017). Through our encounter, the virtual affectiveness of the fragments – their innate potential to provoke the uncanny – was actualized (see Graham, [Chapter 4](#)).

Encountering these fragments had significance for me, as an individual, in a particularly fraught historical moment when an awareness of isolation and absence was very much a part of my experiential web. After theoretically unpacking the questions that had been provoked by our confrontation, I found that my personal reactions to the broken landscape of the park were, in a way, predictable. In the presence

of these fragments, I was sensorially triggered into an awareness of the absence of the wholeness they represented and of the temporal distance that stretched between the moment I physically inhabited and the moment in which that wholeness had existed as a reality in the now-gone amusement park. There was a shadow-world of bright sound and vibrant colour all around me – a memory, once contained within these fragments, that was leaching into the landscape as they decayed – a world beyond the reach of vision and hearing and yet still, somehow, perceptibly there. This was my sensory experience. But how could I know if this was an experience shared by others?

When I entered Rocky Point Park for the first time, I was completely alone – acres of manicured lawns stretched out in front of me, entirely empty of human presence. But as I was sensorially pulled from fragment to fragment across the park, something became immediately clear. I was not the first person to have made this journey, or to have been drawn into an encounter with each of these traces, potentially by the affective pull of their incompleteness. Each had become, not only an epicentre of sensorial entanglement, but a magnet for an ever-expanding halo of material that spread out around each of them. Despite the fact that I was alone, I was surrounded, not only by the ghosts of the once-whole elements of the park, but by the ghosts of now-absent people who had visited these fragments before me, leaving material memories of their presence behind. The atmosphere of isolation imposed by pandemic restrictions against social gatherings made the significance of this even more poignantly clear. Standing in front of the metal support of the Circle Swings ([Figure 2.3 \(A2\)](#)), my eyes swept over this evidence of human presence in a park – and a world – that was currently empty of it. My fingers reached out to touch a set of initials and a date that had been scratched into the surface of the support, only the day before. The bubble-shaped letters and the care with which the marks had been made evoked an individual and unique personhood – and for a moment, that person stood next to me, absent but, like the amusement park itself, not entirely gone. Together, we watched the missing circle swings twirl overhead, listened to the shouts and whistles and the noise of an invisible crowd, smelled popcorn and cinnamon twists, and felt the absolute aliveness and reality of the absent park – still very much there, in these fragments, despite the fact that it was no longer fully here.

The experience I recount may have been an entirely subject-centred one, but the proliferation of material traces that appeared throughout the park was not. Here, before me, was a possible means of quantifying the sensorial pull of the fragmentary elements of Rocky

Point, even without access to words, either written or spoken, which described the experiences of other visitors. Was it possible that what I was seeing – a proliferation of graffiti and discarded objects surrounding every fragmented element of the park – was a material response to things that could objectively, through the power of group consensus, be considered sensorial catalysts? Was it possible that the awareness of incompleteness, evoked through the symbolic power of the fragments, was strong enough to provoke not just an individual, but a communal material response, and to make a sensorial demand that these now-apparent emptinesses be materially filled – that these absences be *presenced* through material acts?

There are many examples of material markers of presence, like these, appearing in association with absences of many kinds. There is a ritual aspect to this tendency to fill spaces of both physical and emotional absence with material presence, and it is one that many of us witnessed and even participated in first-hand during the pandemic as we watched ourselves, our loved ones and the others in our communities, respond to the imbalances created by virus-related losses. Hoarding was a clear manifestation of this behaviour. Many of us had moments where we sought to control sudden and unexpected absences through the obsessive collection of other things that we were afraid of losing – staple goods, medications and cleaning supplies are only a few examples. Overindulgence was another attempt at presencing that was common. In response to feelings of emptiness we drank more alcohol or ate more chocolate. These were behaviours intended to soothe us, to restore our balance and our sense of control. The factors that encouraged these behaviours were immaterial, and few, if any, of us consciously solidified our compulsion to perform these rites into an acknowledged and canonized dogma. Despite this, and despite their immaterial origins, these compulsions manifested themselves in material ways: a bigger collection of liquor bottles in our recycling bins, for example, or closets filled with hundreds of rolls of toilet paper.

Outside of those associated with the pandemic, perhaps the most pertinent and poignant example of ritualistic material responses to absence are the spontaneous memorials that spring up at sites of death and tragedy (Doss, 2006). These memorials emerge immediately at the moment of loss and stay in place throughout the period of mourning – perhaps even long afterwards – marking the transitional state between the everyday presence of the beloved and their not-yet-tolerable absence. They are performing a function, materially manifesting the absent body until it is psychologically possible for it to be accepted as no longer

there. Importantly, they expand the awareness of absence to a larger public audience. They are often not just individual acts, but communal responses to tragedy – a communal negation of the fact that death, the ultimate absence, is inevitable – a communal protest against the unstable nature of the material body and its inevitable march towards decay (MacConville and McQuillan, 2010: 195). It is of critical importance that visitors to memorials such as these rarely come empty handed. They come with teddy bears, flowers, cards and signs. These material presences soften an absence that is perceived as unbearable (Bleyen, 2010: 81). They ease the imbalance left by material loss (Maddrell, 2013). The process of presenting these absences through the accumulation of material tokens brings comfort both to those most closely connected with the departed and to the wider community – a material ripple effect of shared experience that is also a visible recognition of absence as a sensorial vacuum that needs to be materially redressed (Diamond, 2012).

The growing assemblages at Rocky Point mirrored those that are found at spontaneous memorials and other spaces of absence. Here, as at roadside shrines, repeated episodes of visitation and material response represented multiple embedded attestations of significance – of objective meaningfulness (Armstrong, 2010: 245). They also represented an exponential widening of the liminal power of the ruinous remnants of the park. Every added material element represented an additional absent presence – the absent presence of the agent who had left that material trace behind. Those interacting with the fragments were, therefore, also engaging with a community – an immaterial community, but a community all the same – that had come to a consensus about the significance of the place of encounter to which these material extensions have become attached (Hamilakis, 2021: 244; Bleyen, 2010: 70). Most importantly, this was a community that was actively leaving behind quantifiable material data – data that might be able to communicate some of the information that I couldn't, ethically, collect through ethnographic work. A theoretical enquiry, prompted by a question asked in response to my own autoethnography, thus yielded a theory about how one might measure the objective communal impact of very individual sensorial experiences of fragmentation, absence and loss – through the attempts that were being made to address these sensations materially. Having identified what constituted the 'data' in this case study, the next step was to collect that data through survey.

A community of ghosts: surveying a sensorial awareness of absence

In the heart of the pandemic, in the spring of 2020, a girl named Sarah got into an argument with a friend. Struggling to process her emotions, the friend recorded her feelings about the argument, and about losing Sarah, on a plate, took that plate to a cave near the ruined upper gondola station at Rocky Point ... and smashed it (Figure 2.3 (A14)). One can assume that the process of giving those feelings of loss a physical form and then releasing them, through the ritual fragmentation of the object that had been made to embody them, was cathartic and healing (Figure 2.2). I found that plate on my second visit to Rocky Point – picking up the piece inscribed with a name that was the same as my own and holding that uncanny icon of absence in my hand. Like clung to like in that space – the fragmented site, the fragmented relationship, the fragmented plate, left among the other objects spread out like a halo around the decayed station in a completely empty park – all of these



Figure 2.2 Objects surrounding the structural fragments at Rocky Point Park, 2020. *Source:* author.

things belonged to each other. They were ritual relics that broke the spell of the once here, now gone – the spell of loss – and claimed power over it. The discovery of the plate was significant, not only for its symbolic power, but because it allowed me to visualize another phenomenon connected with these material traces that had a significant impact on how my survey methodology needed to be structured. Over the weeks that followed, the broken pieces of that plate began to move. Not just from place to place, but from fragment to fragment in the park.

Not all of the material traces left in association with the decaying elements of the park at Rocky Point take such a symbolic and meaningful form, but almost all of them – shoes, beer bottles and fragmented objects of innumerable kinds – are moving in the same way (Figure 2.2). The assemblages associated with each fragment change daily. The question of why this is so is an intriguing one, and one which seems to indicate that progression and procession are key aspects in the ritual deposition of material at the park. Sadly, this is a question which cannot be fully engaged with in this paper, though clues to the significance of this trend arose in the collected data discussed below. As I was, by necessity, conducting this research alone, the size and the continually changing nature of the assemblages quickly became an impediment to progress. What could not move, and was therefore easier to accurately record, were the traces inextricably affixed to the fragments themselves. These included several forms of mark-making – spray painted graffiti, names and dates either scratched into the fragments or written in permanent marker, stencilled images and stickers (Figure 2.1). The survey focused on these immovable traces.

A fairly standard survey methodology was followed when studying these markings. A series of relevant datapoints were identified – location of the mark, date (if given), content of the markings and repetitions of the same mark – and then this data was collected across the entirety of the park. Standing structures – both the fragmentary remains of the old amusement park and the structures associated with the new state park – natural elements like boulders and trees, roads, paths and signage were all carefully studied. Concentrations of marks were given a rank ranging between one and six, with one representing only a single marking and six representing 50–100 markings within the same area. This data was then imported into a layered map which allowed for the location and concentration of graffiti to be visualized in relation to the various park elements, both old and new. The ultimate goal of this mapping process was to determine which areas at Rocky Point were being recognized by the mark-making community as objectively

significant, and if these areas coincided with the fragmentary remains still standing in the park.

The results of this survey take very little time to report and can be visualized clearly in [Figures 2.3a](#) and [2.3b](#). [Figure 2.3a](#) represents the locations of standing structures and other architectural fragments in the park. The elements shown in dark grey represent structures that belong to the state park established in 2014. Elements in light grey represent the fragmentary remains of the old amusement park. Also included in light grey are two structures that are no longer represented by any physical remnants, but which are made 'visible' in the landscape through public signage.² These are the hotel, labelled as A1, and the haunted house, labelled as A3. [Figure 2.3b](#) represents the locations and relative concentrations of graffiti and other kinds of mark-making at the park, juxtaposed over the map of these architectural elements. The concentration is indicated both by the colour and scale of the associated symbol.

As [Figure 2.3b](#) makes clear, the survey revealed a pronounced positive relationship between the locations of the fragmentary remains of the amusement park and the concentrations of markings. Notably, the structural elements associated with the state park established in 2014 were not targeted at all with the exception of N7, a picnic table near the new pavilion, which is often used for children's activities. The graffiti on this picnic table consisted of pencil drawings clearly marked here by a young child or children. While they were included in the survey, they do not belong to the same category as the other graffiti documented. Other difficult-to-categorize groups of marking included those that were not clearly attributable to either the amusement park or the state park. These include U2 and U3, two small concentrations of graffiti on groups of boulders not currently associated with any structure, U4, a single mark on a walkway belonging to the older phase of the park but adopted into the new park infrastructure,³ and U1, a very old and nearly obscured tag on the park's original road. Although it is undated, it seems likely that U1 was made at some point during the time that the amusement park was abandoned.

As this last observation suggests, the question of the timing of the interventions mapped in this survey project is fundamental to almost every other question that can be asked of them, as the interpretation of several points of interest arising from the gathered data is strongly impacted by the question of when these interventions occurred. Rocky Point sat abandoned for 20 years before its incorporation into the state park system, and, during that time, the overall landscape of the park looked very different. Multiple buildings existed on the site in various

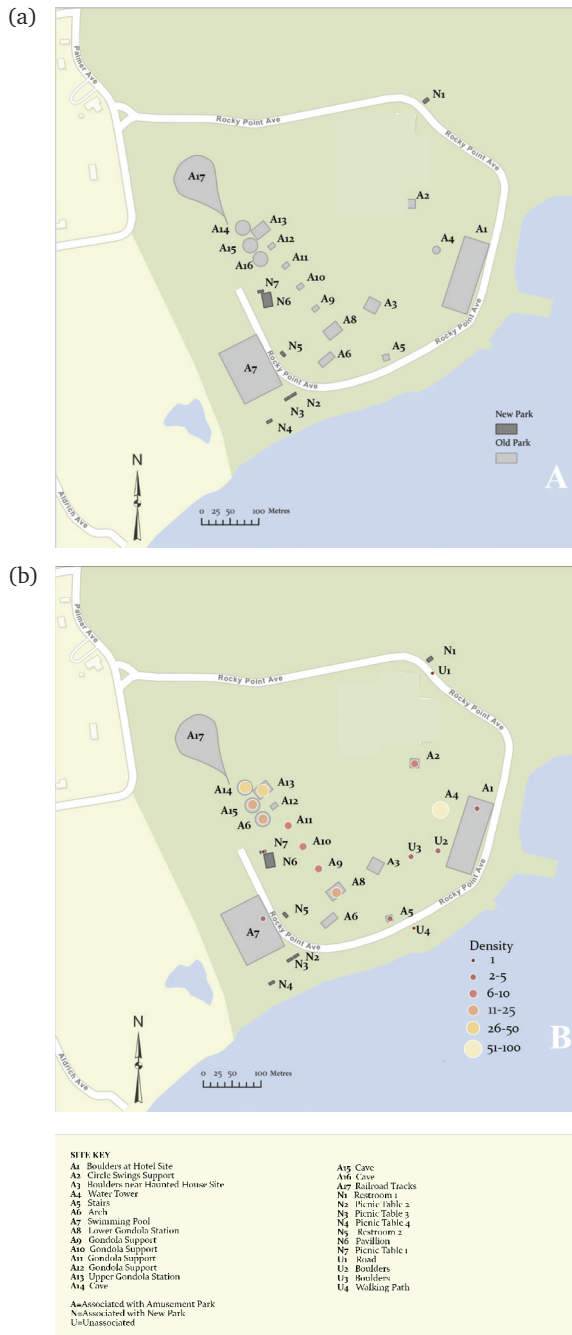


Figure 2.3 a) Location of park elements at Rocky Point Park, 2024. b) Location of graffiti at Rocky Point Park, 2024. *Source:* author, using ArcGIS Pro.

states of ruin, and debris was ubiquitous. What now appears as only a scattering of fragments from a decayed amusement park – a half-lost landscape assimilable only in the imagination – existed as a much more concrete whole, before the more dangerous parts of the abandoned site were demolished. So, when it was noted, for instance, that the elements associated with the new state park were not targeted in any way, the question needs to be asked: might this be a function of the fact that these elements were not present during the time when the majority of this mark-making behaviour was taking place?

It was also noted during the survey that the more ‘whole’ a fragment appeared to be, the more likely it was to be targeted by mark-makers.⁴ As with the previous point, this phenomenon takes on a different interpretation if we consider that the majority of these marks might have been made when significantly more of the whole of these structures remained. Fragments which retained more of their original structure in the new park would, therefore, also retain more of the marks that had accumulated during the park’s abandonment. In a similar vein of thought, during its period of disuse the park was significantly more isolated than it is today. Fenced off to the public, it was accessible only to those willing to climb over barriers and risk arrest for trespassing. Timing, therefore, is also reflective of another potential confounding factor – the possibility that these accumulations of presence might have more to do with the isolation and lack of observation inherent to complete abandonment than with the sensation of absence and uncanny liminality inherent to fragmentation.

The collection of dates, when given, as a data point allows for some clarity regarding these ambiguities. It was found that, while some of the marks recorded, like the mark from U1, clearly belonged to the period of abandonment, all of the standing fragments associated with the old amusement park had been targeted by mark-makers within the last two years, well within the timeframe of the new use of the site. Almost all had at least one mark dated within the last month, well within the timeframe of the pandemic. Several were made just days before the survey was done, and on the day the survey was conducted I interrupted someone – one of only a small handful of people that I actually saw at the park during the time it was closed – in the act of spray-painting a mark on a wall in the water tower. The evidence of presence left behind by hundreds of now absent mark-makers has, thus, been accumulating for a relatively long stretch of time – from 1996 to the present day. The obscuration of older marks by newer ones makes it difficult to assess the ways in which the pace of accumulation may have changed over time,

however the density of newer marks is significant and revelatory of the affective pull that continues to be exerted by these fragments even in the absence of complete isolation and abandonment.

Aside from its potential relationship to timing, the fact that fragments which are more complete appear to attract more attention from mark-makers, at first glance appears to contradict the idea that it is the uncanny sensation provoked by their liminal nature which draws attention. If it is the sensation of absence which creates the attraction, it appears logical that the level of interaction would increase as the level of fragmentation increases. To a degree, I think this is true – but only to a point. As discussed above, the fragment is defined by the absence of the wholeness that it represents. In order to function in its role as a sign that points to the absence of this wholeness, enough of the fragment must remain to allow the absent whole to be mentally materialized. There is a sliding scale of affect that is related to the ratio of absence versus presence in any given object. There needs to be enough ‘present’ left to make the ‘absent’ felt affectively.

The same rule applies to the temporal continuum that intersects with the absent–present spectrum. The past is only present if it is here, or at least here enough. At Rocky Point this appears to be borne out by the fact that neither complete objects nor objects in an advanced state of fragmentation were targeted in the same way as those that lay somewhere in the middle of their journey between wholeness and complete decay. [Figure 2.4](#) allows this phenomenon to be visualized in a much more haunting way. In this image, the past is made visibly present, through the superimposition of an aerial photograph from 1988, less than a decade before Rocky Point closed, over the graffiti distribution map. The march of time has removed the traces of almost all that existed in this space 35 years earlier. Where no traces remain, the landscape is silent. The contagion of pastness has no pathway into present awareness. There is evidence in the park for the material remediation of uncanny contamination only where it is sensorially apparent – where material traces in a readable state remain.

Whether it is isolation or lack of observation rather than affective merit that triggers mark-making practices at Rocky Point is more difficult to address. The idea that it is the isolation of complete abandonment that has resulted in these ghostly presences is undone by the dating of the marks, as discussed above. The fact remains, however, that some areas of the park are far more isolated than others – and this varies by season and by time of day. In New England, the foliage is primarily deciduous, which means that what is obscured in the summer is much more visible in

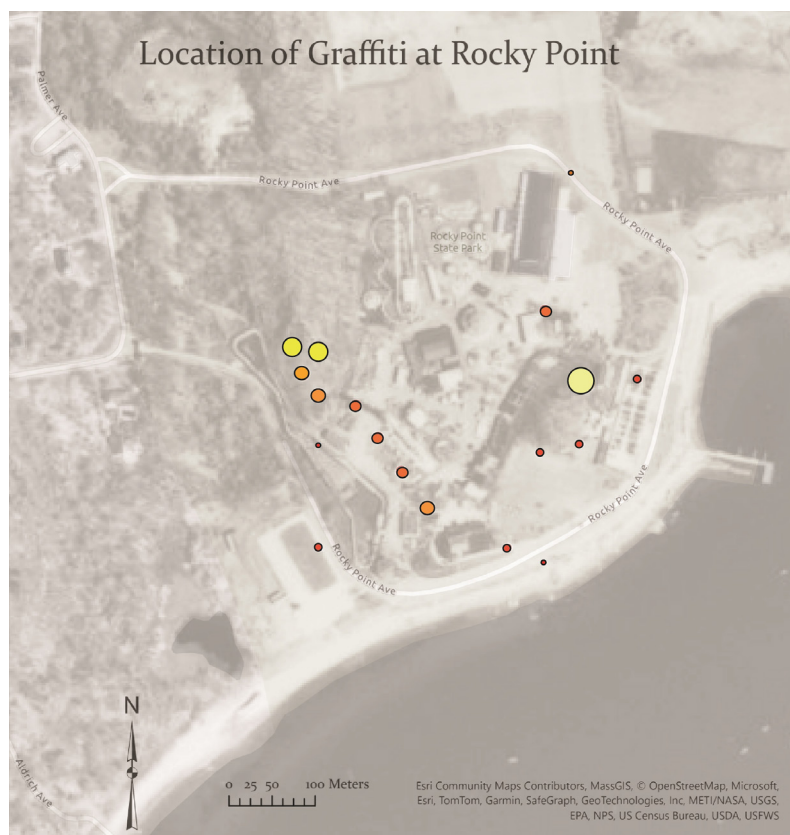


Figure 2.4 Aerial photo from 1988 superimposed over location of graffiti at Rocky Point Park, 2024. *Source:* aerial photo from Providence Historical Aerial Viewer, provided by Arcgis Pro Online; composite image created by the author using ArcGIS Pro.

the winter. To address this potential factor, the relative isolation of each of the fragments was explored in relation to the number of marks that were made in each location. The results of this query show that, while relative isolation probably does play a role in which fragments attract attention at various times of the year, isolation itself is not the primary attraction. Several of the most visible structures – the exterior of the water tower and both the upper and lower gondola stations – are the most heavily marked. Perhaps the most apparent point against weighing isolation more heavily as a factor, however, is the fact that, at night, the entire park is isolated. Despite this fact, it is only the fragments of the old amusement park that have been targeted. The elements of the new park, as equally hidden at night as the fragments, remain almost completely untouched.

The content of the markings was carefully studied to ascertain whether it related, in any way, to the history of the park or to its state of fragmentation. This was not found to be the case. It was found, however, that the vast majority of these marks were either names, initials, or pseudonyms. The significance of this is twofold. Firstly, the distinctive signature of each artist makes the spectral, or the 'here at some point, but gone now' nature of specific identities readable in the landscape. Secondly, the readily identifiable monikers of these absent ghosts create a clear trace of their movement through the park – one far more easy to track than the movement of objects like the elements of broken plate. On my first visit to Rocky Point, I found myself drawn through the landscape, from fragment to fragment. As I approached one, another would become visible in the distance, and this was a process that repeated itself as I moved through the site. This same pattern of embodied movement is recorded in the repetition of highly individualized marks across the park. Not only does this help to trace the almost ritual procession of visitors from fragmented icon to fragmented icon, it also serves to visually associate certain very apparent fragments of park infrastructure with others which are now less visible, or less whole. Here, the invisible communication between absent visitors plays a key role in identifying places of significance. Marked by the material traces left by others, the relationship of almost completely dematerialized fragments to the immaterial whole of the amusement park can still be traced – and through the documentation of this deliberate movement it becomes undeniably clear that it is the park fragments that are drawing and dictating the pattern of this movement.

Critique and conclusion

At Rocky Point, material traces are accumulating. Here, as in the other examples given above, this accumulation of material presence is strongly associated with spaces of absence – in this case, an absence signified through fragmentation. The archaeological survey described above objectively confirms that it is these liminal spaces that are being recognized as significant by the community of mark-makers visiting the park. What cannot be conclusively stated, from the evidence produced by this project, is whether it is the affective pull of fragments that represent the absence of immaterial wholes, the perception of these fragments as being partially anchored in the past, or the traces that other visitors have left behind in association with them, that provides the ultimate impetus

for these acts of material presencing. As the theoretical background to the study makes clear, however, all of these factors are related, in that they inhabit the same liminal space. It is difficult to distinguish between the fragments and their associated material accumulations as markers of absent presence and these same elements as markers of the present past. Both ways of describing their significance speak to the same sensorial power – the uncanny awareness of the monstrous liminality that emanates from perceptibly missing things.

The methodology for this project was crafted under unique circumstances, and these circumstances added a layer of difficulty to something that is already exceptionally hard – recognizing and quantifying sensorial awareness in the archaeological record. Paradoxically, it was the pandemic and the reliance that it forced me to place on my own sensorial experiences that provoked a startling realization – that some of the things that we have been trained *not* to do – like including ourselves as an integral part of what we study and giving scholarly weight to our own experiences as individuals – may actually provide a way forward in this endeavour. Our own bodies – our own experiences of being alive and awake in the world – can give us the awareness that we need to first ask insightful questions and then craft the theoretical approaches necessary to elucidate the sometimes unclear connections between sensation and the material response that it incites. Ethnographic data could, potentially, have strengthened the conclusions of this project – and perhaps, someday, it may. On the whole, however, the way in which the methodology of the project developed helped me to achieve exactly what I hoped to achieve – healing, and reassurance that the emotional and sensorial impacts of the absences that we all confront, whether related to fragmentation, loss, or to the isolation of a global pandemic, are real and shared.

This case study has attempted to demonstrate that, rather than requiring that we *do* things differently, an archaeology of the senses requires that we *think* differently – sometimes through our own experiences – about the production of the material record as an active response to sensation. Above all, it requires us to accept our dual existence as human beings *and* scholars, and to allow both of these identities to contribute to the research that we do. In comparing the absences of Rocky Point Amusement Park with losses associated with a global pandemic, it is not at all my intention to trivialize the nearly ubiquitous trauma of that historic moment. Rather, the opposite is true. The Rocky Point project demonstrates that absence is something that is profoundly felt and experienced through the body and the self,

that it is unsettling and affective, and that to subjectively feel these absences – to feel emotion or to feel unbalanced in the face of them – is not only a normal and a shared human response, it is one that can, at times, be objectively quantified through the material reactions that they provoke.

Notes

- 1 The concept of autoethnography arises from the field of sociology, where it was recognized, early on, that the personal experiences of the researcher – in situations where the researcher is inextricably tied to the social group or situation under study – can, and even should, be considered as another source of primary data. See Anderson, 2006; Chang, 2013.
- 2 These include the location of the haunted house and a hotel from an older iteration of the amusement park, where, incidentally, Rutherford B. Hayes, 19th President of the United States, made the first presidential phone call. It was to Alexander Graham Bell (Bettencourt and Chauvin, 2009).
- 3 This consists of a line, above which is written: 'if you cross you're (last word obscured)'.
- 4 The relative 'wholeness' of the fragment appeared to be the only factor which was predictive of a greater number of relative marks. Even accessibility was not predictive in the same way. While there were greater concentrations of marks at eye-level, it was clear that people were also climbing to make marks in difficult-to-access places. Surface-type was not predictive either. With the exception of trees, every category of surface-type was targeted, including wood, metal, concrete and stone.

References

- Anderson, L. (2006) 'Analytic autoethnography', *Journal of Contemporary Ethnography*, 35(4): 373–95.
- Armstrong, J. (2010) 'On the possibility of spectral ethnography', *Cultural Studies – Critical Methodologies*, 10(3): 243–50.
- Bell, M. (1997) 'The ghosts of place', *Theory and Society*, 26(6): 813–36.
- Bettencourt, D. and Chauvin, S. (2009) *Rocky Point Park*. Mount Pleasant, SC: Arcadia.
- Bleyen, J. (2010) 'The materialities of absence after stillbirth: Historical perspectives'. In J. Hockey, C. Komaromy and K. Woodthorpe (eds), *The Matter of Death: Space, place, and materiality*. Basingstoke: Palgrave Macmillan, 69–84.
- Buchli, V. (2010) 'Presencing the im-material'. In M. Bille, G. Hastrup and T. Flohr Sorenson (eds), *An Anthropology of Absence: Materializations of transcendence and loss*. New York: Springer, 185–206.
- Buchli, V. and Lucas, G. (2001) *Archaeologies of the Contemporary Past*. London: Routledge.
- Chang, H. (2013) 'Individual and collaborative autoethnography as method'. In S. H. Jones, T. E. Adams and C. Ellis (eds), *Handbook of Autoethnography*. Walnut Creek, CA: Left Coast Press, 107–22.
- Chapman, J. (2016) 'Object fragmentation and past landscapes'. In B. David and J. Thomas (eds), *Handbook of Landscape Archaeology*. Walnut Creek, CA: Left Coast Press, 187–201.
- City of Warwick (2020) 'Executive Order 2020-06: An order closing all city parks, beaches, and recreational facilities'. Accessed 25 March 2024. https://www.warwickri.gov/sites/g/files/vyhlif12206/f/pages/eo_2020-06.pdf.
- Cohen, J. (1996) 'Monster culture (seven theses)'. In J. Cohen (ed.), *Monster Theory: Reading culture*. Minneapolis: University of Minnesota Press, 3–25.
- Dawdy, S. (2016) *Patina: A profane archaeology*. Chicago: University of Chicago Press.

- Diamond, M. (2012) 'Visitors continue to seek comfort at memorial in front of Sandy Hook Elementary School', *CBS New York*, 19 December. Accessed 30 December 2024. <https://www.cbsnews.com/newyork/news/visitors-continue-to-seek-comfort-at-memorial-in-front-of-sandy-hook-elementary-school/>.
- Doss, E. (2006) 'Spontaneous memorials and contemporary modes of mourning in America', *Material Religion*, 2(3): 294–319.
- Edensor, T. (2007) 'Social practices, sensual excess and aesthetic transgression in industrial ruins'. In K. A. Franck and Q. Stevens (eds), *Loose Space: Possibility and diversity in urban life*. New York: Routledge, 234–52.
- Gonzalez-Ruibal, A. (2016) 'Archaeology and the time of modernity', *Historical Archaeology*, 50(3): 144–64.
- Hamilakis, Y. (2010) 'Recollecting the fragments: Archaeology as mnemonic practice'. In K. Lillios and V. Tsamis (eds), *Material Mnemonics in European Prehistory*. Oxford: Oxbow, 188–99.
- Hamilakis, Y. (2017) 'Sensorial assemblages: Affect, memory and temporality in assemblage thinking', *Cambridge Archaeological Journal*, 27(1): 169–82.
- Hamilakis, Y. (2021) 'From fields of discourse to fields of sensoriality: Rethinking the archaeological record'. In M. J. Boyd and R. C. P. Doonan (eds), *Far from Equilibrium: An archaeology of energy, life and humanity*. Oxford: Oxbow, 239–57.
- Harris, O. and Cipolla, C. (2017) *Archaeological Theory in the New Millennium: Introducing current perspectives*. London: Routledge.
- Kindynis, T. (2019) 'Excavating ghosts: Urban exploration as graffiti archaeology', *Crime, Media, Culture*, 15(1): 25–45.
- Loviglio, J. (1997) 'Rocky Point carousel gets new home', *The Standard Times*, 13 July. Accessed 22 December 2024. <https://www.southcoasttoday.com/story/lifestyle/1997/07/13/rocky-point-carousel-gets-new/50604138007/>.
- MacConville, U. and McQuillan, R. (2010) 'Potent reminders: An examination of responses to roadside memorials in Ireland'. In J. Hockey, C. Komaromy and K. Woodthorpe (eds), *The Matter of Death: Space, place, and materiality*. Basingstoke: Palgrave Macmillan, 195–207.
- Maddrell, A. (2013) 'Living with the deceased: Absence, presence and absence-presence', *Cultural Geographies*, 20(4): 501–22.
- McAtackney, L. (2014) *An Archaeology of the Troubles: The dark heritage of Long Kesh/Maze Prison*. Oxford: Oxford University Press.
- Merrick, J. (n.d.) 'Rocky Point Park is not forgotten', *Rhode Tour*. Accessed 24 January 2025. <https://rhodetour.org/items/show/331>.
- Navaro-Yashin, Y. (2009) 'Affective spaces, melancholic objects: Ruination and the production of anthropological knowledge', *Journal of the Royal Anthropological Institute*, 15: 1–18.
- Olsen, B. and Pétursdóttir, Þ. (2014) *Ruin Memories: Materialities, aesthetics and the archaeology of the recent past*. Abingdon: Routledge.
- Rocky Point Foundation (n.d.) 'Rocky Point Park: A cultural heritage'. Accessed 25 March 2024. <https://rockypointfoundation.org/saga>.
- Stephen, S. (2022) '"The Backrooms": Exploring the unconscious together through collective meaning making', *Journal of Psychosocial Studies*, 15(3): 201–8.

Ancient olfactory materialities for divine encounters: reflections from Asian regions

Neha Khetrapal

Introduction

The aim of this chapter is to throw light on past or ancient (olfactory) material culture from regions of Asia by seeking to work out the relationship between people and their things (material objects) within space. This opening section of the chapter lays the groundwork, in theoretical terms, for the analysis that has been undertaken. To several critics, an endeavour like this is meant to be infused with challenges, because it requires researchers and archaeologists to coordinate efforts in the service of recreating multisensorial means of engaging with the world. How can we, in the present times, bring up evidence for (ancient) human sensory processing, that is ephemeral and ethereal, in order to decipher the world of people and their sensorial modes of engagement with their material space? As impracticable as this question appears to be, the question itself, in an implicit and subtle manner, calls for a unique way of looking at architecture and cultural landscape that belonged to the ancient societies. In my attempt to make this question more realizable, I take inspiration from authors who recommend following a holistic sensorial approach for enriching archaeological endeavours and practices (for example, Hamilakis, 2013; Skeates and Day, 2019; Porath, 2008; Tilley, 2019). Furthermore, I also take inspiration from my own socialization experiences, associated with Hindu ritualistic engagements and training in the cognitive sciences, psychology and linguistics.

Touching upon the subject matter or the focus of my analysis, ancient olfactory materiality of the Asian regions (particularly belonging to North India), I similarly adopt a holistic approach to experientially colour my encounters within the ancient and contemporary Hindu

places of worship in North and Central India (both functioning and non-functioning temples of Khajuraho, New Delhi, Prayagraj and Vindhyachal) and within the museum sites of New Delhi and Sariska (Rajasthan) that host several ancient sculptures and statues of Hindu deities. The essential impressions of these encounters – consistent with the aim of this chapter – emerge from my bodily movements through these spaces and concomitant interactions with the built and decorated parts (for example, the heavily sculpted temple walls, aromas of the burnt camphor, enchanting sounds of bells and countless other elements). I consider these features very important as they afford unique opportunities to experience the space and the divine, specifically in the absence of real people who could have narrated the significance of these constructed elements. I further enrich this phenomenological experience with my knowledge of closely associated folk stories and myths, which have prevailed for years. In this pursuit, I also look for literature from other parts of the world (such as China and Tibet) which I have not yet had the privilege to visit.

As much of this chapter is developed around the Asian traditions, I briefly delve into various aspects of the region-specific traditions before moving onto the main part of the chapter. Readers would acknowledge that ancient societies devoted their efforts to narrowing the divide between the sacred and the profane – in the service of experiencing divinity. In this endeavour, societies sculpted their physical spaces in a manner that helped the visitors and the worshippers to perceive the divine. In other words, the materialities were meant to make the imperceptible more perceptible.¹ I will explain further with the help of two examples, towards the end of this section.

There are still problems and challenges here. The affordances or the opportunities for olfactory, haptic and auditory encounters have faded, specifically, from the ancient sites and museums. However, the available images and the visual artworks still have the potential to modulate my present encounters. What we are left with are gradations of these potentialities – that are stronger within the actual sites or the functioning temple spaces. Therefore, a contemporary visitor can still hope to experience the divine in a multisensory manner. Or would it be viable to say that visitors are better placed to experience divinity, just like their predecessors, by engaging with the space in a multisensory, holistic manner – an experience that could be further enriched by supplying associated folk tales and myths?

Before I end this introduction, I bring up an example to showcase how visually available materials or artworks could have the potential to

communicate the physical effects of imagined sounds (divine music, for example). Through this example, I attempt to show the significance of audition against a rich multisensory backdrop.² In the latter part of the chapter, I also strive to underline the significance of olfaction against such a backdrop. Even though I examine or lay emphasis on audition or olfaction, I do not attempt to isolate these senses from each other because in our real-world encounters our senses co-mingle. In other words, the senses work in harmony (Porath, 2008; Tilley, 2019). And, it is the totality of our sensory experiences that makes our world so enriching.

Cognitive psychologists may be inclined to use a different label – synaesthetic³ materiality – to refer to this kind of sensory co-mingling.⁴ An example from the Southern Highlands of Papua New Guinea is briefly described, here, to illustrate sensory co-mingling. The Kaluli people of the Highlands appreciate the close association between their culture, aesthetics – entailing various sensory experiences – and the natural sonic patterns evoked by their rainforest (Feld, 1988). However, and despite sensory co-mingling, I am motivated to lay emphasis on a particular sensory modality, against a rich multisensory backdrop, because of experiential gradations or graded sensory affordances associated with the material objects or material remains. I take an everyday example to illustrate experiential gradation. For instance, a sacred spoon, compared to an everyday spoon, is a material medium that embodies both taste and touch, because it affords eating while being held. At the same time, it offers comparatively less scope for embodying audition unless it is used against another object to create sound. In this manner, a spoon does not embody all senses evenly but it does not preclude the possibility of evoking other sensations (sound, in this case).⁵ As such, a spoon offers opportunities for graded sensory experiences. However the possibilities of evoking other sensory experiences may become more evident, if the sacred spoon may have been placed in its original context or its interpretation may have been infused with locally available stories or ritualistic practices. To put this differently, a particular spoon is a materialization of taste and touch more than serving as a materialization of audition – unless accompanied by locally available ritualistic practices.

In my endeavours, similarly, I examine these gradations within spaces. This kind of theoretical attention and the consequent endeavours assume significance, as several material remains have been taken away from their original contexts (such as antique statues, dislodged from their original temple sites) and are now placed within contemporary museum exhibits. See [Figure 3.1](#) as an example of how The Buddha sculpture could embody various senses. A few questions may be asked



Figure 3.1 A statue of standing Buddha, from the second century, at the National Museum in New Delhi. *Source:* author.

in this regard. As an artefact, should the sculpture be appreciated for its visual appeal or does The Buddha's standing posture – as opposed to the usual sitting posture – signify a different kind of enlightened state? If we grant scope for the theorizing that the standing statue of Buddha, akin to the sacred spoon, offers room for graded sensory experiences – opportunities for which are stronger in the original worship site – then it becomes essential to work out a strategy to spotlight how these other senses have been materialized as a part of the sculpture. I propose that ancient texts and literature, and local cultural stories, could serve as an important source of information for such endeavours.

The next example, taken from a non-Asian region, helps to illustrate the importance of pairing knowledge about local ritualistic practices with material remains. The example hinges upon the Greek ritualistic

use of caves, during the classical period, for the reverence of agricultural deities, the cult of the invisible Pan – a deity connected to natural sounds – and the nymphs (Yioutsos, 2014).

Ritualistic activities, devoted to Pan, involved the production of different kinds of sounds that resonated and echoed through the caves, in order to evoke the presence of an invisible Pan (Yioutsos, 2014). Given the prominence of sounds in the worship of Pan (known through various sources), it comes as no surprise for present-day visitors that Pan is represented as a musician on several votive reliefs discovered at the relevant cave shrines (Laferrière, 2019). Several of these reliefs also bear a surrounding rocky frame, a feature that replicates the relation between the interior space of the caves and Pan, and by implication also serves as a symbol with a potential to evoke an image of the ritualistic sound echoes within the caves; echoes that were produced by the worshippers back then (Laferrière, 2019). In a similar manner, other votive reliefs also depict images of music-making and dancing, that, in turn, helped to augment the holistic sacred experience within the cave. As such, and quite crucially, the process of perceiving the divine (Pan) is one of collaboration between the worshipper and the cave – with all its associated materiality. While the worshipper may have revelled in the conflation of sensory perceptions – brought about by the sculpted parts and decorative embellishments, deep inside the cave – the job of a researcher and an archaeologist is to decipher the opportunities for this multisensorial engagement, as afforded by the materialities. He or she may, further, delve into recreating or deciphering the auditory sensorium against a multisensorial backdrop. For my interpretive analysis, the focus will be on deciphering the olfactory sensorium in an analogous manner.

Overview

Taken from different parts of the world, the Greek reliefs, the standing statue of Buddha and the hypothetical spoon are multisensory objects. Their new placement in contemporary museum spaces, however, affords the possibility for visual engagement. Contemporary visitors have the opportunity to appraise these objects for their aesthetic potential, as a result. The devotional significance of these objects, enmeshed with the opportunities for multisensory engagements, is subdued in their new contexts.⁶

The materiality of senses

The following vignette is worded as a thought experiment, addressing an essential goal of this chapter, which is to underscore the importance of olfaction within ancient religious traditions.

In a small Indian village, the worship of a village deity is not complete unless the chimes of bells and the use of colour is matched by the burning of incense. The chief priest of the village mentions that transcendence is only possible if all the senses of the worshipper are stimulated. It is not sufficient to witness the main deity of the village temple only visibly. As such, there are well-planned attempts to stimulate the senses for all ritualistic practices.

Although the vignette is described as a thought experiment, the contents of the vignette are based on the author's personal experiences associated with ritualistic practices of India (the Hindi-speaking Northern region, to be precise). Framed as a hypothetical scenario, one may still expect to find similar real-world instances, wherein onlookers and passers-by appreciate the significance of multisensorial sacred encounters. The emphasized multisensoriality could also be an important aspect of nonsacred encounters. An example includes the sound of blooming lotus flowers at the Shinobazu Pond in Tokyo (Gould et al., 2019). At the outset, it is essential to draw multisensory parallels between sacred and nonsacred encounters because different cultures may attribute different values to the senses (see Joyce and Meskell, 2014) and it is these values that become an important element of materialities (both sacred and nonsacred) that cultures produce (Price, 2022; 2018).

The multisensory parallels between the Japanese and the Indian examples, pertinently, provide a glimpse into a, hitherto, lesser examined domain of archaeology. Archaeologists, in their attempt to examine ancient religious sites and the excavated objects, are often guilty of downplaying the significance of past human (sensory) experience (see Johnson, 1999; Tilley, 1994). In those instances, where investigative efforts are deployed to spotlight sensory aspects of experience, these have mostly been devoted to what can be gleaned from the sense of sight (for example, Cummings and Whittle, 2003; Tilley, 1995).

An apprehension that has restricted archaeological efforts is the reluctance to grant scope for deliberations about the human senses. The fear is that this step would imbue archaeological endeavours with subjective and unscientific overtones. Even for those who are willing to place emphasis on human senses, there is an overreliance on textual

analysis as a means of decoding the importance of human senses for ancient ritualistic practices – a stance that rests on an implied understanding that individual experiences are personal and private. Hence, it might appear safe to choose the texts, over other materials like sacred objects.

As an author, I gradually unsettle this stance by showing that past human experiences can be examined with the help of material remains.⁷ The contention is that human (sacred) experiences from the ancient world are reflected in the sacred and cultic objects that people produced in the past or their material remains. In other words, the material remains⁸ can help us decipher the experiential repertoire of our ancestors even in the absence of reliable text.

Cognitive psychologists can describe such an endeavour in different ways (for example, Gibson, 1977). For them the idea of affordances, or sensory affordances associated with materiality of cultures, is paramount. For my endeavours, multisensory affordances are of prime importance. The multisensory affordances are exemplified with the help of the same example that was used before. For instance, an excavated spoon, made of a special metal, invites human interactions in several ways. It affords or helps one to eat, experience a metallic taste while eating and can also be used for creating enchanting sounds when used against another object.⁹ The task of a researcher, working at the intersections of archaeology, phenomenology and cognitive psychology, is to uncover these affordances. Uncovering these affordances, however, does not happen in a cultural or a historical vacuum. Thus, combining archaeology with local stories and information about past cultural practices, can help us gain insight into the experiential repertoire of common people or those who have been – in myriad ways – underrepresented in sacred texts or who may have remained *less* involved with the preparation of such texts (Hunter-Crawley, 2017).

Including local stories and information about cultural practices, that, in turn, are influenced by culture-specific sensory models, also allows scope for including culturally diverse ways of perceiving or knowing the world. In cultures, where the sense of vision – for instance – is ranked higher than other sensory modalities, the customs, beliefs and the material culture would reflect this sensory ordering. Consideration of local sensory orders comes with another added methodological advantage – it paves the way for undertaking sensory-based investigations or ‘phenomenological walks’, for instance (Tilley and Bennett, 2008).

Temples in India

The use of phenomenology in the study of archaeological landscapes is gradually yielding a rich amount of analysis for deciphering relations between people and their environment (Brück, 2005; Sulzmann, 2019). In this section, I embark on a phenomenological journey in the temples of Khajuraho¹⁰ (Central India) to explore the (multisensory) architecture – an endeavour that has not been thoroughly reported, thus far.¹¹ As I embark on this journey, my central focus will be on resurrecting past or lost experience of smell, against a multisensorial backdrop – an attempt that has rarely been documented. The temple architecture affords several opportunities for sensory experiences in this regard. For instance, the interior passages that are less lit, by natural light, during the day, invites haptic exploration. The exquisitely carved exterior walls of the temples also afford similar opportunities. The innermost chamber of one of the temples allows only a narrow beam of sunlight that naturally illuminates the main deity – nudging visitors to focus their attention on the main deity. By undertaking this phenomenological journey, I do not interpret the temple imagery and other aspects of the temple architecture as mere representations of the ancient world but as important elements of my entire experience of the temple space. This phenomenological endeavour would be similar to the efforts undertaken by a different archaeologist or a researcher, as he or she enters, for instance, the Greek caves and attempts to reconstruct the associated experiential demeanour by taking into account the significance of votive reliefs belonging to the invisible Pan. Both of these instances demonstrate how a contemporary researcher can expect to experience historic places from the perspective of a moving and sensing body. In other words, a researcher is able to experience these spaces with the help of her body (refer to Tilley, 2004).

Before entering the premises of the Kandariya Mahadeva Temple,¹² its grand exterior beckons my attention (see Figure 3.2). An overarching visual feature of this temple is the graded (visual) ascent (Kramrisch, 1939). A devotee, as he or she enters the temple, progressively walks from the entrance (on the left) to the main tower, which houses the inner dark chamber. As the devotee advances towards the most sacred part of the temple, the main tower which houses the main deity (Shiva), this gradual progression towards the divine is analogously mirrored in the visual ascent that is evident in the picture. As such, the visual arrangement of the exterior reflects the gradual progression that a temple visitor takes inside the temple. In other words, the visual



Figure 3.2 The Kandariya Mahadeva Temple in Khajuraho, depicting the physical movement undertaken (left) and the inner chamber of the temple (right). *Source:* author.

arrangement of the temple architecture serves as a visual analogue for experiencing the divine.

As I traversed the same path – designed for the mediaeval visitor – I gathered that the temple architecture afforded opportunities to experience this graduated progression and by implication the graded spiritual ascent. The central part of the main tower, holding the main deity, resembles a small dark cavity – perfectly designed to amplify sacred multisensorial (including olfactory) encounters (see [Figure 3.2](#)). Before I arrived here, I was treated with mundane themes of everyday human life and encountered minor deities that were carved along the walls of the temple. These themes are expressed in a three-dimensional (sculptural) manner that can be experienced visually and haptically, en route to encountering the main deity, Shiva.¹³ In other words, it is a (spatial) key to transcend the boundaries of daily and mundane life with the aim of bringing people closer to God and his pantheon (see Renfrew, 1985). Thus, the worshipper's body is fully prepared, in an all-encompassing sensorial manner, to experience the divine. As my description explicates, there are graded opportunities for evoking sensory experiences within the temple premises (for example, the central part of the main tower versus the other parts of the temple). Comparable thoughts have also been offered by other theorists in the context of other Hindu temples (see Sinha, 2014). To put this differently, as a visitor, I have opportunities to engage with the temple architecture in a multisensorial manner. Within this multisensory context, there are opportunities for haptic and olfactory engagements too – opportunities that might be lost, if I appraised the temple with a mere visual frame.

It is of crucial importance to mention that the Khajuraho temples are not functional, in the sense that there is no active worship of deities that takes place every day in a ritualistic manner. Nevertheless, my phenomenological (bodily) experience in this context could be equal to those at other, active, sites of Hindu worship that I have attended. In a functional worship space, as well, there is active and cumulative engagement of various human senses – an engagement that is afforded by both the features of the built temple space and other ritualistic objects.

Critics could still argue that my current experience in both the contemporary and the mediaeval temple space is not sufficiently informative about the sensory experiences of the past. While I am sympathetic to this criticism, I also underscore that the point of combining phenomenology with archaeology is not to replace the past sacred experiences but to help draw commonalities across the contexts (see Moyes, 2023). This position allows scope for situating phenomenological endeavours within archaeological investigations – for as long as there are commonalities across the experiencing bodies, there are bound to be similarities in experiences. With these constraints, how can we move this endeavour forward? In other words, how can we continue to decipher the past sensory (sacred) experiences based on the material remains? A different solution is offered by evoking analogies. Ascher (1961; 317) offers an important point of thought for practising archaeologists: ‘In its most general sense interpreting by analogy is assaying any belief about non-observed behaviour by referral to observed behaviour which is thought to be relevant.’ To put this differently, using analogues across contexts or the deployment of analogies assumes importance for informing further endeavours along these lines.

In elucidating methodological concerns, I may have drifted far from my main objective (marking the significance of human olfactory sensibilities to decipher the nature of older or ancient religious traditions) but I suppose that thoughts about methodological rigours help set the stage for the upcoming analysis. In the next section, I exclusively focus on the relevance of smell for the experience of divinity. And, I evoke various kinds of analogies, experiential and linguistic, for this endeavour. My own multisensorial engagements with Hindu ritualistic practices serve as the basis of experiential analogies. Subsequently, I reflect on the importance of smell and the concomitant importance of materialities that have been creatively developed in the Asian traditions, to enhance a fragrant, smelly or an olfactory experience of the divine.

Relevance of smell for experiencing divinity

I again begin with a vignette, but this time, I focus on my real experiences associated with visiting the National Museum in our capital city – as opposed to a functional temple space (see [Figure 3.3](#)). Here, I have had the privilege of viewing ancient sculptures of deities – taken from their original contexts and subsequently placed within the museum space.

The sculptures of deities, quite imbued with opportunities for evoking multisensorial experiences in their original context, appear isolated within the confines of the museum. It is possible to admire these ocularly and to still appreciate their aesthetic appeal but these sculptures no longer appear to evoke other sensibilities. The visual appeal is remarkably striking and unparalleled but it is relentless that the opportunity for multisensory *Gesamtkunstwerk*¹⁴ is severely restricted.

Interested readers might question my emphasis on smell, for the experience of divinity, despite the focus on *Gesamtkunstwerk*.¹⁵ In other words, holistic sensory encounters, wherein senses work in harmony. The answer to this concern again lies in experiential gradations. A fully functional temple offers several opportunities for evoking different sensory experiences in comparison to a museum space. In contrast, researchers may have to devote their analytical attention to material objects within the museum space in order to decipher their significance. I explicate this argument with the help of incense burners¹⁶ that were routinely deployed within temple or other worship spaces, but are now placed within a less complex sensory environment (for example, a museum space). How do we decipher what an incense burner embodies in such contexts? Does an incense burner only function as an object for visual gaze? Or, does it serve as the materialization of olfaction, vision and touch? An example from the mediaeval Chinese period is described here.

Smells prevailed in the mediaeval Chinese world (Jia, [2023](#)). Aromatics were deployed at temples, shrines and altars during ritualistic practices. Even poets, active during this time period, were drawn to the material aspects of burning aromatics (Romaskiewicz, [2022](#)). A popularly cited censer is the *boshanlu* or the hill or mountain censer, which – as the name suggests – is shaped like a mountain. A few inscriptions on these censers mention ‘xunlu’ (Erickson, [1992](#)), implying that *boshanlu* were known by various names. Made of either metal or bronze, the hill censer dates back to the Han dynasty (206 BCE–220 CE) and includes a tall lid that is shaped like a layered mountain, which, in turn is adorned with motifs of trees and plants, humans and creatures of all

(a)



(b)



Figure 3.3 Juxtaposed views of (a) one of the galleries of the National Museum at New Delhi and (b) of a functional temple of Prayagraj, which offers various opportunities for multisensory engagements.
Source: author.

kinds (Kirkova, 2018). At the bottom, the *boshanlu* is supported by a vertical stem that stands on a circular foot. In some other versions, the lid is embellished with decorative motifs of flower petals (Kirkova, 2018). In the latter case, the censer looks like a flower bud. Incense was burnt inside the central part of the *boshanlu*.

Several theorists interpret the *boshanlu* as a representation of a sacred or a cosmic mountain or as a mythical island of immortals (Rawson, 2006). Early texts also highlight the worship of mountains, as gateways to heaven (Erickson, 1992). The smoke that was produced, as a result of burning incense, was considered as sustaining to all lives or as an attempt of establishing contact with immortal beings. These interpretations are derived from mediaeval poems and other historical sources.

Motifs of *boshanlu* – among other motifs – are also found on Buddhist votive steles, belonging to the late fourth century (Shi, 2014). Carvings of The Buddha appear alongside these motifs, implicating a close association, back then, between aromatic ritualistic practices and the worship of The Buddha. The discovery of the *boshanlu* in ancient tombs prompted several theorists to propose that this may have been associated with a prayer or a wish for immortality (Kirkova, 2018).

The description of *boshanlu* shows that sensory experiences potentially mattered for past societies. And, our predecessors capitalized on the functionality of our senses, designing sacred objects like incense burners. Thus, it becomes necessary that we pay close attention to the fact that our contemporary ways of engaging with the world – with its vision-centric outlook – could be different from endeavours of the past. And, relying on a vision-centric approach entails disregarding other sensory affordances. It may, therefore, be worthwhile to decipher ancient sensory frameworks by paying close attention to the ancient material finds paired with their localized practices. By paying attention to these historical objects, in this manner, we may be in a better position to surmise how these objects might have narrowed the divide between the sacred and the profane.

Sacred artworks from other Asian regions

In this section, I examine Buddhist artworks and excavated finds, in support of my argument, to showcase how people or worshippers made use of olfaction and corresponding materialities for narrowing the divide between humanity and divinity, the sacred and the everyday.¹⁷ In order to elucidate this argument, I begin with an experiential (multisensorial) analogue from the Kandariya Mahadeva temple of Khajuraho. The walls of the pathway that worshippers must traverse, in order to reach the inner chamber where the main deity is situated, is replete with mundane themes and other themes of minor deities. These themes are expressed in a three-dimensional, sculptural manner that can be experienced visually and haptically, en route to the encounter with the main deity. The immersive nature of the pathways, as afforded by the temple architecture, becomes an important part of the sacred experience for the worshipper who traverses the pathway to discover the divine. This example serves to spotlight the importance of two different senses – vision and touch – that help worshippers in constructing their sacred experiences. Similarly, my fieldwork alludes to the possibility that the enclosed design and structure of the inner chamber was developed to trap scented air just as the echoes inside the Greek caves would have helped to create a divine echoic ambience. The trapped scented air helped further enhance the worship experience. The objective may have been to induce feelings of awe in a worshipper. In other words, a key to transcend the boundaries of daily and mundane life, with the aim of bringing people closer to God and his pantheon (see Renfrew, 1985). As such, the architectural space not only afforded visual and haptic experiences but olfactory experiences as well.

Critics may have reservations about the use of experiential analogues that are closely associated with one's own culturally specific sensory frameworks, because even sensorially aware researchers and archaeologists may end up imposing their familiar frameworks, inadvertently, while working with excavated materials. Critics also warn against assuming that some non-Western societies may make use of nonvisual sensory frameworks (see, Classen and Howes, 1996). As such, a viable alternative is to make judicious and careful use of both experiential analogues and synaesthetic materiality or multisensory affordances¹⁸ that allow researchers to move beyond the ocular privilege (for example, Houston and Taube, 2000; Mrázek, 2011). In the next two sections that follow, I attempt to work with a multisensorial framework for analysing the selected South Asian artworks, to highlight the significance of their olfactory materiality for ancient sacred experiences or encounters.

Introducing the fragrant Buddha

Followers of Buddhism fondly recognize their revered Buddha as both iconic and aniconic (Seckel and Leisinger, 2004). There is merit in devoting space to the aniconic forms to further exemplify the adoption of synaesthetic materiality. To explicate this line of thought, I briefly focus on the famous Buddhist stupa that was found in Bharhut (Central India). In its popular visual form, a stupa serves both as a container for holy relics and also as a memorial that characterizes the location of an event in The Buddha's life. If we inspect the stupa further, we notice a creative juxtaposition of visual and olfactory imagery.¹⁹ The lower portion of the stupa bears a row of palm prints that are interpreted to be perfumed palm prints, the use of which is also mentioned in relevant Buddhist texts (see Coomaraswamy, 1956; Schopen, 2015). The artists of the time have crafted a creative tension between the subtle or implied presence of smell as a subject for art and its absence as a human sensory experience (comparable arrangements of floral motifs are also observed across the perimeter of one of the Khajuraho temples, Figure 3.4). To further explain this artistic tension, I examine another fragrant aspect of aniconic Buddhist art – the hut motif.

The hut motif is an aniconic depiction of The Buddha. Belonging to the second century BCE, The Buddha's hut (or, the apparent dwelling place or an abode²⁰) is both visual and olfactory. This structure (or, the signifying motif) is also known as *Gandhakuṭī* or the perfumed chamber. Despite scant reference in canonical Buddhist text (Strong, 1977), *Gandhakuṭī* is



Figure 3.4 Floral motifs as repetitive patterns. *Source:* Shilpa Shinde's blogpost (used with permission).

understood to be a repository of floral offerings. Importantly, the nature of offerings (that included sweet-smelling flowers) helped transform an ordinary chamber into a perfumed chamber.²¹ These fragrant connections are often depicted in architectural spaces²² as floral canopies and pavilions. For the followers and worshippers, the sweet-smelling fragrance, when present, potently signals the presence of the absent Buddha.

In several monasteries of Odisha (Eastern India), with the passage of time, the image of The Buddha filled the empty central part of *Gandhakuṭī* (Schopen, 2015). This spatial arrangement, then, explains the interchangeable use of the terms – 'Buddha's chamber' and 'perfume chamber'. This is why The Buddha is also considered the aromatic one.²³ This proposal is also closely aligned with the explanation offered by sinologist, Edward Schafer, according to which, the word *gandhā* simply means 'pertaining to the Buddha' (Schafer, 1963). Consistently and remarkably, sandalwood has often been used for carving Buddhist statues (Guggenmos, 2020).

The interpretation of the hut motif and the palm print imagery on the stupa signify that archaeologists can hope to develop and refine the concept of synaesthetic materiality, embodying sensory co-mingling, by relying on a number of interpretive sources. The contemporary or decontextualized placements of fragments of stupa may encourage onlookers and researchers to interpret these as mere visual objects akin to the (decontextualized) interpretations, which may be evoked for artefacts used by Kaluli people and the votive reliefs associated with the cult of the invisible Pan (for instance). In my present endeavour, I have attempted

to recreate the olfactory sensorium, associated with the hut motif and the Bharhut stupa, against a multisensorial backdrop.

Implications for sacred experiences

The previous sections allude to the importance of both experiential analogues and synaesthetic materiality for archaeological endeavours. As researchers, we are also interested in focusing on the relevance of olfactory materiality for sacred experiences. Many people are acquainted with common deliberations that emphasize how divinity is distinct from humanity but that humans can still hope to discover godly presence in a pervasive manner. We can frame the question, under consideration, in a slightly different manner: why did our predecessors construct sacred (material) objects that afforded olfactory experiences among other sensory opportunities?

Based on the premise that divinity is distinct from humanity but that humans can still hope to discover Godly presence, I propose that olfactory materiality may have been developed for narrowing the divide between the sacred and the profane. It then comes as no surprise that connection myths (of bridges, for example) are consistently found in religious rhetoric. An Indian example includes the *Rama Setu*, connecting the southern point of India to the Mannar Island that is off the coast of Sri Lanka. For Buddhist followers, as well, unenlightened states are regarded as the middle world (Barrie, 2013). Hence, olfactory materiality – associated with olfactory affordances for experiencing the divine – could have been developed as a sacred or a spiritual bridge.

Representing odour in iconography

Given that much of the tangible material – that becomes the focus of contemporary archaeological interpretive endeavours – could be labelled as visual art, the point of contestation is understanding the representation of odour in iconography. This can happen in distinctive ways. In the likeness of *Gandhakuṭī*, I note an interesting discovery from the region of Ladakh (North India). Here, painted mandalas appear on the walls of one of the shrines (Sumtsek) that belongs to the Alchi Buddhist monastery in the village of Alchi. A relevant aspect of these painted mandalas, from the perspective of this chapter, includes the visual presence (motifs) of goddesses – *Dhūpā* and *Gandhā* (also Sanskrit

words for fragrance or perfume) (Goepper, Poncar and Linrothe, 1996). The goddesses personify the human sense of smell and embody fragrant ritual offerings (Lessing, 1956). As such, the motifs of the goddesses testify to the significance of fragrant ritual offerings.

Similar motifs are also found in Buddhist sanctuaries of Western Tibet that date back to the eleventh century (Bazin, 2013; Neumann, 1998). If we further examine Tibetan Buddhist ritualistic practices, it becomes evident that the followers used a wide variety of metal incense burners (Bazin, 2013), the motifs of which appear not only as a part of different Buddhist paintings but also closely resemble real burners from the tradition, that are on display in several museums. For example, the Guimet Museum in Paris hosts an oblong incense burner and a pair of canopy-shaped incense burners, complete with chains.

In other words, the representation of odours in Tibetan Buddhist iconography appears to be inspired by the long-standing tradition of fragrant ritualistic offerings for The Buddha. We find parallels in other traditions too, wherein these parallels hinge upon distinctive ways of representing odours in iconography. Much of the time, this representation appears as a part of synaesthetic materiality. Another similar example includes a thorough analysis undertaken by Day (2013) of stone blossom bowls and ceramics belonging to Minoan Crete (c.3300–1200 BCE), and bearing relief flowers and petals.

In elucidating these examples briefly, my intention is to reiterate that the historical material records could be used to access contextualized (past) multiple sensory experiences, where the relevant contexts include ritualistic practices and religious or spiritual worldviews.²⁴ By moving beyond a visual interpretive framework, we can expect to uncover the full range of sensory affordances, associated with material culture. Although I have focused on recreating the olfactory sensorium against a multisensorial backdrop, others may like to focus, for instance, on recreating sonic, haptic²⁵ or taste sensoria for cultures that remain under-explored. En route to this agenda, there could be biases or rather filters that researchers should acknowledge. An important form of bias is the difficulty in completely transcending one's own culturally familiar sensorium (Day, 2019). This is why it becomes imperative to adopt a range of strategies (analogies and local stories and practices) in order to ensure a successful endeavour. The upshot is that the past historical record, consisting of sacred artworks, should not be viewed as a series of two-dimensional visual snapshots but as material that offers graded opportunities for multisensory engagements (see Pallasmaa, 2012). The latter argument is also in line with cognitive and neuroscientific studies

that have shown activations in brain areas responsible for taste while participants simply looked at pictures of food (Avery et al., 2021).

Creating alternate sensibilities for processing

The stance on materiality, as seen so far, remains instrumental for explaining humanity's attempts to transform the unknown and abstract world into a concrete and perceptible one. Descriptions and examples show that a site of divine residence is considered a sacred space. This sacred space is maintained and established with the help of ritualistic acts. Some of these sites are physically accessible, such as a constructed temple, whereas the others may not be easily accessible, such as the mountains or even the heavens. Olfaction, then, served as a bridge that narrowed the divide between the divine and his followers. However, we haven't settled issues with respect to another closely associated abstract domain – the domain of time or sacred time. Just as humanity allocated a perceptible space – associated with graded sensory encounters – for the divine that occupies a spaceless world, the divine timeless also required a concrete counterpart. Here too, incense played a role. The godly fragrance not only permeated the space where the divine dwelled (*Gandhakuṭī*, for example) but it also transcended the 'here' and 'now'. Our ancestors not only constructed incense clocks to measure sacred time or the time duration for ritualistic activities, but they also used incense sticks. Material evidence for the use of incense, in this manner, is available from China, Japan, Taiwan and Korea. Incense spirals for marking durations are still used in the present times in a few Chinese temples (Voytishek, 2022).

Use of incense timekeepers

The use of incense for measuring time has been closely associated with the spread of Buddhism from one country to another in Asia. Inasmuch as the use of incense in Buddhist worship began in India, it is not unexpected that various prototypes of incense timekeepers originated in India before their introduction into other countries, such as China and Japan. Several theorists would suggest that timekeepers, given their secular nature, were used for merely measuring time in the absence of other developed methods, but a closer look at history suggests that the use of incense-based timekeepers was restricted to Buddhist temples, at least, this was the case in Japan during the Tokugawa period

(1603–1867) and Korea (Bedini, 1963). In these settings, they were deployed by priests to announce prayer times – with the help of a loud bell – to community dwellers (Bedini, 1963). Besides utilizing incense for sacred purpose, people in China have also made use of incense clocks in the form of elaborate dragon boats (Bass, 2019). In this case, the latter served as an alarm clock, as the burning incense was used to release weights that, in turn, would cause sounds. Considering both the religious and the mundane contexts, it may thus be proposed that incense served a dual purpose for societies. Whether used as an object of prayer or as an object for telling time, beautifully carved burners – replete with culturally relevant imagery – served as microcosms of the world. Burning incense in these helped create sensual experiences to bring both worshippers and non-worshippers closer to the divine – spatially and temporally.

Decline of olfactory materiality

A few questions assume importance, here. Why have we witnessed a decline in olfactory materiality? Do we attribute this decline to the Western taxonomy of organizing the senses that infiltrated other cultural circles through routes of travel or trade? Or, do we attribute the decline to the legacy of post-Enlightenment romanticist Protestant bias that structures the modern way of looking at religion (Meyer, 2010)? Or, are there different factors that could have played a role?

Before offering reasons for the decline, a very brief (global) history on the rise and fall of smells is warranted. Renaissance technologies of print elevated vision to the sphere of objectivity even though olfaction may also have played a prevalent role in premodern Europe. Furthermore, sensory hierarchies – considered of modern origin – also helped elevate the status of vision and consequently relegated lower senses to the human primitive past (refer to Jenner, 2011). Therefore, the demise, in status, of olfaction has been attributed to post-Enlightenment Western cultures by several theorists (Classen et al., 2002). At any rate, the desacralization of scents was also marked by the destruction of olfactory materiality, for example, incense burners (Baum, 2013). This meant that the devaluation of olfaction and olfactory materiality happened simultaneously.

Although people are well-acquainted with the history of smells from the Western perspective, less is known about other cultures. Here, an attempt is made to elucidate the close relation between our natural

environments and smells, before concluding that the decline of fragrant material assemblages could have been associated with our gradual detachment from natural environments. The contents of this section are based on ancient texts and literature, and local stories – cultural myths – that people have narrated for centuries.

The closeness between smells and natural environments could be gleaned from the fact that ancient Hindu thought associates *gandhā* (smell) with the element of earth (*prthivī*). Beyond this association, there are written texts that underline the significance of fragrance for ritualistic activities. For instance, the *Mahābhārata* – a major Sanskrit epic of ancient India – lays emphasis on fragrance as a medium of spiritual connection between the worshipper and the worshipped. Therefore, the use of fragrance and scents, in various forms, have been very pervasive in Hindu ritualistic practices. When we consider forms, there is rich evidence to suggest that Hindu worshippers are familiar with perfumed waters, scented oils and pastes, other than the ritualistic use of *dhūp* and incense sticks. The ingredients used for these substances have been naturally derived from trees and plants. Examples include musk, saffron, sandalwood and camphor. Besides making scented offerings, these natural materials have also been utilized for carving statues of deities, making prayer beads and in the construction of temples.

While the use of incense is still prevalent in Hindu ritualistic practices, along with other traditions of South Asia, it is evident that smells and fragrances do not serve as a major conduit between the earthly and the heavenly worlds. For people living in close proximity to nature, reliance on the sense of smell is still comparatively pervasive. An example is the Ongee people of the Andaman Islands, an archipelago in the Indian Ocean. The Ongee community is still attuned to odour (Pandya, 1993). For them, everything in the universe is characterized by smell. And, smell serves as a crucial intermediary in their cosmology. They also practise several rituals that are odour-based. Similarly, the significance of smell is noted with other hunter-gatherer communities, residing in different parts of the world and in close physical proximity with their natural environments (Hoover, 2010).

Based on the available evidence, I propose that our detachment from natural surroundings may have contributed towards the decline of the importance of olfaction, for various groups and communities of people, thereby impacting their religious rituals. What is at stake here? The decline of olfactory significance, at best, implies that olfactory experiences are not counted as legitimate religious experiences in

the modern world. In a contemporary world, as we know today, where vision dominates sacred experiences, olfaction provides meagre knowledge of the divine.

Discussion

There could be different, creative, ways of doing sensory archaeology, with rich potential for uncovering multisensory affordances for sacred and nonsacred objects. Skeates (2010; 2011) offers a few suggestions for traversing the sensory pathway in a theoretical manner. These include reflexivity, creative writing, experimentation, thick description and inventory. Others have offered different means, such as, autoethnography, combining archaeological and textual evidence, imaginative reconstruction and exploring sensory affordances (for example Betts, 2017; Hamilakis, 2013). Several or many of these methods could be deployed for making sense of our past material world.²⁶

A brief note on future directions

I conclude this section by offering further thoughts for future exploration of olfactory opportunities from the ancient temples of India. Visitors to these temples are familiar with a common motif of 'a woman and tree' (*Salabhanjika*). The origins of the motif could be attributed to ancient flower festivals of India, paired with the belief that the relationship between the tree and a woman signifies fertility (Kumari, 1988). Would it be possible to discover the significance of fragrance for fertility, given the fact that, based on the *Mahābhārata*, it was believed that a young woman could precipitate 'fragrant' blossoms with the help of her touch?

Conclusion

In this chapter, I have attempted to (re)create ancient sacred sensorium from hitherto lesser discussed geographical areas, with the hope of showcasing the significance of senses, in general, and olfaction, in particular, for religious (sensory) experiences. In doing so, I maintained a focus on materiality paired with an overview of religious texts, communal stories, personal sensory experiences and beliefs. There are two advantages to this endeavour. First, examining sensory and

material aspects of religion can assist us in deciphering the essence of everyday (past) religious life. Second, we can aspire to develop alternate religious scholarship in ways that complement, yet expand, traditional approaches to investigating religion. Besides the advantages, this kind of endeavour has relevance too. We are all embodied beings and learn about our surroundings with the help of our senses, as much as we learn from reasoning. To ignore our embodied understanding, while studying religion, is akin to sidelining our essential human nature. I also adopted a comparative approach, wherein I placed emphasis on bringing up examples from different religious traditions, belonging to the Asian regions. This endeavour again has relevance because we, as embodied beings, occupy different worlds and environments. This also means that we prioritize our senses differently. To rely only on vision, as many may be inclined to do, is analogous to devaluing the knowledge that our predecessors have gained from other senses.

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Notes

- 1 In this instance I deliberately avoid the use of the term ‘see’.
- 2 See Díaz-Andreu et al. (Chapter 11, this volume) for a review of the methods that are devoted to addressing a comparable aim – spotlighting archaeoacoustics of rock art sites.
- 3 See an argument offered by McHugh (2011) for the use of ‘intersensoriality’ over synaesthesia.
- 4 Here, other examples could be noteworthy. For instance, a rounded versus an angular shape could evoke different kinds of sounds among the Himba people of Namibia (Bremner et al., 2013).
- 5 See Howes (2019) for a similar analysis about a motion picture projector.
- 6 There are several questions that remain unanswered at this juncture. For instance: does de-sanctification of devotional objects entail removing opportunities for multisensory engagements?
- 7 I have also done this, albeit partially, in the introduction.

- 8 Materiality means tangibility or characteristics that can be perceived by the human senses (sight, touch, hearing, smell and taste).
- 9 See Hunter-Crawley (2019) for similar descriptions about 'cups'.
- 10 I focus on Khajuraho temples because these were built during the mediaeval times when significant artistic development gained momentum in India.
- 11 Refer to the work by Monika Baumanova (Chapter 5, this volume) for multisensorial corporeal experience of precolonial Swahili stone-built environment.
- 12 The word *Kandarya* means a cave. This particular temple is devoted to Lord Shiva. The temple building is the tallest of all the Khajuraho monuments.
- 13 As esoteric as my encounters at Khajuraho may sound, these find resonance with important Hindu textual material. The *Bhāgavata Purāṇa* (tenth century CE) underscores the importance of human senses for consuming the god's presence.
- 14 The use of *Gesamtkunstwerk* entails a different kind of analogy – a linguistic analogy. Other authors have used *Gesamtkunstwerk* to describe multiple art forms, while researchers interested in ritualistic experiences have used the term, analogously, to describe the activation of multiple senses, intricately linked with religious rituals (Winter, 2021).
- 15 I use the term in an analogous manner to refer to the multisensorial nature of seeing the divine (Hindi: *darśan*). Although I translate across the languages, the act of witnessing the divine is not in a simple manner equivalent to 'seeing', in the English sense of the term (Low, 2019). This argument makes it all the more pertinent that localized sensoria should be examined within its own framework.
- 16 There is compelling evidence to show that ancient societies used burners and aromatics that offered possibilities for olfactory encounters within a multisensorial framework.
- 17 This has been a significant and pervasive goal within several South Asian religious traditions.
- 18 A parallel could be drawn to the use of the word 'rose', which can refer to both the plant and the colour or even the distinctive smell that it evokes (see Géczi, 2006).
- 19 Here, mental odour is considered synonymous to olfactory imagery, which is popularly defined as the experience of smell sensation in the absence of a corresponding odorant (Stevenson and Case, 2005).
- 20 Refer to Ashraf (2008) for various interpretations about how the 'hut' motif is understood to be the dwelling place of The Buddha.
- 21 Even today, the offerings of flowers and lighting of incense is an essential part of worship for the followers of The Buddha.
- 22 Visible in *Gandhāra* art.
- 23 Olfactory Buddhist divinity resonates with early Christian practices in mediaeval Europe, where bad smells were considered to emanate from bad things while good smells from good things (Brazinski and Fryxell, 2013).
- 24 See Khetrapal (2023) for a relevant example in teaching and pedagogy.
- 25 See Assaf (2005) for touch.
- 26 Refer to Chapter 1 by Hamilton for further deliberations on orchestrating sense-based investigations.

References

- Ascher, R. (1961) 'Analogy in archaeological interpretation', *Southwestern Journal of Anthropology*, 17(4): 317–25. Accessed 2 January 2025. <https://doi.org/10.1086/soutjanth.17.4.3628943>.
- Ashraf, K. K. (2008) 'The Buddha's house', *RES: Anthropology and Aesthetics*, 53(1): 225–43. Accessed 2 January 2025. <https://doi.org/10.1086/RESvnlms25608819>.
- Assaf, S. (2005) 'The ambivalence of the sense of touch in early modern prints', *Renaissance and Reformation/Renaissance et Réforme*, 29(1): 75–98. Accessed 2 January 2025. <https://www.jstor.org/stable/43446028>.
- Avery, J. A., Liu, A. G., Ingeholm, J. E., Gotts, S. J. and Martin, A. (2021) 'Viewing images of foods evokes taste quality-specific activity in gustatory insular cortex', *Proceedings of the National Academy of Sciences*, 118(2): e2010932118. Accessed 2 January 2025. <https://doi.org/10.1073/pnas.2010932118>.

- Barrie, T. (2013) *The Sacred In-between: The mediating roles of architecture*. London: Routledge.
- Bass, E. (2019) 'Tracing Incense: The affective power of objects'. Master's thesis, Queen's University, Kingston, ON. Accessed 2 January 2025. <https://qspace.library.queensu.ca/items/532e08f6-2b12-4abf-b1cb-c011a4d35f2a>.
- Baum, J. M. (2013) 'From incense to idolatry: The reformation of olfaction in late medieval German ritual', *The Sixteenth Century Journal*, 44(2): 323–34. Accessed 2 January 2025. <https://doi.org/10.1086/SCJ24245084>.
- Bazin, N. (2013) 'Fragrant ritual offerings in the art of Tibetan Buddhism', *Journal of the Royal Asiatic Society*, 23(1): 31–8. Accessed 2 January 2025. <https://doi.org/10.1017/S1356186312000697>.
- Bedini, S. A. (1963) 'The scent of time: A study of the use of fire and incense for time measurement in oriental countries', *Transactions of the American Philosophical Society*, 53(5): 1–51. Accessed 2 January 2025. <https://doi.org/10.2307/1005923>.
- Betts, E. (2017) *Senses of the Empire: Multisensory approaches to Roman culture*. London: Routledge.
- Brazinski, P. and Fryxell, A. (2013) 'The smell of relics: Authenticating saintly bones and the role of scent in the sensory experience of medieval Christian veneration', *Papers from the Institute of Archaeology*, 23(1): 1–15. Accessed 2 January 2025. <https://doi.org/10.5334/pia.430>.
- Bremner, A. J., Caparos, S., Davidoff, J., De Fockert, J., Linnell, K. J. and Spence, C. (2013) "Bouba" and "Kiki" in Namibia? A remote culture make similar shape–sound matches, but different shape–taste matches to Westerners', *Cognition*, 126(2): 165–72. Accessed 2 January 2025. <https://doi.org/10.1016/j.cognition.2012.09.007>.
- Brück, J. (2005) 'Experiencing the past? The development of a phenomenological archaeology in British prehistory', *Archaeological Dialogues*, 12(1): 45–72. Accessed 2 January 2025. <https://doi.org/10.1017/S1380203805001583>.
- Classen, C. and Howes, D. (1996) 'Making sense of culture: Anthropology as a sensual experience', *Etnofoor*, 9(2): 86–96. Accessed 2 January 2025. <https://www.jstor.org/stable/25757895>.
- Classen, C., Howes, D. and Synnott, A. (2002) *Aroma: The cultural history of smell*. New York: Routledge.
- Coomaraswamy, A. K. (1956) *La sculpture de Bharhut*. Paris: Musée Guimet.
- Cummings, V. and Whittle, A. (2003) 'Tombs with a view: Landscape, monument and trees', *Antiquity*, 77(296): 255–66. Accessed 2 January 2025. <https://doi.org/10.1017/S0003598X00092255>.
- Day, J. (2013) 'Imagined aromas and artificial flowers in Minoan society'. In J. Day (ed.), *Making Senses of the Past: Toward a sensory archaeology*. Carbondale: Southern Illinois University Press, 286–309.
- Day, J. (2019) 'Seeing is (not) believing: Visual and non-visual interpretations of Aegean Bronze Age frescoes'. In H. Hunter-Crawley and E. O'Brien (eds), *The Multi-Sensory Image from Antiquity to the Renaissance*. London: Routledge, 39–59.
- Dunn, N. and Edensor, T. (eds) (2023) *Dark Skies: Places, practices, communities*. London: Routledge. Accessed 4 January 2025. <https://doi.org/10.4324/9781003408444>.
- Erickson, S. N. (1992) 'Boshanlu: Mountain censers of the western Han period: A typological and iconological analysis', *Archives of Asian Art*, 45: 6–28. Accessed 2 January 2025. <https://www.jstor.org/stable/20062588>.
- Feld, S. (1988) 'Aesthetics as iconicity of style, or "lift-up-over sounding": Getting into the Kaluli groove', *Yearbook for Traditional Music*, 20: 74–113. Accessed 2 January 2025. <https://doi.org/10.2307/768167>.
- Gécsi, J. (2006) 'The rose in Ancient Greek culture', *Practice and Theory in Systems of Education*, 1: 1–83. Accessed 2 January 2025. <https://www.epa.hu/01400/01428/00001/pdf/0101geczi.pdf>.
- Gibson, J. J. (1977) 'The theory of affordances'. In R. E. Shaw and J. Bransford (eds), *Perceiving, Acting and Knowing: Towards an ecological psychology*. London: Wiley, 67–82.
- Goepper, R., Poncar, J. and Linrothe, R. N. (1996) *Alchi: Ladakh's hidden Buddhist sanctuary: The Sumtsek*. London: Serindia.
- Gould, H., Chenhall, R., Kohn, T. and Stevens, C. S. (2019) 'An interrogation of sensory anthropology of and in Japan', *Anthropological Quarterly*, 92(1): 231–58. Accessed 2 January 2025. <https://www.jstor.org/stable/48730494>.

- Guggenmos, E. M. (2020) 'Smell as communication'. In A. Koch and K. Wilkens (eds), *Bloomsbury Handbook of Cultural and Cognitive Aesthetics of Religion*. London: Bloomsbury, 219–28.
- Hamilakis, Y. (2013) *Archaeology and the Senses: Human experience, memory, and affect*. Cambridge: Cambridge University Press.
- Hoover, K. C. (2010) 'Smell with inspiration: The evolutionary significance of olfaction', *American Journal of Physical Anthropology*, 143(S51): 63–74. Accessed 2 January 2025. <https://doi.org/10.1002/ajpa.21441>.
- Houston, S. and Taube, K. (2000) 'An archaeology of the senses: Perception and cultural expression in ancient Mesoamerica', *Cambridge Archaeological Journal*, 10(2): 261–94. <https://doi.org/10.1017/S095977430000010X>.
- Howes, D. (2019) 'Digging up the sensorium: On the sensory revolution in archaeology'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 21–34.
- Hunter-Crawley, H. (2017) 'Movement as sacred mimesis at Abu Mena and Qal'at Sem'an'. In T. M. Kristensen and W. Friese (eds), *Excavating Pilgrimage: Archaeological approaches to sacred travel and movement in the ancient world*. London: Routledge, 187–202.
- Hunter-Crawley, H. (2019) 'Sensory archaeology and the Roman world: A shifting paradigm', *Journal of Roman Archaeology*, 32: 690–7. Accessed 2 January 2025. <https://doi.org/10.1017/S1047759419000576>.
- Jenner, M. S. (2011) 'Follow your nose? Smell, smelling, and their histories', *American Historical Review*, 116(2): 335–51. Accessed 2 January 2025. <https://doi.org/10.1086/ahr.116.2.335>.
- Jia, Q. (2023) 'The poetics of incense in the lives of medieval Chinese officials'. In G. McClelland and H. Gould (eds), *Aromas of Asia: Exchanges, histories, threats*. University Park, PA: Penn State University Press, 63–84.
- Johnson, M. (1999) *Archaeological Theory: An introduction*. Oxford: Blackwell.
- Joyce, R. A. and Meskell, L. M. (2014) *Embodied Lives: Figuring ancient Maya and Egyptian experience*. London: Routledge.
- Khetrapal, N. (2023) 'Olfactorizing religious education', *Teaching Theology & Religion*, 26(2–3): 101–8. Accessed 2 January 2025. <https://doi.org/10.1111/teth.12642>.
- Kirkova, Z. (2018) 'Sacred mountains, abandoned women, and upright officials: Facets of the incense burner in early medieval Chinese poetry', *Early Medieval China*, 24: 53–81. Accessed 2 January 2025. <https://doi.org/10.1080/15299104.2018.1493827>.
- Kramrisch, S. (1939) 'Medieval Indian sculpture', *Journal of the Royal Society of Arts*, 87(4535): 1180–94. Accessed 2 January 2025. <https://www.jstor.org/stable/41359445>.
- Kumari, M. K. (1988) 'An approach to the erotic sculpture of the Ramappa Temple', *Proceedings of the Indian History Congress*, 49: 151–5. Accessed 2 January 2025. <https://www.jstor.com/stable/44148366>.
- Laferrière, C. M. (2019) 'Sacred sounds: The cult of Pan and the Nymphs in the Vari cave', *Classical Antiquity*, 38(2): 185–216. Accessed 2 January 2025. <https://doi.org/10.1525/ca.2019.38.2.185>.
- Lessing, F. D. (1956) 'Miscellaneous Lamaist notes, I: Notes on the Thanksgiving offering', *Central Asiatic Journal*, 2(1): 58–71. Accessed 2 January 2025. <https://www.jstor.org/stable/41926334>.
- Low, K. E. (2019) 'Theorising sensory cultures in Asia: Sociohistorical perspectives', *Asian Studies Review*, 43(4): 618–36. Accessed 2 January 2025. <https://doi.org/10.1080/10357823.2019.1664985>.
- McHugh, J. (2011) 'Seeing scents: Methodological reflections on the intersensory perception of aromatics in South Asian religions', *History of Religions*, 51(2): 156–77. Accessed 2 January 2025. <https://doi.org/10.1086/660930>.
- Meyer, B. (2010) 'Aesthetics of persuasion: Global Christianity and Pentecostalism's sensational forms', *South Atlantic Quarterly*, 109(9): 741–63. Accessed 4 January 2025. <https://doi.org/10.1215/00382876-2010-015>.
- Moyes, H. (2023) 'The life and afterlife of phenomenology in archaeological theory and practice'. In J. Yoshimi, P. Walsh and P. London (eds), *Horizons of Phenomenology: Essays on the state of the field and its applications*. Cham: Springer International, 307–24.
- Mrázek, J. (2011) 'The visible and the invisible in a Southeast Asian world'. In R. M. Brown and D. S. Hutto (eds), *A Companion to Asian Art and Architecture*. Oxford: Blackwell. 97–120.

- Neumann, H. F. (1998) 'The cave of the offering goddesses: Early painting in Western Tibet', *Oriental Art*, 44(4): 52–60.
- Pallasmaa, J. (2012) *The Eyes of the Skin: Architecture and the senses*. Chichester: Wiley.
- Pandya, V. (1993) *Above the Forest: A study of Andamanese ethnoanemology, cosmology and the power of ritual*. Delhi: Oxford University Press.
- Porath, N. (2008) 'Seeing sound: Consciousness and therapeutic acoustics in the inter-sensory shamanic epistemology of the Orang Sakai of Riau (Sumatra)', *Journal of the Royal Anthropological Institute*, 14(3): 647–63. Accessed 2 January 2025. <https://doi.org/10.1111/j.1467-9655.2008.00522.x>.
- Price, R. S. (2018) 'Sniffing out the Gods: Archaeology with the senses', *Journal of Ancient Egyptian Interconnections*, 17: 137–55.
- Price, R. S. (2022) 'Sensing the Fundamentals: An examination of scent as integral to Ancient Egyptian society'. PhD thesis, University of California Los Angeles. Accessed 2 January 2025. <https://escholarship.org/uc/item/2534b3wm>.
- Rawson, J. (2006) 'The Chinese hill censor, boshan lu: A note on origins, influences and meanings', *Arts Asiatiques*, 61(1): 75–86. Accessed 2 January 2025. https://www.persee.fr/doc/arasi_0004-3958_2006_num_61_1_1640.
- Renfrew, C. (1985) *The Archaeology of Cult: The sanctuary of Phylakopi*. London: British School of Archaeology at Athens.
- Romaskiewicz, P. M. (2022) 'Sacred Smells and Strange Scents: Olfactory imagination in medieval Chinese religions'. PhD thesis, University of California Santa Barbara. <https://escholarship.org/content/qt7nx9g6rc/qt7nx9g6rc.pdf>.
- Schafer, E. H. (1963) *The Golden Peaches of Samarkand*. Berkeley: University of California Press.
- Schopen, G. (2015) 'The fragrance of the Buddha, the scent of monuments, and the odor of images in early India', *Bulletin de l'École française d'Extrême-Orient*, 101: 11–30. Accessed 2 January 2025. <https://www.jstor.org/stable/26435096>.
- Seckel, D. and Leisinger, A. (2004) 'Before and beyond the image: Aniconic symbolism in Buddhist art', *Artibus Asiae. Supplementum*, 45: 3–107. Accessed 2 January 2025. <https://www.jstor.org/stable/1522713>.
- Shi, J. (2014) 'To die with the Buddha: The brick pagoda and its role in the Xuezhuang tomb in Early Medieval China', *T'oung Pao*, 100(4–5): 363–403. Accessed 2 January 2025. <https://doi.org/10.1163/15685322-10045P03>.
- Sinha, A. (2014) 'The sacred landscape of Braj, India: Imagined, enacted, and reclaimed', *Landscape Journal*, 33(1): 59–75. Accessed 2 January 2025. <https://doi.org/10.3368/lj.33.1.59>.
- Skeates, R. (2010) 'Imagining the sensual cultures of prehistoric Malta'. In D. Gheorghiu and P. Bouissac (eds), *How Do We Imagine the Past? On metaphorical thought, experientiality and imagination in archaeology*. Cambridge: Cambridge Scholars Publishing, 111–20.
- Skeates, R. (2011) 'Making sense of world art: An archaeological perspective', *World Art*, 1(1): 143–9. Accessed 2 January 2025. <https://doi.org/10.1080/21500894.2011.534595>.
- Skeates, R. and Day, J. (2019) *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge.
- Stevenson, R. J. and Case, T. I. (2005) 'Olfactory imagery: A review', *Psychonomic Bulletin & Review*, 12: 244–64. Accessed 2 January 2025. <https://doi.org/10.3758/bf03196369>.
- Strong, J. S. (1977) "'Gandhakuṭi": The perfumed chamber of the Buddha', *History of Religions*, 16(4): 390–406. Accessed 2 January 2025. <https://doi.org/10.1086/462775>.
- Sulzmann, S. (2019) 'The Use of Phenomenology in Sensorial and Experiential Archaeology'. Master's thesis, University of California Merced. Accessed 2 January 2025. <https://escholarship.org/uc/item/0zp8g3p7>.
- Tilley, C. (1994) *A Phenomenology of Landscape: Places, paths and monuments*. Oxford: Berg.
- Tilley, C. (1995) 'Art, architecture, landscape (Neolithic Sweden)'. In B. Bender (ed.), *Landscape: Politics and perspectives*. Oxford: Berg, 49–84.
- Tilley, C. (2004) 'Mind and body in landscape research', *Cambridge Archaeological Journal*, 14(1): 77–80. Accessed 2 January 2025. <https://doi.org/10.1017/S0959774304240057>.
- Tilley, C. (2019) 'How does it feel? Phenomenology, excavation and sensory experience'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 76–93.
- Tilley, C. and Bennett, W. (2008) *Body and Image: Explorations in landscape phenomenology 2*. Walnut Creek, CA: Left Coast Press.

- Voytishek, E. E. (2022) 'Cultural transfer into the future: Time measurement with incense in East Asia'. In *The Fourth Tohoku Conference on Global Japanese Studies Precarity in an Inter-connected Northeast Asia*. Sendai: Tohoku University, 61–9.
- Winter, I. J. (2021) 'Temple ritual as Gesamtkunstwerk: Stimulation of the senses and aesthetic experience in a religious context'. In K. Neumann and A. Thomason (eds), *The Routledge Handbook of the Senses in the Ancient Near East*. London: Routledge, 213–33.
- Yioutsos, N. P. (2014) 'Pan rituals of ancient Greece: A multi-sensory body experience'. In L. C. Eneix (ed.), *Archaeoacoustics: The archaeology of sound: Publication of proceedings from the 2014 conference in Malta*. Myakka City, FL: The OTS Foundation, 57–67.

Moving with time and space at the sanctuary of Juno, Gabii, Italy

Emma-Jayne Graham

In his 1969 novel *Slaughterhouse-Five*, Kurt Vonnegut imagines an alien race capable of four-dimensional perception. The Tralfamadorians, as he names them, experience time as if it is all happening at once: past, present and future are indistinguishable (Vonnegut, 2010 [1969]: 21). They may be fictional, but Tralfamadorian ways of perceiving and experiencing time are not as far removed from human realities as might be expected. Studies of the senses have, for instance, pointed towards how sensory perception of the material world can ‘bring into existence multiple times simultaneously’ (Hamilakis, 2013: 103). Similar ideas have also been advanced for the types of Roman archaeological contexts that form the focal point of this chapter: ‘periodic, repeated Republican Roman sacrifice at an altar’, suggests Claudia Moser (2019: 6), was ‘a means of integrating a community’s sense of its materially remembered ritual *past*, its experiential *present*, and the *future* consequence of its current practices’ (original emphasis). Likewise, evidence from indigenous archaeologies points towards the existence across diverse human communities of ontological perspectives on time that differ from the strictly linear, chronological ones favoured by Eurocentric archaeological discourse (Cipolla and Quinn, 2016; Crellin, 2020; Lucas, 2021). Of course, indigenous ontologies cannot be applied wholesale to other contexts, and attempts to do so involve the problematic colonization of those concepts, but their existence – along with the thought experiment prompted by Vonnegut’s Tralfamadorians – should nevertheless encourage archaeological researchers to investigate alternative ways of engaging with time. This includes asking questions such as those posed in this chapter about the potential of sensory manifestations of the past to generate affect in the present.

Affect is defined in the context of the present study as a form of agency that prompts certain responses or causes something to happen, and which emerges from relations largely, but not exclusively, between people and the non-human material world (Jervis, 2019: 44). In many instances, affect is generated as a consequence of people's sensory interactions with the distinctive affordances and qualities of different material things (Graham, 2024). Classical archaeology has long used the combination of this sort of sensory affect and memory to explore the role of the past in the ancient present. Only rarely though has it been suggested that these pasts involved anything other than the sensorially-prompted mental recall of individual and shared experiences or knowledge, with memory sometimes used to promote curated or even largely imagined communal pasts (Dignas et al., 2012; Galinsky, 2014). This is also true of initial work on the topic of sensory archaeologies by Yannis Hamilakis (2013: 119) in which he stressed that time is 'material memory itself, memory evoked and activated through the sensorial interaction with matter'.

Importantly, however, in a much less-frequently cited piece (at least within sensory studies of the Greek and Roman worlds), Hamilakis (2017) clarified his definition of 'sensorial assemblages' and their relationship with the past and the present with reference to philosophical concepts concerning the 'virtual' and the 'actual' (terms which do not appear in Hamilakis 2013 and which are discussed in more detail below).¹ He proposes that 'All pasts co-exist virtually with the present, but only certain pasts are actualized at specific occasions' (Hamilakis, 2017: 174). Put another way, Hamilakis suggests that the past is not merely recalled or represented but, as part of particular sensory assemblages of people and things, manifests as something with tangible affordances that have the potential for affect in the present. As far as human experience is concerned, Hamilakis (2017: 174, original emphasis) notes that 'sensoriality and affectivity are crucial' for the actualization of these pasts at particular moments when 'certain planes of the past, or temporal occasions embedded in matter, voluntarily or involuntarily, acquire *sensorial intensity and affective weight*, and they thus become actual pasts'. In other words, sensory assemblages present the means through which people not only remember the past but through which they can experience it sensorially in the present.

This more complex aspect of Hamilakis's characterization of sensory assemblages has been largely overlooked in scholarship on the senses in antiquity, which often employs his terminology of 'sensory assemblage' as shorthand for the intersection of sensory modalities or

affordances and the subsequent generation of multisensory experiences. As such, 'sensory assemblage' has become a way of describing or enumerating a collection of smells, sounds, tastes and so forth that can be associated with a place, object, activity or experience, losing its arguably more compelling aspects and its connections with time. This chapter addresses this misunderstanding head-on. It pioneers a new approach to engaging with the interpretative possibilities opened up by assemblages that involve the sensorial actualization of the past, to demonstrate how sensory assemblages can be employed more productively as an analytical tool for archaeological research. Accordingly, it argues for the development and application of sensory methodologies that fully incorporate the differential affordances of time as well as space and establishes how these can be used to generate valuable new interpretations of complex ancient sites, including the sanctuary of Juno Gabina at Gabii (Italy).

The sanctuary of Juno Gabina

The archaeological remains of the monumental sanctuary at the heart of this chapter are located approximately 18 km (11 miles) from Rome in the Latin city of Gabii (Latium) (Figure 4.1). Dedicated to the goddess Juno, and constructed within the inhabited area of the city, the sanctuary was located almost directly adjacent to the ancient Via Praenestina. A secondary road ran along its eastern side towards a now-drained crater lake known from the mediaeval period as Lago di Castiglione. Excavations conducted in the 1950s and 1960s by Martin Almagro Basch and Alberto Balil Illana on behalf of the Escuela Española de Historia y Arqueología en Roma were subsequently published by Martin Almagro-Gorbea (1982, with specialist contributions). The following summary of the sanctuary's features and chronological development is derived from this report, which remains the only comprehensive archaeological study of the sanctuary.²

This location was the setting for ritual activity from the late sixth century BCE, prior to which it had been used for habitation, probably from the ninth century BCE. The earliest evidence for activity with a clear sacred character was detected in traces of structures probably connected with a *lucus* (sacred grove). Almagro-Gorbea (1982: 605) suggests that the grove and its associated structures provided the focus for small-scale religious activities until the construction in the fourth or third century BCE of a more formalized *sacellum* (shrine) dedicated to the goddess

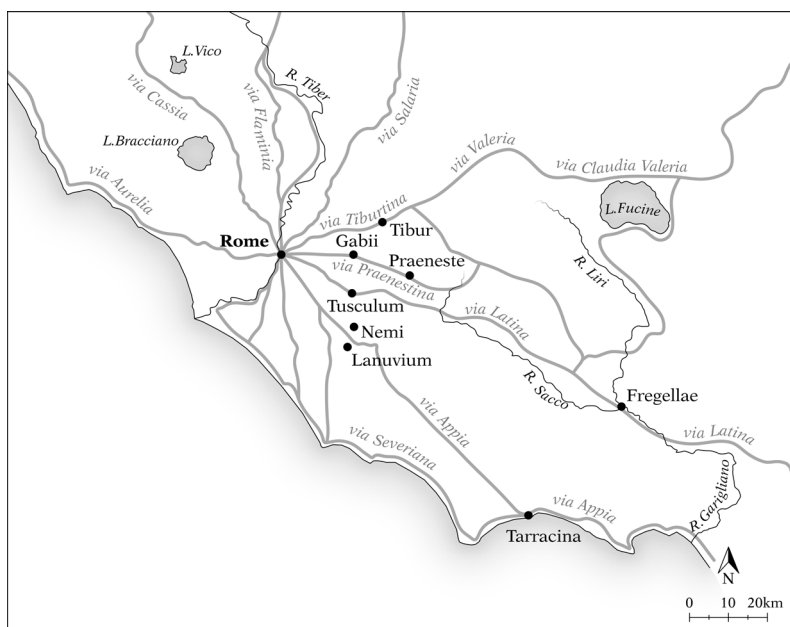


Figure 4.1 Map of monumentalized sanctuaries in Republican Latium.
Source: drawing by Matilde Grimaldi.

Fortuna. The archaeological remains that dominate the site today, however, reflect the substantial reorganization, reorientation and monumentalizing of the sacred area over a relatively short period between 160 and 150 BCE (Figure 4.2). Indeed, Almagro-Gorbea (1982: 616) indicates that the transformation of the site was ‘rápida e ininterrumpida’ (‘rapid and uninterrupted’) and may not have taken much longer than a year to complete. An elevated podium temple (*peripteros sine postico*) was flanked on three sides by symmetrical porticoes, the ends of which aligned with the temple façade, and a rectangular altar was placed centrally a short distance from the temple’s frontal staircase. The newly designed sanctuary, which was now associated with Juno, lay within a *temenos* wall extending from the three-sided portico to enclose the area directly in front of the temple. This wall was interrupted by five points of entry/exit: two within the east and west wings of the portico (not shown in Figure 4.2), two in the south-east and south-west sections of the *temenos* wall and one via a second enclosed space surrounding a semi-circular theatre-like structure of around 12 rows of stepped seats located at a lower level. Much of the building work of this phase was carried out using *lapis Gabinus*, a locally sourced hardwearing and durable volcanic

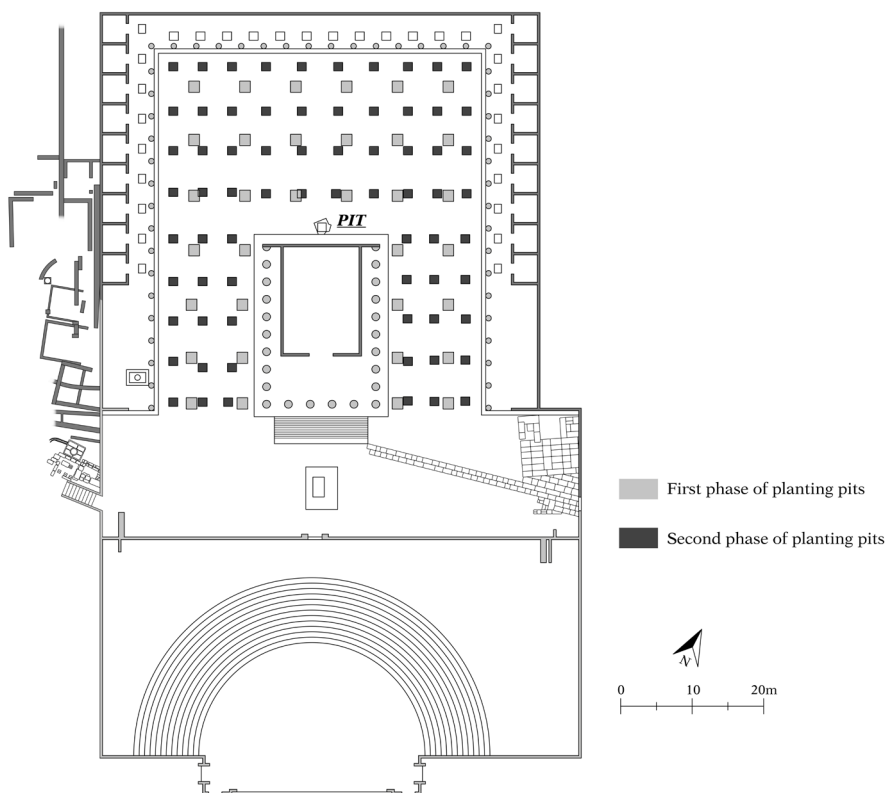


Figure 4.2 Plan of the excavated remains of the *temenos* area of the sanctuary of Juno at Gabii, including the planting pits around the temple podium.

Source: drawing by Matilde Grimaldi.

stone, commonly known as ‘peperino’, that was used in construction at Rome for many centuries (Marra et al., 2022).

This phase probably coincided with the closure and abandonment of the sacellum associated with Fortuna at the south-west edge of the new sanctuary, although it is unclear whether this resulted in a partial or complete burial of the sacellum and its carefully arranged votive deposits (Almagro-Gorbea, 1982: 606–7, 610). Although the *temenos* wall was superimposed on its eastern end, and the western area has since been lost through quarrying activity, the sacellum was certainly not destroyed: mid-twentieth-century excavation photographs suggest that inscribed *cippi* (small stone slabs) naming Fortuna remained in place and upright on its façade, their texts facing outwards (Almagro-Gorbea, 1982: plate vii.5).³ Nevertheless, it appears to have been intentionally excluded from

the main area of the reorganized sanctuary, and a new flight of steps led from the cobbled surface in front of the shrine to the equally new south-west gateway (Jiménez, 1982: 58). Importantly, however, despite the reorientation of the entire sanctuary, the original alignment of the sacellum was mirrored by the staircase, which was built immediately adjacent to it at an oblique angle with the new wall (Jiménez, 1982: 58). This is especially notable in the context of a new sanctuary where symmetrical precision and principles of axiality were a marked priority (Coarelli, 1987: 13; Rous, 2010: 167–8).

A different response to the presence of an existing area of ritual significance can be detected in the vicinity of the south-east entrance where the *temenos* wall deviated from its otherwise straight course. In the corner created as a result of this deviation are the remains of a very poorly preserved rectangular structure (3.40 m x 2.80 m) built using *lapis Gabinus*, with evidence of a worn moulding suggestive of the plinth of an altar (Jiménez, 1982: 58; for parallels see Moser, 2019). The ground immediately in front of the structure was paved, from which a path comprising two parallel lines of peperino slabs led to the south-east corner of the temple steps. The slabs of both the pavement and the path were arranged at an oblique angle that appears, from the excavation plan, to be similar to that of the sacellum of Fortuna and definitely not aligned with the strict axiality of the newer structures (Rous, 2010: 167–8). These may therefore have preserved the alignment of an earlier sacred area. However, the possible altar and its own associated paving appears to have been constructed on top of the earlier pavement, making it a later feature (most likely a replacement or renovation of an existing feature in the same position), and although it is also not in perfect alignment with the new structures, its orientation is much more closely allied to them (Jiménez, 1982: 58–9). Although the absence of detailed stratigraphic data for this combination of features prevents a definitive account of their use and development, it is reasonable to conclude that the *temenos* deviation was intended to respect an earlier feature that was later replaced (Rous, 2010: 168; Coarelli, 1987: 16, proposes that two separate shrines were placed side by side in this area). However, rather than excluding it from the *temenos*, as happened for the sacellum of Fortuna, this existing feature was deliberately incorporated within it.

The mid-twentieth century excavations also revealed that the open area behind and to the sides of the main temple structure was occupied by regular rows of roughly square pits in which trees, bushes or shrubs were planted to create a simulated sacred grove, seemingly recalling the earlier *lucus* (Jiménez, 1982: 52–5). The arrangement of pits, some of

which cut through each other, indicates at least two phases of planting (Coarelli, 1987: 16; Carroll, 2018: 23). It has been proposed that a quadrangular pit, recut multiple times at the base of the temple's rear wall, was the location of a (repeatedly replanted) tree that in its earliest phases was part of the original sixth century BCE *lucus* (Jiménez, 1982: 54–5; Almagro-Gorbea, 1982: 590). In a previous study, I explored this artificial grove from a multisensory perspective, using it to illustrate the temporal aspects of place and their role in generating lived religion (Graham, 2021a: 71–5). This drew close attention to the multisensory capacities of the regular rows of plants between the portico wings and behind the temple, while demonstrating how movement wove their affordances into a meaningful experience: the plantings of the grove 'afforded as well as constrained movement in particular ways and via specific routes in the same way as was afforded by the colonnades and other material structures of the sanctuary' (Graham, 2021a: 71). As well as moving bodies, the grove itself was subject to a form of movement or 'flow', as plants altered their form and potential affordances on a number of temporal scales, ranging from the daily to the seasonal. The two entrances and the dynamic grove provide a first glimpse of the potent combination of material, sensory and temporal aspects of place with which this chapter is concerned.

Architectural terracotta fragments indicate that the new sanctuary underwent both systematic and unsystematic restorations and interventions over the following 150 years, focused especially on the temple façade and roof, although none were as substantial as the work conducted in the second century BCE. The final major phases of architectural interventions can be connected with a period between the late first century BCE and early first century CE, probably associated with the emperor Augustus's restoration of traditional cult areas (Almagro-Gorbea, 1982: 618). From the first century CE, construction activities were restricted to essential maintenance before the sanctuary was abandoned in the mid-third century CE (Almagro-Gorbea, 1982: 624).

Sensorially assembling movement, matter and the past

Time and space at the sanctuary of Juno are typically characterized with reference to the series of discrete phases outlined above. However, the opening remarks of this chapter prompt other questions about how interactions between these complex overlapping structures and the people who frequented and moved around this sacred landscape drew

those features into other meaningful sensorial relationships that blurred such neat chronological divisions: to what extent did engagements with the affordances of the sanctuary involve sensory assemblages that also enabled its past to generate sensory affect in the present, and what were the consequences? To answer such questions, it is necessary to establish how customary approaches for identifying sensoriality and affect using archaeological data can be combined into a new methodology with concepts concerning virtual and actual pasts.

Memory and the past

This chapter is not the first to consider relations between ritual, time and the materiality of place in the sanctuaries of Republican Rome and Latium (Moser, 2019; Graham, 2021a). Claudia Moser (2019: 3), for example, has demonstrated that matter and movement were crucial to how past, present and future were experienced and negotiated in relation to ancient religious place. According to Moser (2019: 10), through repeated ritual and kinaesthetic engagements with the materiality of altars, successive generations of worshippers replicated previous practice, thus enabling the re-experience ‘of the ritual past in the present by an extended community of individuals, monuments, objects, and gods, concertedly responding in the here and now to the material memory of past practices, and continually maintaining the ways of the past for future generations’. What is more, when sanctuaries underwent alterations involving the renovation, replacement or burial of features such as altars, these temporal and material connections became even more significant as ‘sequences of once visible and then later hidden transmitters of memories of what lay buried yet further beneath’ (Moser, 2019: 135).

At the heart of Moser’s work lies a focus on the power of memory and on cultural understandings of the past that emphasize its apparent stability and durability: despite aesthetic and material changes, altars and their locations represent ‘the coalescence of centuries of ritual memory’ (Moser, 2019: 10) and are the setting for practices involving ‘timeless and enduring behaviours’ (Moser, 2019: 7). These concepts play a similarly significant role in Hamilakis’s original work on sensorial assemblages. Crucial for Hamilakis (2013: 122) was Henri Bergson’s suggestion that matter is durable, and as such ‘embodies various times at once’, times that become accessible to people through ‘reanimation and reactivation by sensorial and experiential processes’. Hamilakis went on to propose that human memory is vital for determining which of

those stable pasts become available to the senses, when he suggests that ‘every given present carries with it all pasts, but, of course, through the selective process of memory, only specific pasts are conjured up at any specific present moment’ (Hamilakis, 2013: 123). Therefore, in his initial formulation of sensorial assemblages, at least, Hamilakis privileged human memory as the sole means through which the past can be sensorially experienced in the present, reducing the role of matter to that of a fixed prompt or stimulus and sidelining the real, dynamic capacities of the virtual and actual pasts that he acknowledges in his subsequent work (Hamilakis, 2017).

Virtual and actual pasts

The ‘virtual’ and ‘actual’ were briefly introduced in the opening sections of this chapter, but to be built into a usable sensory methodology for analysing complex multi-period settings such as the sanctuary of Juno they require further unpacking. Ben Jervis (2019: 57–8) explains these concepts as follows:

The virtual and the actual are different modes of reality and do not simply equate to realized and unrealized potential (as the virtual consists of everything that has been, as well as everything that might have been and might be), nor to tangible and intangible (ideas, for example, are intangible but actual).

Expanding on this, Oliver Harris (2021: 236) defines the actual as ‘the empirical world we can measure around us, the size, weight and dimensions of objects, the current occupant of a seat, what a computer is being used for right now, not what it might be used for later’. As something empirical, the actual is therefore a form of reality that can be encountered via the senses (or ‘measured’ in Harris’s terms). Correspondingly, the virtual is ‘the part of an assemblage that is not currently actual’, and which ‘captures those things that are absolutely real but not currently present: the capacity of an empty mug to hold coffee, for a silent phone to ring, for a blank page to be filled’ (Harris, 2021: 241; see also DeLanda, 2016: 5–6 and 108–9). In other words, an actualized world possesses detectable sensory affordances or qualities; a virtual one also possesses those qualities, but they cannot be directly encountered. Virtual capacities must therefore be ‘actualized’ in order for their sensory affordances to be perceived and for their qualities to affect: the empty mug must become filled with coffee, a process that

allows the discrete haptic, olfactory and gustatory affordances, that were previously merely virtual, to affect a person's sensorium. This actualization of the virtual is described as an 'intensive process', which combines (or 'territorializes') things into assemblages that in turn generate affect (Harris, 2021: 239).

The virtual and actual have been used to frame discussions about the pasts that archaeologists themselves actualize in the course of research (Harris, 2017). Accordingly, 'the Roman period' about which archaeologists write can be considered a distinctive actualization of the past arising from the assembling of particular types of knowledge and forms of evidence, rather than an objective 'reality' meaningful to someone in the first century BCE. These actualized pasts have empirical affects in the present: they affect the sharing and creation of knowledge and understanding, ways of acting and new research.⁴ This is important because it shows how concepts of the virtual and actual also have the potential to be valuable in investigations of 'the past in the present' within those historical settings that archaeologists investigate (see also Bell, Chapter 2, this volume). That is to say that, if through intensive processes modern archaeologists can actualize the deep past in the present and be affected by it, ancient people – including those visiting the sanctuary of Juno – could potentially do the same. The discussion below will explore just one way in which this can be detected within the archaeological record, through an assessment of the role of moving bodies in actualizing the virtual past of the sanctuary of Juno.

Movement as intensive process

This chapter adopts and develops what has become a fairly standard methodology within ancient sensory studies: the identification of all potential sensory affordances associated with the objects, materials, places, substances and other things within a definable assemblage, the subsequent interpretation of the possible (individual and collective) impact of those affordances on the human sensorium, and an assessment of the behaviours, knowledge or other responses that resulted (Betts, 2017; Graham, 2021a; 2021b). In many ways, this finds connections with the sort of 'desktop' approaches outlined in the Introduction (Hamilton, Chapter 1, this volume). In the present context, what is newly proposed is that movement can be responsible for the generation of very particular assemblages in which the identifiable sensory affordances associated with some components comprise those of the virtual past actualized in the present. Movement, kinaesthesia and proprioceptive experiences are also

well-established components of work within sensory archaeologies as well as research that does not necessarily adopt explicitly sensory or phenomenological standpoints (Edgeworth, 2011; Leary, 2014; Lash, 2020; Aldred, 2021). As Ryan Lash (2020: 135) notes: 'Much of our sensory experience is achieved through movement', while movement also 'activates and accentuates the synaesthetic character of all sensorial experience'.⁵ Building on the above account of the virtual and actual, this chapter proposes that movement is also an example of an intensive process.

Intensive processes are essentially those processes that prompt relations between things, including between the sensing capacities of a person and the more-than-human world. As an intensive process, for instance, movement brings physically distanced objects and things into relational assemblages: a body moving from a shaded, enclosed portico into a brightly lit open space prompts the assemblage of a new collection of diverse affordances. The sensorial can also become foregrounded within the assemblages formed by intensive processes, such as movement, in ways that allow aspects of the virtual to become actual, or in other words to become directly accessible to the human sensorium. As an example, imagine a person entering the sanctuary of Juno via the south-east gateway, described above (see Figure 4.2). Their bodily movement (an intensive process) could cause them to assemble with the tactile and acoustic qualities of the peperino paving beneath their feet, its visual misalignment with the gateway, wall and temple and its disappearance under a differently aligned altar in the corner of the *temenos* wall. Rather than merely remembering previous uses of this area, their act of movement simultaneously engaged them directly and sensorially with the past, as actualized matter that had the capacity to affect (the pavement, the location of the altar, earlier orientations of the sacred space) and with the actualized matter of the present that also had the capacity to affect (the wall, the current altar, their own body). This is what Hamilakis (2017: 174, original emphasis) refers to when he writes about how 'certain planes of the past, or temporal occasions embedded in matter, voluntarily or involuntarily, acquire *sensorial intensity and affective weight*', that allows for the virtual to be actualized, and for the past to be actively engaged with via sensory modalities in the present.

However, actualized pasts remain continually subject to change, since matter is inherently vibrant and does not remain static (Bennett, 2010; Crellin, 2020): stone pavements and altars are liable to become differentially worn, polished, repaired and replaced, potentially offering other affordances to human sensoria. Subsequent movement might therefore generate alternative sensorial assemblages and involve

alternative actualized pasts. It should therefore be evident that this framing of sensorial assemblages with reference to the virtual and actual differs quite substantially from one predicated on a fixed or stable past recalled via memory alone: the visitor to the sanctuary did not merely remember its earlier material form but instead engaged sensorially with the dynamic matter of the past as its material affordances were continually actualized in the present through that person's intensive acts of movement.

Sensorial assemblages and the past at the sanctuary of Juno

Let's now return to the sanctuary of Juno to assess more closely the virtual and actual sensory affordances that might have been made available to an ancient person moving around this monumental complex. The south-east and south-west gateways were explicitly designed to facilitate movement in and out of the sanctuary. Movement and kinaesthetic experiences were therefore not only frequently at play at these locations but were especially heightened, making them ideal settings for an analysis of movement as an intensive process.⁶ Each gateway was nonetheless materially and sensorially different from the other, meaning that movement caused people to assemble with the very discrete affordances associated with each: one incorporated steps, the other did not; one involved encounters with a shrine outside the wall, the other with one inside the wall; one incorporated a cobbled surface, the other flat paving slabs. Having already briefly discussed some aspects of the actualization of the past in relation to the south-east gateway, this section concentrates on applying the same methodological and theoretical approach advanced above to a detailed evaluation of the south-west gateway (Figure 4.3).

Sensory encounters: the staircase

We can begin by following established sensory archaeology methodologies to consider what the archaeological data reveals about sensory affordances and movement in this area of the sanctuary. A visitor approaching from the south-west in the period after 150 BCE could gain access to the newly enclosed sanctuary via a flight of nine steps constructed from regular courses of squared stones (*opus quadratum*) on an area of cobblestone paving immediately adjacent to the apparently abandoned sacellum (Jiménez, 1982: 58). The non-monumental staircase was 4.50 m long and, despite being narrow (1.50 m), was

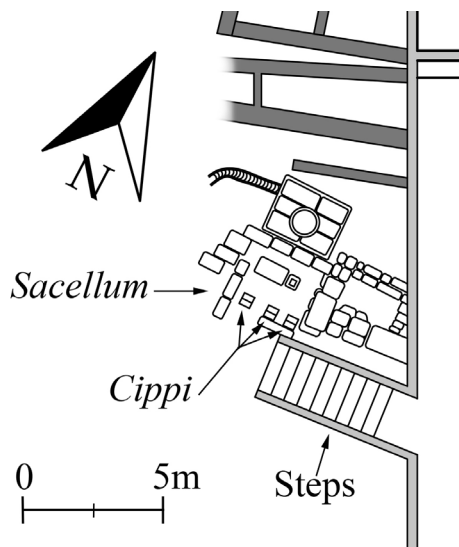


Figure 4.3 Plan of the excavated remains of the structures associated with the sacellum of Fortuna and the staircase leading to the south-west gateway of the sanctuary of Juno at Gabii (annotated detail of [Figure 4.2](#)). Source: original drawing by Matilde Grimaldi.

wide enough to accommodate two people walking abreast or passing one another on steps with a run ('going') of 0.45 m and a rise of 0.20 m (Jiménez, [1982](#): 58). To help contextualize and better understand how this affected particular types of sensory experience, the staircase dimensions can be cross-referenced with modern building regulations. Its dimensions are slightly above those permitted for 'institutional and assembly' stairs intended for 'a place where many people gather' by modern UK government building regulations, and closer to those acceptable for 'private' single-dwelling stairs (Building Regulations BS 5395-1:2010 Stairs, see Approved Document K [2013](#)). This suggests it lent itself primarily to routine forms of movement by individuals or very small groups, rather than large numbers of people. The pitch of the staircase was probably around 24 degrees, towards the lower end of the acceptable range for modern public stairs (20–35 degrees, with 30–35 degrees recommended). The staircase was also not as steep as those at other sanctuaries, including the precipitous central staircase of the sanctuary of Fortuna Primigenia at nearby Praeneste (Coarelli, [1987](#): 35–84; Graham, [2021a](#): 57–66; Graham, [2021b](#)). As a consequence, the steps were potentially accessible to a range of people, although individual experiences will have differed, especially for those who experienced

physical impairments or disabilities (Graham, 2021b). Based on current knowledge of the construction and use of steps in antiquity it seems unlikely that the staircase included a handrail, potentially placing further restrictions on its use by some individuals (Hollinshead, 2015; Graham, 2021b).⁷

People encountering the staircase therefore experienced the transition from one space to another through multisensory kinaesthetic sensations which emphasized the physical, muscular exertions and proprioceptive sensations of changing elevation and balance involved in ascending or descending a set of stone steps without a handrail, as well as the changing visual and aural prospects afforded by movement. In contrast to walking on the cobbled pavement outside the sanctuary, or the partially paved surface within it, the bodily changes of position and level of exertion required to walk up or down the steps made movement an intensive process capable of generating distinctive and situational sensorial assemblages. In other words, as well as possessing cognitive knowledge about how moving up or down the stairs would bring them into a different type of space, and cultural knowledge that led to the assignment of particular significance to that movement, the visitor will also have felt and understood this transition through the sensorial effects that were generated when movement caused them to assemble with the specific materiality of the south-west gateway steps.

The staircase was probably not used for processional purposes, since its dimensions afforded neither the easy movement of communal groups, nor quadrupeds destined for sacrifice at the sanctuary's altar. Sacrificial victims more probably entered via the south-east gateway before proceeding along the linear pavement towards the altar, where a metal ring set into the temple steps was used for temporary tethering (Almagro-Gorbea, 1982: 594; Coarelli, 1987: 15). The sensorial assemblages produced by movement up and down the south-west steps therefore featured primarily human individuals and small groups. That persons with physical or mobility disabilities may have been among them has already been mentioned, and the recovery from the site of anatomical votives (broadly dated between the third to first century BCE) also attests to the possibility of a range of vision impairments among the community who made use of the sanctuary. A considerable number of eye votives (129 examples), potentially associated with requests for divine healing, were recovered from 'Favissa III' at the southern end of the western portico, close to the south-west gateway. Eyes were the most common anatomical votive (a total of 286 examples) within all three 'favissae' deposits and elsewhere across

the site (98 examples), making them four times as numerous as ears, the second most frequently dedicated body part (96 examples) (Elvira Barba, 1982; Hasselin Rous, 2023). It is probable, therefore, that blind persons, or those who had low vision or visual impairment, also engaged with the south-west gateway area in distinctively personal ways, their movement generating sensorial assemblages in which visual affordances and visible distinctions between older and newer structures were not prioritized.

Movement up and down the steps, with all its individualized nuances, can therefore be identified as an intensive process that sensorially assembled differentially sensing kinetic human bodies with the actual affordances of the stone steps, the surrounding structures, the *temenos* wall (including the opening within it) and gravity, as well as with cultural knowledge about how movement towards, through and beyond the gateway entailed entering or exiting a sacred space.

Sensory encounters: the sacellum

Extending this analysis to incorporate the apparently abandoned sacellum suggests ways in which the sensorial assemblages generated via these intensive processes of movement could also involve sensory engagements with the affordances of actualized pasts, in similar ways to those already described for the paving and shrine at the south-east gateway. Moving up or down the steps, and into or out of the sanctuary via this gateway, entailed moving exactly parallel and immediately adjacent to the façade of the sacellum. Sensorial relations forged between this feature and the moving body were undoubtedly further enhanced by the conspicuously oblique angle of the stairs, which very explicitly responded to the presence and orientation of the shrine rather than to the *temenos* wall. Even a person concentrating only on using the steps could not help but find themselves sensorially assembled with the affective materiality of the sacellum, since its presence actively affected their movement.

The visual attention of a visitor climbing the stairs was most likely drawn to the shrine's obviously excluded, distinctly abandoned but not entirely destroyed structures pressed close to the side of the staircase. The act of upwards movement also brought continually changing visual perspectives that gradually allowed that visitor to look down into the open spaces enclosed within it. Additionally, the remains of other abandoned features connected with earlier stages of the sanctuary's development might have been detectable immediately behind the

sacellum, at least one area of which was possibly used during the second century BCE building work for the ritual disposal of unwanted materials from previous structures ('Favissa II': Almagro-Gorbea, 1982: 608). Equally complex sensorial assemblages will have emerged as a person descended the steps, with movement bringing them progressively closer to the shrine structures. As a result, what moving visitors engaged with were aspects of the material and sensorial capacities of a past sacellum actualized in the present, capacities which retained the possibility of generating affect whether they were recognized as the past or not. For instance, by bringing people into kinaesthetic relations with the affordances of the inscribed *cippi* at the base of the steps, which perhaps prompted visitors to trace the incised lettering with their fingers, or to read and possibly speak out loud the name of the goddess Fortuna, movement actualized the virtual past of this location as one that had and continued to provide access to the goddess, and which had and could continue to prompt certain ritual gestures, because of its affects on the sensing body. It was not (only) the present ruins that visitors' senses responded to, but to the actualization in the present of aspects of the virtual past of the sacellum.

It was movement, as an intensive process, that territorialized these multiple materials, structures and complex temporalities into sensorial assemblages that actualized elements of the physical materiality of the sanctuary's virtual past and made their affordances accessible to the human sensorium in the present. These were sensorial assemblages that foregrounded different actualizations of the shrine's continually becoming status in the past and present: as a recognizable sacellum that through its visible inscriptions remained overtly associated with a goddess, that through its tangible material presence retained its significance as a potential location for ritualized activities, and that continued to affect particular forms of movement through its influence on the staircase, but which manifestly played no active role in the sanctuary's present ritual practices and was excluded from the new *temenos*.⁸ Of course, the very specific affects of these sensorial assemblages will have differed for all visitors, including the blind people and people with vision impairments noted above. In those instances, the matter of the past sacellum was also actualized by movement, but the lack of an unequivocal visual distinction between the sacellum, other older structures and the new staircase and sanctuary wall may, for example, have led to a number of alternative experiences and rationalizations of their varied affordances. Furthermore, since actualization is a continually becoming state and therefore always temporary, when people were *not* moving

up and down the steps to the sanctuary the sensorial capacities of the sacellum remained virtual. They nevertheless continued to be available to a host of future potential actualizations.

The specific aspects of the past and present sacellum, actualized through intensive processes of movement via the staircase, were also subject to constant change. As noted above, it is not certain how ruinous the shrine's structure became as a result of the mid-second-century BCE building programme. The date (189–180 BCE) of the latest coin in the votive deposit associated with the sacellum ('Favissa I') led Almagro-Gorbea (1982: 607) to suggest that it was around the beginning of the second century BCE that the sacellum was 'closed'. This would indicate that it was already out of (formal) ritual use by the time it was excluded from the sanctuary. However, it is arguable that the coin could have been deposited at any time after 180 BCE, making it problematic as evidence for the full closure of the sacellum prior to the new building programme, even if the absence of later coins may indicate that its use for this type of offering, or its popularity more generally, had declined. Similarly, there is no evidence to indicate a formalized ritual closing of the sacellum: there are, for instance, no obvious ritual closure deposits (Edlund-Berry, 1994; Glinister, 2000) and no evidence for a complete or even token burial of its structures or prevention of access to the shrine. In fact, it appears to have remained readily accessible from the cobbled area at the base of the steps. If those responsible for the new sanctuary had intended that Fortuna's presence no longer be evoked, they could easily have removed, buried or erased the inscriptions. The sacellum was perhaps slowly abandoned and no longer maintained, becoming subject to the effects of its own vibrant materiality and that of the wider environment, as plants, weeds and insects, each with their own variable visual, olfactory and acoustic affordances, colonized the cracks between its stones and soil gradually infiltrated its open-air spaces. After all, abandoned structures do not remain static, and ruination need not be caused by anthropocentric action alone. This means that the matter of the sacellum, and its affordances, were always changing, before and after it was no longer actively used for ritual activities. Both the 'past' and 'present' shrine that movement caused people to assemble with were constantly becoming. The potential consequences of this vibrancy have already been demonstrated with reference to the parallel ways in which the sensory effect of the past sacellum might be experienced differently by people with vision impairments. In essence, those people engaged with actualizations of the virtual sacellum that were different from those who could visually detect that it belonged to a previous phase of activity.

The same principles hold true for those who encountered it at different moments in the year or when it was in a more or less ruinous state. These are just some examples of how multiple actualizations of the virtual were possible even for the same feature.

The significance of sensing the past in the present

The sacellum was therefore not merely a remembered aspect of the sanctuary landscape that people may have thought about as they walked past it. Instead, in these moments it was a tangible and sensorially affective actualized aspect of the sanctuary's past, something empirical with which people continued to engage in forms that extended beyond its ruination. When analysed from this perspective it becomes possible to investigate more closely what might have happened when people moving in and out of the sanctuary via the south-west steps were not prompted simply to recall the shrine as it once was (or as they had been told it once was), but instead sensorially encountered it as it had been, currently was and could still be.

What was the significance of these multitemporal sensorial encounters in the context of engagements with the religious setting of the sanctuary of Juno? The outcomes of engagements with actualized pasts in the present such as those described here will of course have varied from person to person. Nevertheless, it is reasonable to suggest that most generated broad forms of knowledge concerning the religious and ritual status of the sacellum as a continuously revered, respected, important and potentially still ritually powerful feature of the sacred landscape. For some visitors, the affordances that become available to them via a sensorial assemblage into which were territorialized both unmaintained structures undergoing material decay and newer monumental sanctuary architecture might have reinforced understandings of the importance of the latter within their own lived religious experiences. It might have emphasized the specifically localized character or power of the new titular deity, Juno, compared with others, including the goddess Fortuna whose ongoing presence continued to be actualized in a distinctively different manner through sensorial engagements with the sacellum. Movement up and down the south-west steps ensured that Fortuna and her shrine were continually actualized as components of the sanctuary at Gabii, but in ways that sometimes compelled her to play a subordinate role to Juno, to whom the elaborate architectural structures within the new sanctuary walls were dedicated. Fortuna and

her shrine may therefore have been ritually abandoned, but intensive processes ensured that these aspects of the sanctuary's past continued to be actively affective components of the present landscape. At times, such knowledge may also have had a role to play in heightening local forms of identity and competition with neighbouring communities: Fortuna was, after all, the goddess associated with another architecturally impressive sanctuary, built around a generation later at nearby Praeneste (probably 110–100 BCE).

It seems very probable that similarly complex relationships involving the actualization of the past were also formed with other material elements of the sanctuary, especially those which connected people with past ritualized activities. The altar and pavement in the vicinity of the south-east entrance were briefly explored from this perspective earlier in this chapter. The reorganized grove and the continually replanted tree immediately behind the temple, as well as the theatre *cavea*, might also be analysed through a sensorial assemblage framework that considers the actualization of virtual pasts in the present. This example and others deserve more sustained investigation than is possible here. Nevertheless, even without these other instances it is apparent that not only human and non-human, but also past and present, were assembled in multiple ways at the sanctuary of Juno, an observation that substantially complicates and adds four-dimensional nuance to the apparent simplicity of its precisely phased chronology and symmetrical two-dimensional plan.

Conclusion

This chapter has demonstrated how incorporating concepts of the virtual and actual into established sensory methodologies and studies of movement and kinaesthetic experience make it possible to reinterpret the archaeological remains of the sanctuary of Juno at Gabii. From this perspective the sanctuary is revealed as the setting for direct sensorial encounters with the affordances of actualized pasts in the (ancient) present. By applying Hamilakis's (2017) 'sensorial assemblage' approach, in accordance with its intended theoretical underpinnings, new ways of assessing the sensory power of the past for generating experiences in the present have therefore been revealed. It has shown that under certain circumstances virtual pasts could – and still can be – actualized in ways that render them materially and sensorially accessible in the present, where they continue to be part of ongoing relations. The example of the

sacellum of Fortuna at the sanctuary of Juno Gabina has highlighted how the application of this methodology can generate more complex, multi-layered interpretations of multi-period ancient sanctuary landscapes. Furthermore, this chapter has engaged in the ongoing actualization of the sanctuary's past in our own present, via another intensive process: that of archaeological research and theoretical discourse.

As a result, it can be stated that both the pasts that were sensorially experienced by ancient visitors to the sanctuary at Gabii, and those that we actualize as part of contemporary research practices, retain the potential to affect, and consequently to always be potent in the present. Accepting this position and finding ways to incorporate it into well-established sensory methods for assessing archaeological landscapes, allows us to advance new interpretations of ancient sites, structures and artefacts. These extend far beyond the typical designation of certain features as unchanging symbols or material signs of a stable past with a fixed meaning transmitted through memory. Equally, such observations should encourage archaeologists to revise their temporal characterizations of archaeological sites as a series of discrete 'phases', as we discover that all of those moments could potentially be encountered concurrently via the senses.

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Notes

- 1 The concepts of 'virtual' and 'actual' were adopted and developed by Gilles Deleuze and Félix Guattari (2013 [1980]) in their work on relationality and assemblages, which has gained considerable currency within recent discourse on archaeological theory as part of a so-called relational or new materialist turn, despite remaining regrettably under-applied to ancient Mediterranean contexts (Jervis, 2019; Crellin et al., 2021; Graham, 2021a; Harris, 2021).
- 2 Current excavations centre on other aspects of the city: The Gabii Project n.d.; Becker et al., 2009; Samuels et al., 2022; Banducci and D'Acri, 2023.
- 3 The partial reburial of the remains that were once excavated at the site, and its current state of preservation and presentation (large areas are now fully grassed over) make it difficult to

visually assess these relationships *in situ* today, and it is therefore also unfortunately not possible to provide further visual reference materials for the key features discussed in this chapter.

- 4 It is worth noting that the actual never becomes fixed but continues to change, creating 'potential for new intensities to emerge ... as other interventions in the past lead to new processes of actualisation' (Jervis, 2019: 58; see also Harris, 2021: 236). The coffee in the mug might be drunk, actualizing different virtual aspects of the mug: a mug that recently contained coffee. This means that, despite appearances, actualized pasts including 'the Roman period' remain in flux and available for ongoing actualization in alternative ways, in this case as archaeological research develops. Although they do not frame it in these terms, see Padilla Peralta and Bernard, 2022 for a demonstration of a newly actualized 'middle Roman Republic'.
- 5 See also Hamilakis, 2013: 79–80 on 'the glance'.
- 6 The opening in the wall at the summit of the theatre *cavea* provided another potential point of entrance and exit for the sanctuary. This also entailed particular forms of movement and was in use contemporaneously with the south-east and south-west gateways. The inclusion of some form of theatre *cavea* was also typical of other monumentalized sanctuaries of Latium in the late Republic, including Tibur, Praeneste and Fregellae (Coarelli, 1987; see also Figure 4.1, this volume, 84). A full examination of the *cavea* at Gabii is beyond the scope of this chapter, but it should be noted that using this entrance/exit involved negotiating a series of stone steps in an upwards or downwards movement that territorialized the visitor with specific material aspects of the sanctuary. People entering via this route moved from a wide, open space (perhaps with distinctive acoustics) through a narrow opening in the wall, which will have significantly slowed and disrupted the movement of a large group, potentially focusing attention on the wall as a point of division or separation between spaces of different status. They then emerged into another open, but nonetheless architecturally controlled, space dominated by the temple façade and its surrounding shrubs or trees. They were also required to make further lateral movements in order to move around the main altar placed close to and immediately in front of the opening, briefly halting forward movement. Such movements territorialized visitors into assemblages with the altar in ways that involved changing visual, acoustic and haptic experiences that affected the sacred character of the site and actualized aspects of its past and present use. It is not clear how often or under what circumstances this point of entry/exit was used, or by whom, and whether it was only significant if and when the theatre was the setting for communal ritual, or other non-ritual events, such as political gatherings. Like the south-east and south-west gateways, however, the comparative narrowness of the opening in the wall suggests that it did not afford processional movement.
- 7 Although this chapter draws on the work of Hamilakis for its overall theoretical framework, it is important to point out that, along with scholarship on archaeological phenomenology by other researchers, aspects of Hamilakis's approach have been rightly criticized for their normative approach to 'the human' sensorium and sensory experience. Many such studies assume that the sensory experiences of white, able-bodied, heterosexual, Western/European, adult males reflect a baseline of shared experiences from which representative generalizations can be drawn. For the importance of incorporating more diverse perspectives, such as those foregrounded here, see Graham, 2021b; Ward, 2023.
- 8 The sensorial exclusion of the sacellum might additionally have been reinforced by the absence of the typical sounds and smells of ritual activity encountered there in the past (ritual utterances, prayers, chanting or singing, incense, blood, food and liquid offerings, animal faeces and so forth), or their replacement by other acoustic and olfactory affordances. Those same ritual sounds and smells might still be available within the new *temenos*, becoming more or less pronounced as a person moved up or down the staircase, towards or away from them, but they also always had the potential to be actualized once again at the sacellum through the performance of ritual activities and movements.

References

- Aldred, O. (2021) *The Archaeology of Movement*. Abingdon: Routledge.
- Almagro-Gorbea, M. (1982) 'Recapitulación: Interpretación histórico-cultural'. In M. Almagro-Gorbea (ed.), *El Santuario de Juno en Gabii*. Rome: Escuela Española de Historia y Arqueología en Roma, 581–622.

- Approved Document K (2013) *Approved Document K: Protection from falling, collision and impact, K1. Stairs, ladders and ramps*. London: Ministry of Housing, Communities and Local Government.
- Banducci, L. M. and D'Acri, M. (eds) (2023) *Gabii through its Artefacts*. Oxford: Archaeopress.
- Becker, J. A., Mogetta, M. and Terrenato, N. (2009) 'A new plan for an ancient Italian city: Gabii revealed', *American Journal of Archaeology*, 113: 629–42.
- Bennett, J. (2010) *Vibrant Matter: A political ecology of things*. Durham, NC: Duke University Press.
- Betts, Eleanor (ed.) (2017) *Senses of the Empire: Multisensory approaches to Roman culture*. Abingdon: Routledge.
- Carroll, M. (2018) 'The sacred places of the immortal ones: Ancient Greek and Roman sacred groves'. In J. Woudstra and C. Roth (eds), *A History of Groves*. Abingdon: Routledge, 13–33.
- Cipolla, C. N. and Quinn, J. (2016) 'Field school archaeology the Mohegan way: Reflections on twenty years of community-based research and teaching', *Journal of Community Archaeology and Heritage*, 3(2): 118–34.
- Coarelli, F. (1987) *I Santuari del Lazio in età Repubblicana*. Rome: La Nuova Italia Scientifica.
- Crellin, R. J. (2020) *Archaeology and Change*. Abingdon: Routledge.
- Crellin, R. J., Cipolla, C. N., Montgomery, L. M., Harris, O. J. T. and Moore, S. V. (2021) *Archaeological Theory in Dialogue: Situating relationality, ontology, posthumanism, and indigenous paradigms*. Abingdon: Routledge.
- DeLanda, M. (2016) *Assemblage Theory*. Edinburgh: Edinburgh University Press.
- Deleuze, G. and Guattari, F. (2013 [1980]) *A Thousand Plateaus*. London: Bloomsbury.
- Dignas, B., Smith, R. R. R. and Price, S. R. F. (eds) (2012) *Historical and Religious Memory in the Ancient World*. Oxford: Oxford University Press.
- Edgeworth, M. (2011) *Fluid Pasts: Archaeology of flow*. Bristol: Bristol Classical Press.
- Edlund-Berry, I. E. M. (1994) 'Ritual destruction of cities and sanctuaries'. In R. de Puma and J. P. Small (eds), *Murlo and the Etruscans: Art and society in ancient Etruria*. Madison: University of Wisconsin Press, 16–28.
- Elvira Barba, M. A. (1982) 'Terracotas votivas'. In M. Almagro-Gorbea (ed.), *El Santuario de Juno en Gabii*. Rome: Escuela Española de Historia y Arqueología en Roma 17, 263–300.
- Gabii Project*. n.d. Accessed 6 December 2022. <https://gabiiproject.org/>.
- Galinsky, K. (ed.) (2014) *Memoria Romana: Memory in Rome and Rome in memory*. Ann Arbor: University of Michigan Press.
- Glinister, F. (2000) 'Sacred rubbish'. In E. Bispham and C. Smith (eds), *Religion in Archaic and Republican Rome and Italy: Evidence and experience*. Edinburgh: Edinburgh University Press, 54–70.
- Graham, E.-J. (2021a) *Reassembling Religion in Roman Italy*. Abingdon: Routledge.
- Graham, E.-J. (2021b) 'Interactional sensibilities: bringing ancient disability studies to its archaeological senses'. In E. Adams (ed.), *Disability Studies and the Classical Body: The forgotten other*. Abingdon: Routledge, 165–91.
- Graham, E.-J. (2024) 'The haptic production of religious knowledge among the Vestal Virgins: A hands-on approach to Roman ritual'. In A. Graham and B. Misis (eds), *Senses, Cognition, and Ritual Experience in the Roman World*. Cambridge: Cambridge University Press, 59–88.
- Hamilakis, Y. (2013) *Archaeology and the Senses: Human experience, memory, and affect*. Cambridge: Cambridge University Press.
- Hamilakis, Y. (2017) 'Sensorial assemblages: Affect, memory and temporality in assemblage thinking', *Cambridge Archaeological Journal*, 27(1): 169–82.
- Harris, O. J. T. (2017) 'Assemblages and scale in archaeology', *Cambridge Archaeological Journal*, 27(1): 127–39.
- Harris, O. J. T. (2021) *Assembling Past Worlds: Materials, bodies and architecture in Neolithic Britain*. Abingdon: Routledge.
- Hasselin Rous, I. (2023) 'Terracotta artefacts from the Temple of Juno Gabina: Recent findings'. In L. M. Banducci and M. D'Acri (eds), *Gabii through its Artefacts*. Oxford: Archaeopress, 92–105.
- Hollinshead, M. B. (2015) *Shaping Ceremony: Monumental steps and Greek architecture*. Madison: University of Wisconsin Press.
- Jervis, B. (2019) *Assemblage Thought and Archaeology*. Abingdon: Routledge.
- Jiménez, J. L. (1982) 'Arquitectura'. In M. Almagro-Gorbea (ed.), *El Santuario de Juno en Gabii*. Rome: Escuela Española de Historia y Arqueología en Roma 17, 39–86.

- Lash, R. (2020) 'Movement, materials, and intersubjectivity: Insights from Western Ireland'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 130–48.
- Leary, J. (2014) *Past Mobilities: Archaeological approaches to movement and mobility*. London: Routledge.
- Lucas, G. (2021) *Making Time: The archaeology of time revisited*. Abingdon: Routledge.
- Marra, F., Palladino, D. M. and Licht, O. A. B. (2022) 'The peperino rocks: Historical and volcanological overview', *Bulletin of Volcanology*, 84: 69. Accessed 5 January 2025. <https://doi.org/10.1007/s00445-022-01573-5>.
- Moser, C. (2019) *The Altars of Republican Rome and Latium: Sacrifice and the materiality of Roman religion*. Cambridge: Cambridge University Press.
- Padilla Peralta, D.-E. and Bernard, S. (2022) 'Middle Republican connectivities', *Journal of Roman Studies*, 112: 1–37.
- Rous, B. D. (2010) 'Triumphs of Compromise: An analysis of the monumentalisation of sanctuaries in Latium in the late republican period (second and first Centuries BC)'. PhD thesis, University of Amsterdam. Accessed 6 December 2022. <https://hdl.handle.net/11245/1.327031>.
- Samuels, J. T., Cohen, S., Johnson, T., Moses, V., Naglak, M., Opitz, R., Banducci, L., D'Acri, M., Motta, L., Rittershaus, A. and Stewart, E. (2022) 'Reimagining urban success: Rhythms of activity at Gabii, 800 BC–AD 600', *Antiquity*, 96(385): 103–22.
- Vonnegut, K. (2010 [1969]) *Slaughterhouse Five*. London: Vintage.
- Ward, M. (2023) *Blindness and Spectatorship in Ancient and Modern Theatres: Towards new ways of looking and looking back*. Cambridge: Cambridge University Press.

Experimental multisensory survey of precolonial towns on the East African coast

Monika Baumanova

Archaeological heritage on the East African coast is renowned for the remains of precolonial Islamic towns, which engaged in long-distance trade along the Indian Ocean rim throughout the last millennium. The stone buildings preserved on these sites are the only standing part of this past built environment, as evidence of earthen houses is only accessible through excavations. These stone remains allow some level of direct sensory experience of the houses and towns, as opposed to other building typologies. Pushing beyond typical investigatory methods used in the region, this chapter engages with the sensory characteristics of the stone buildings, in order to show how they may advance our understanding of precolonial Swahili towns.

Apart from understanding how the properties of the built environment acted on individual senses, this study taps into the current trend of multisensory analyses, experimentally addressing the complex corporeal experience of the precolonial Swahili stone-built environment by incorporating vision, sound, smell and haptic experience. Two sites in Kenya, Jumba la Mtwana and Mnarani, are used as case studies. This chapter explores the sensory implications of past spatial configurations, the distribution of public spaces, as well as sensory connotations of Swahili stone building alterations. These are considered against the background of seasonality and zoning in Swahili towns. Together with ethnographic and historical data, this chapter brings insights relevant for Swahili archaeology and informs our understanding of specific aspects of past lifestyle and social sustainability in these towns.

Introducing sensory archaeology to the Swahili coast

In recent decades, sensory archaeology has aimed to make a more global appeal, exploring beyond Western contexts and increasingly finding applications beyond its well-established domain of European prehistory and ancient world. In an effort to work with a geographically broader range of case studies, as well as to widen its methodological toolkit, African case studies can be highly relevant to archaeological investigation, yet are few in number (for example Skeates and Day, 2019). This chapter contributes to sensory archaeology with a consideration of Swahili sites on the East African coast. The remains of precolonial towns with well-preserved stone buildings are distributed on a strip of land along the Indian Ocean, several kilometres wide and nearly 3,000 km long, extending from present-day southern Somalia, Kenya and Tanzania, to northern Mozambique and Madagascar, and on numerous islands near the coast.

The character of the precolonial Swahili built environment, which has been studied since World War II, marks this region as particularly interesting for sensory archaeology. Spatial and social dynamics were intertwined in complex ways, as suggested by ethnographic and archaeological data (for example Horton and Middleton, 2000; Ichumbaki and Pollard, 2021). As a result, a number of their aspects must have influenced sensory perception. For example, the specific arrangement of rooms in houses or the placement of monumental tombs in highly visible locations within towns. The appearance and organization of the built environment was similar in settlements along the coast, suggesting that they supported a certain level of uniformity in the sensory landscape too, ranging from characteristic aural properties of houses, due to layout and building material choices, to the experience of moving through towns with similar placements and distributions of buildings. The existence of these patterns in the sensory environment may be generalized to represent the local sensory 'norms'.

As in any other part of the world, these past sensory norms translated into some level of shared experience of living in the world and being in an 'urban' context and hence were part of the local identity, customs and cultural traditions. In the absence of contemporary written accounts, there has been an overwhelming reliance on later historical and ethnographic evidence for interpreting the meaning of early Swahili built environments (for examples, see Fleisher, 2015; Gensheimer, 2001; Meier, 2016). Sensory archaeology, albeit little explored in Swahili archaeology, may therefore add balance to the debate on precolonial

Swahili past, because it is, to a degree, based on analysing universal sensory capacities of human bodies, which may then be interpreted in context with local material culture, such as the built environment.

Though they represent only part of the original past built environment, the standing stone architectural remains on the Swahili coast can be used to reflect on and bring together spatial data-based analytical calculations and experimental qualitative research, based on testing sensory experience at each site. In the author's previous research, a range of quantitative methods were employed with a focus on audibility, such as calculating the spatial reach of calls to prayer from mosques or sounds of the ocean (Baumanova, 2021) or studying the role of courtyards in movement (haptic) patterns inside houses (Baumanova, 2022).

Building on some of these sensory-based findings by the author, the following discussion presents an experimental field approach that is complementary to desk-based research. It seeks to establish the multi-sensory capacity of space on the site, exploring a range of evidence preserved in the appearance, composition, layout and character of the stone-built environment. It also evaluates how a multisensory approach may be designed, building on field surveys undertaken at two case study sites in Kenya: Jumba la Mtwana and Mnarani.

The Swahili built environment: its character and capacity for sensory perception

Archaeologically, the origins of the Swahili people can be traced back to the seventh and eighth century CE. The precolonial period is usually understood to have ended gradually, from the seventeenth century onwards, when the increasing involvement of European and Omani colonial powers in the region had a significant impact on the existing local political and social arrangements. Throughout the precolonial period, certain features became characteristic of Swahili society and have also been used as key reference points in archaeological research. One of these is the importance of Islam, which became the dominant religion on the coast. Islam in East Africa did not spread further inland and it was probably used to enhance the position of the coastal society as that of trustworthy middlemen. This way, the Swahili were making a livelihood and drawing prestige from facilitating trade links both with the predominantly Islamic regions along the Indian ocean rim and with the African interior.

This intertwining of religion and trade, shows that commerce shaped the economy on the coast, as well as important sociospatial practices. For example, in places associated with social encounter, such as public spaces and house courtyards, imported items were displayed to demonstrate wealth and contacts with faraway lands. Trade was linked with social cooperation as well as competition; for example, access to specific places and resources was limited (Middleton, 2004), while the internal organization of Swahili towns relied on divisions into urban quarters and wards (Baumanova, 2020; Wilson, 1982). Politically, the towns of the Swahili trading communities most likely organized themselves as separate city-states or formed coalitions (Sinclair and Håkansson, 2000). Despite this relative political fragmentation, there was a marked level of coherence within the Swahili cultural sphere. This is represented in portable material culture as well as the architecture of houses and burial customs, which seem to have been adopted and respected – with local variations – all along the coast.

The shared range of identifiable features of precolonial Swahili sites includes building technologies and related materials. The primary building material was wattle-and-daub, fossilized coral or a mixture of the two. As a material of organic origin, coral is a type of limestone with numerous sensory connotations (Figure 5.1). This so-called coral rag was quarried on land and was used in the form of ashlar blocks as the main structure of buildings for most of the precolonial period. Porites coral was quarried from the ocean, some distance offshore, and because it was soft while still wet, it could be carved. The earliest buildings were constructed entirely of porites coral, but in later buildings it was reserved mostly for those elements that required more delicate shaping such as decorative features and doorways. While wood is most commonly associated with carving, most types of wood available on the coast are either too hard or too fibrous (such as mangroves and neem or coconut palms) and its use was mostly limited to roof or rope construction. Apart from block-cutting and carving, coral was also burned to obtain lime, which was then used as mortar and plaster. Freshly built or plastered buildings were white, which made them easily visible when one approached coastal towns from the land or the ocean.

The coral architecture of the Swahili coast represents one of the few global uses of this technology outside the Gulf of Mexico and the Pacific islands (Molle et al., 2023; Newcomb, 1990 [1937]). It mostly fell out of use on the coast, replaced today with modern materials. Modern buildings are therefore significantly different in terms of sensory properties. The study of sensory properties of precolonial buildings at



Figure 5.1 A piece of coral used for building, from the site of Jumba la Mtwana, Kenya. *Source:* author.

archaeological sites hence represents an important, and otherwise inaccessible, aspect of past urbanism.

Initially, the first – and in some places the only – stone buildings were mosques, which marked the gradually growing importance of Islam in Swahili towns, from the tenth century, and played a role in creating urban communities (LaViolette et al., 2023). By the thirteenth century, coral rag was being used to construct mosques, tombs and a range of other structures, including town walls, wells and outbuildings, as well as residential buildings. This ubiquity suggests that the whole population of most towns would have been familiar with the daily sensory experience of a stone-built environment.

Stone buildings were relatively expensive to construct, requiring expertise, labour investment, regular upkeep and long-term planning. Hence, stone residential architecture has generally been understood as representing the elite or wealthier part of the population (El Zein, 1974; Horton, 1994). However, the size of individual stone houses varied greatly, as did their proportions and distribution. This suggests that no distinctive part of society could be uniformly associated with stone houses. In contemporary contexts, construction with modern permanent materials in the region is interpreted primarily as a long-term

involvement and investment by the owner in the local community, while its representation of wealth is secondary (Kamalkhan, 2010: 185; Sheriff, 2006). So, it cannot be excluded that the more permanent character of building material in the precolonial period was similarly associated with layers of meaning beyond wealth.

Several features of the precolonial stone house layouts may be identified as typical, including a characteristic arrangement of interior spaces and their proportions. The houses consisted of open-air courtyard(s) and oblong rooms. Courtyards were usually stepped, which means they had rows of benches along the sides. Smaller houses usually had four or five rooms and one courtyard; the number of courtyards grew proportionally as the house size increased (Baumanova and Smejda, 2018). The largest recorded residential buildings are known as palaces or palace-complexes and featured approximately 40–60 rooms. Regardless of their large size, the palace-complexes adhered to the same spatial logic as smaller dwellings, apparent for example in the configuration of their rooms, which facilitated similar patterns of movement or possible sightlines between open courtyards and rooms (Baumanova and Smejda, 2018). In this way, the shared principles of spatial configuration promoted specific patterns of sensory perception that are further discussed below.

The individual rooms of the stone houses were long and narrow; their proportions were largely predetermined by the length of the mangrove poles used for roofing, which limited their width to approximately 2.5 metres. Such elongated narrow rooms would have had unfavourable auditory properties, as reverberation would impact the intelligibility of human voices, but this was likely much improved by the custom of hanging carpets on the walls (Baumanova, 2021). Interior rooms usually had no windows, light was provided through open doors and by lamps placed in wall niches. This suggests that doors between individual rooms were kept open during the day.

Use of individual rooms in houses has long been discussed in Swahili archaeology. The study of space within houses has been influenced by ethnographic parallels drawn primarily from historical houses in Lamu, in northern Kenya. In the Lamu examples, the front room of the house served to receive visitors and have business meetings, and the farther one proceeds from the entrance, the more private the roles of the rooms become (Allen, 1979; Donley-Reid, 1990; Horton, 1994). This model was supported by later architectural studies that stipulated that private spaces were situated at the back of the house and, in the case of later Lamu houses, on the upstairs floor (Kamalkhan, 2010). Parallels with Lamu refer to a continually occupied but much-changed town over

the colonial period, when it was strongly influenced from the Middle East (see also Fleisher, 2015). Furthermore, the differences in layout between precolonial houses and those at Lamu (early descriptions of later houses can be found in Ghaidan, 1975), would have an impact on sensory characteristics of the house. For example, the small size and low configurational importance of courtyards in later Lamu houses contrasts with the general situation in the precolonial period, when courtyards are prominently placed just beyond the house entrance, stepped and proportionally larger (Baumanova, 2022). Compared to later houses, the precolonial courtyards would have functioned as more prominent sources of light for the houses, and their depth and stepped character would have better carried sound and odours through the houses.

Regarding urban exterior space, precolonial sites with numerous stone buildings, such as Gede, Mtwapa, or Jumba la Mtwana in Kenya and Kilwa, Songo Mnara or Kuan in Tanzania (Figure 5.2), share a number of sensory characteristics associated with built features. For example, the visual experience of towns was influenced by tall monumental stone tombs, while movement was determined by the composition of houses built in blocks. For the site of Shanga, Kenya, it was argued that urban quarters with dedicated access routes were distributed evenly around a central area (Horton, 1994). From the distribution of gates, access routes or entranceways, it is apparent that channelling and limiting movement choices has been a characteristic feature of Swahili urban space (Baumanova, 2020).

Sensory experience of the built environment on the Swahili coast was to a certain extent shaped by the natural environment too. The coastal landscape provided access to specific resources, supplying the local people with fish, or coral for building, while the ocean facilitated communication along the coast. The alternating dry and wet seasons are demarcated by the monsoons, and in the past, these directly affected trade by determining the seasonality of travels from the Middle East, between November to March, and in the opposite direction between July and October. On land, the prevailing winds come from the east, that is, from the ocean (Mahongo et al., 2011). Approaching the coastline, characterized by sandy beaches, rocky outcrops and dense mangrove forests (Pollard, 2018), there are numerous islands, archipelagos, lagoons and changing patterns in mangrove composition. These create a variety of memorable settings and constellations. The landscape immediately beyond the shoreline is characterized by alternating dry grasslands and tropical coastal forests. Trees mark boundaries of land plots and feature as reference points in oral histories, inside and outside of settlements

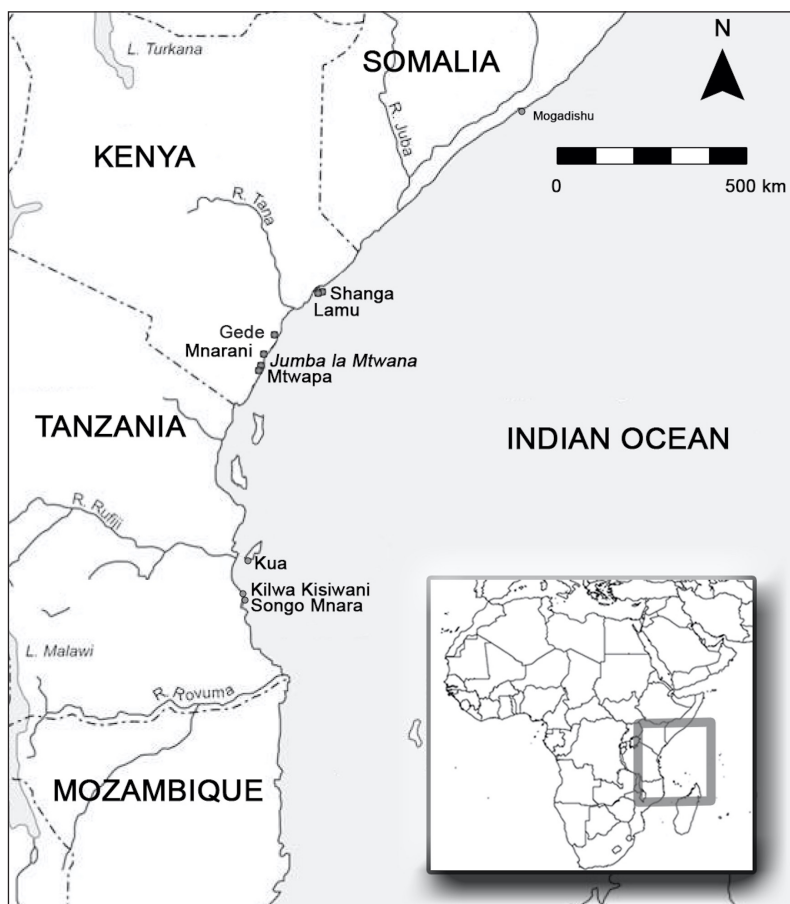


Figure 5.2 A map of the East African coast, showing the location of sites mentioned in the text. *Source:* author.

(Fabian, 2019: 38). Assessing the past sensory environment needs to include the seasonality, the local climate, vegetation and resources, available along the coast, that are experienced through views, natural sounds and odours.

The social relevance of sensory perception in the Swahili cultural context

Comparing various societies around the globe, there is a different sensitivity and relevance routinely ascribed to individual senses. For example,

vision is the most important sense in Western societies, associated with order, nobility and truthful perception of the world (Rodaway, 1994: 124). The significance of vision stems from and is accentuated by ever-present visual stimuli such as written texts and images (Llobera, 2007). The prioritization of one sense does not mean, however, that other senses are disregarded. The role and relative importance routinely ascribed to individual senses as well as the sensory stimuli in the environment create traditions that may be termed 'prevailing sensory regimes' (Howes and Classen, 2014: 12), which characterize individual societies at any point in time.

With the goal to interpret past social transactions, understanding a sensory regime requires multisensory considerations. A number of studies have put forward the argument that this 'sensory envelope' of a given society may help to bridge the gap between a narrative and investigative understanding of the past (Baumanova, 2020; Fleming, 2005; Frieman and Gillings, 2007). The shared sensory pattern and context of interaction is well established as contributing to the construction of identity and tradition (Drewal, 2020: 278). Multisensory studies reflect the observation that all senses are interconnected, as our perception registers them simultaneously. For example, movement, as part of the sense of touch, requires physical interaction, similar to taste, while other senses like vision, hearing and smell operate at a distance (Howes and Classen, 2014: 8). Senses also complement one another with their properties. In this vein, vision and touch are unidirectional and reciprocal, as human bodies are unable to employ them without being visible or touched at the same time, while sound and smell are multidirectional and nonreciprocal, because aural or olfactory perception is possible without being heard or smelled (Ingold, 2000: 276).

In order to establish some basic foundations that may be relevant for the precolonial Swahili sensory regime, data from societies that share important key features with the Swahili may be considered. In the Islamic world, the role of vision usually has a specific character and social connotations. Accent is placed on close-range vision, represented by ornaments inviting closer inspection, or preference for short streets in urban layouts, which promote gradually opening views and close-range experience (O'Meara, 2019). Privacy is often thought of as characterizing the interior space, attested by its capacity to enclose sound (Mills, 2014: 42). However, the precolonial Swahili differed from many other Islamic cultures in that they were a society with oral histories, using Arabic script only for limited purposes, such as on tomb epigraphy or on coinage. From this perspective, communities with oral histories

have been noted as less visually oriented on the whole, accentuating sound and hearing as a more prominent and relevant sense (Rodaway, 1994).

Further guidance may be provided by ethnographic data recorded in later colonial and postcolonial contexts, as the relevance of the documented themes may extend over a long period of time. The importance of visual access, and sightlines specifically, has been attested in the Swahili context by the ethnoarchaeological studies of Linda Donley-Reid, who argued that the alignment of series of doorways inside the house allowed the display of expensive imported items, in niches in the back room, to visitors who entered the front rooms (Donley, 1982; Donley-Reid, 1987; 1990). Archaeological data on numerous precolonial sites support the hypothesis that visual access inside houses was shaped to cross physical boundaries when desirable (Baumanova, 2020). Similarly, there was a custom of setting porcelain bowls into facades or pillars of tombs, which represent the tallest and most visually exposed parts of these mortuary monuments. The popularity of richly and colourfully decorated cloth and clothing is also linked with visibility. Cloth is documented as a desired import from India and the Middle East and was used to showcase wealth and social power (Meier, 2009; Pearson, 1998). Although textiles are not preserved on Swahili archaeological sites, the abundant evidence of peg-holes demonstrate that cloth or rugs were commonly displayed on house walls. This practice must have imprinted on visual and auditory perception, as discussed above (Baumanova, 2021).

Ethnographic studies offer further examples of how material culture could have been employed to engage the senses, but there are very few, if any, parallels preserved from the precolonial period, especially with regard to smells or sounds. Odours have played an important role within Swahili homes, with incense burners placed in meeting spaces (Verne, 2012: 199–200). These could have been used to create specific olfactory experience of the houses, distinct from exterior space. Today, preferred odours in Swahili houses include jasmine, ylang-ylang and other sweet smells (Kamalkhan, 2010: 158). Following classifications used for human neural perception, these smells have a ‘warm’ sensory association (Barth et al., 2012). In the past, the exterior space of towns would have featured smells associated with daily activities, that can no longer be experienced on the sites today. Archaeological evidence from Songo Mnara, Tanzania, for example, showed that activities like food preparation took place outdoors (Wynne-Jones, 2013). As smells linger and spread well in the coastal weather, it can be assumed that odours of outdoor activities were apparent, especially in seasons with higher

humidity, when they would be notable even in the more open parts of towns or on the beaches.

Likewise, sounds have been noted as an important part of Swahili social events, as music is associated with festivals, including weddings, commemorative gatherings and processions (Ivanov, 2014). Auditory sensations are represented by the prominent role of musical instruments such as drums and *siwas* (a type of blowhorn) and the popularity of dance and singing (Middleton, 2004: 51). The regular presence of music in the Swahili sensory environment may be recognized as rooted in the African continent, because its role is usually not so prominent in other Islamic societies. Features of Swahili music also reveal the cosmopolitan nature of the society, linking the coast with other regions. This ‘translocal’ quality is also reflected in other senses such as taste in food choices and in imported decorative objects for visual and haptic appreciation (Ivanov, 2014; Verne, 2012).

The building customs and practices discussed above are today often presented as ‘traditional’ because they are likely to have certain historical depth. Although it cannot be presumed that the meanings of these customs extended to the precolonial period, they demonstrate that, in principle, sensory aspects could have been particularly meaningful in some situations and spatial configurations. The life of recent Swahili generations is rich with sensory experience, highlighting numerous contexts where it accompanies or charts the setting of social transactions.

In order to begin to understand sensory characteristics of the past environment, it is perhaps unnecessary to know what specific sounds or smells accompanied individual events or places, but rather what the capacity of the building was to contain or propagate them. Adopting this approach, Chris Scarre argued that identifying patterned repetition and design coherence is sufficient in acoustic contexts (Scarre, 2006). This capacity for creating a certain sensory environment may be considered through identifying changes by contrast, such as variations in views, colours, intensity and character of views, sounds or smells, that activate sensory perception (Tuan, 1993: 44). The built environment is particularly suitable for making multisensory assessments because the analysis of spatial dynamics allows for the identification of differences and changes in the capacity of space to cater to particular sensory regimes of the past. In precolonial Swahili towns, the ‘anchoring of cognitive maps’ (Golledge, 1991: 38) was facilitated by the permanence of stone building materials, which increased the relative capacity of a sensory environment to last over multiple generations.

Field assessment of the sites of Jumba la Mtwana and Mnarani

An experimental study of sensory perception in the built environment presented here was conducted at two precolonial sites. The initial review and analysis of existing data on the sites inspired the idea that field sensory observations have a potential to bring a kind of information not accessible from the spatial data alone and to complement the author's past desk-based analyses. Prior work focused on movement as well as visual and aural perception (Baumanova, 2020; 2021; 2022), and it was additionally linked to high-resolution mapping of the stone-built remains.

The two sites under study are located on the coast of present-day Kenya approximately 40 kilometres apart (Figure 5.2). The occupation of both sites was dated between the eleventh and the sixteenth centuries, according to excavations undertaken between the 1950s and 1980s (Garlake, 1966; Kirkman, 1974). Jumba la Mtwana is located directly on the oceanfront. Some of the most monumental buildings, including a mosque and tombs, were located alongside some house remains directly on the beach (Figure 5.3). Mnarani has a much smaller set of preserved stone buildings, with mosques, tombs and several square structures attached to them (Figure 5.4). In contrast to Jumba, Mnarani is hidden from view in the direction of the ocean, as it is located in a lagoon formed by the Kilifi Creek. Both sites were built with the majority of stone buildings positioned on ground elevated from the ocean level. At Jumba, most of the site is on a plateau just slightly above the level of the beach, while the approach to Mnarani is by a steep climb from the waterfront. However, the original extents of the sites have most likely been lost, as the remains of stone buildings have been encroached upon by modern properties, gardens, or other development.

The goal of sensory research was to establish what the sensory regimes were at the two precolonial sites and how the senses were acted upon in the past, using a combination of analyses. Quantitative analyses were desk-based and relied on the processed results of high-resolution mapping with a 3D scanner. Calculations and imaging in specialized computer software assessed, for example, sightlines created by building patterns, the connectivity of spatial networks throughout the towns and the potential audibility of the ocean in the town and calls to prayer from mosques (Baumanova, 2021; 2022).

The qualitative survey presented in this chapter depended on a customized survey method and took place between periods of desk-based

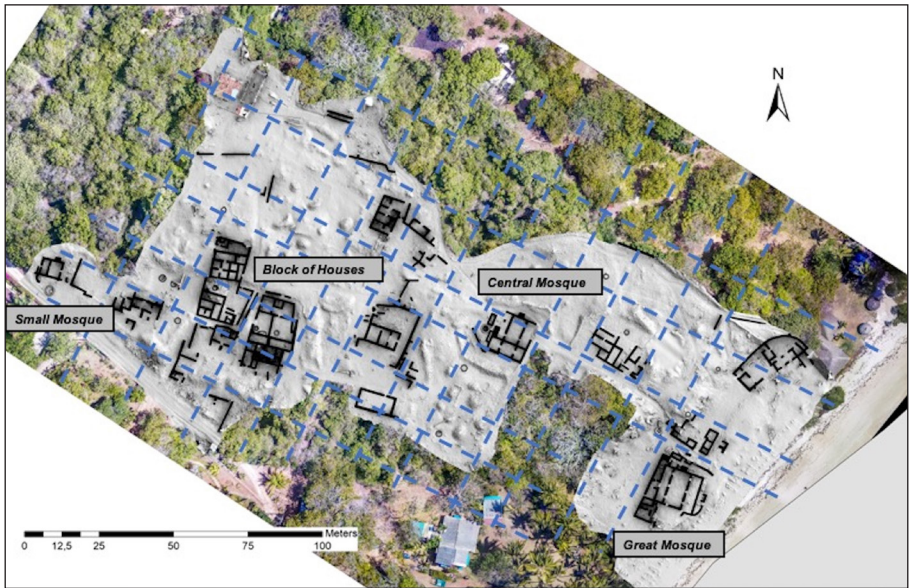


Figure 5.3 A plan of Jumba la Mtwana, showing the approximate distribution of walkover transects. *Source:* author.

data analysis. The experiments took place during three visits to the sites between 2021–3. The first was a reconnaissance visit, with the main survey taking place in September 2021. The survey was repeated the following June to check for any differences in the previous sensory observations.

The recording consisted of a walkover survey. The site of Jumba la Mtwana was walked in transects approximately 20–25 metres apart, where vegetation allowed, following the course of past streets and passages between buildings, where available (Figure 5.3). The preserved built environment of Jumba la Mtwana is relatively complex, with at least 15 houses and three mosques among other smaller structures. Existing streets are oriented in a NE–SW and NW–SE direction. At Mnarani, the site was traversed in an unstructured manner. The immediate vicinity of extant mosques and tombs was the focus of study, as dense vegetation now covers most of the area beyond (Figure 5.4).

Two types of observational data were collected during the survey, one by the author alone and one by the author accompanied by a field assistant. The author solely recorded observations on visual, olfactory and haptic perception. The methodology used for surveying the visual landscape was inspired by cognitive science



Figure 5.4 The location of the site at Mnarani, showing the dense overgrowth and the layout of the two mosques with a cluster of tombs recorded on the site. *Source:* plan by the author, © 2025 Monika Baumanova, over a Google Earth view of the area.

of spatial navigation, which argues that human perception first registers landmarks, then route, and finally configuration (Fisher, 2009; Golledge, 1991: 45). Therefore, the relative height of features, which affects their visibility in the urban environment, was noted, as well as orientations of buildings and access routes, and potential changes in light, temperature or wind associated with the daily rhythm of meteorological conditions. The sites were approached using all possible extant access routes, and walked again several times to test potential differences in perception in the early morning and in the afternoon, especially in terms of auditory and olfactory experience and temperature (trigeminal) perception.

Answers to the following set of questions were noted by the author during the survey, aimed towards addressing complex corporeal experiences:

- What can you see from your position? What do you notice as dominating the scene (tall buildings, public buildings, open space, tomb ...)? How many routes can you take from your position? Can you see the ocean? Can you see a mosque?

- What can you hear? What activity is it reminiscent of? Can you hear the ocean?
- Can you smell anything? What is it like?
- Are there any other notable sensory sensations?

All questions were answered at the outset of the survey (randomly chosen to be the north-west corner of both sites); then the approximate line of the transect was followed, with the author stopping to record when any change in perception was observed, compared to the last recording. This technique aimed to test how (and how frequently) various aspects of sensory landscape changed when traversing the site.

Subsequently, test walks were also conducted by an assistant, working with the same set of questions as above. The assistant was untrained in sensory research, apart from an introductory explanation by the author, and, perhaps as a result, fewer observations were made, but most were nevertheless consistent with those of the author. On some days, parts of the sites were also re-walked with Khamisi Mtengo, a member of the local community from a nearby town, to check whether there could be differences in local sensitivities, as the team was otherwise composed of people raised in the cultural context of Europe and South Africa.

For testing aural perception, the author always collaborated with an assistant. Two people were needed to record the relative perception of voices at different volumes and distances, which complemented the author's earlier computational auditory analysis (Baumanova, 2021). The assistant was recruited from people collaborating with the author on the spatial survey of the site. As the author was the only female on the team, the assistant was always male, facilitating considerations of both male and female voices. The experiments with audibility of shouting and conversations focused on social spaces such as courtyards, spaces immediately in front of main entranceways and on exterior open spaces. The interaction between the author and assistant was structured into a set of tasks:

- walking in parallel transects and testing the mutual audibility of the voices of the author and the assistant,
- testing the reach of voice when shouting (open spaces, among buildings, doorways),
- experimenting with the intelligibility of speech inside the rooms (two people in a room), and
- testing the audibility and intelligibility of speech between two rooms/a courtyard (using yes/no answers).

Inside the buildings, observations were concentrated around the better-preserved constructed features, especially a block of houses near the middle of Jumba la Mtwana, as well as the mosques. Recording focused on testing the audibility and intelligibility of voice in various rooms, the direction of views possible from the entranceways, and recording any observations about the character of possible movement (distance, route, changes of direction).

Exterior space

The newly produced 3D model of Jumba la Mtwana demonstrated that, similar to other precolonial sites, there were few features with an upper storey in the town, as no evidence of staircases was recorded in the wall faces. The experimental field survey confirmed that the features perceived as the tallest 'landmarks' were usually those located on higher ground. When approaching Jumba from the ocean, that is, from the east, the Great Mosque and the tombs directly on the beach were the most visually prominent, but this part of the town was not visible from any other direction due to its location below a cliff-like undulation of the terrain. Approaching the site from the west would result in the Small Mosque being the best visible structure, and from the north it would have been the Central Mosque (Figure 5.3). From the south, the tallest structure would be a block of houses, but it needs to be considered that the stone buildings probably extended further south, where there are now modern buildings. On site, entranceways were consistently noted as the most prominent features, in terms of visibility. Contrary to what was expected, given their social importance, mosques did not dominate the visual landscape. When assessing route options, it was noted that most routes met at approximately right angles, and one had to change direction frequently to pass by structures, suggesting a preference for short passageways. At Mnarani, no stone houses are preserved and so no visibility comparison was possible with other types of features, but it was noted that the largest tombs and the Great Mosque are located close to the slope overlooking the lagoon.

The ocean was only visible from approximately 100 metres from the beach and was audible across the extent of both sites. Audibility tests showed that intelligibility of voices was much better among the standing stone structures compared to areas of the site with few or no structures. This is likely due to the capacity of the walls to reflect sound, which aids intelligibility (Everest and Pohlmann, 2015: 36–9). Shouting was easily audible across the site, at the distance of a hundred metres, but not

always intelligible. For Jumba la Mtwana, observations presented the possibility that the distribution of mosques could be correlated with the previously calculated audibility of the call to prayer (Baumanova, 2021). The audibility and intelligibility of human voices was improved for a stationary observer compared to a moving listener. Changing intensity of daily activities likely affected the relative perception of noise in the town too. For example, the shouts of returning fishermen or activities from the beach were recorded during survey as more clearly audible in the town in the morning.

In terms of olfactory observations, it was noted that the air appeared more fragrant in the morning, with fresh and flowery smells, probably due to higher humidity in the air brought by morning showers off the ocean. At Jumba la Mtwana, the orientation of most preserved passageways was on the NE–SW axis, roughly aligned with the north-east winds in the hottest part of the year (from November to March), therefore allowing the morning and evening breezes to cool the town. From April to October, the winds come from the east (Mahongo et al., 2011), and thus smells are brought from the ocean. These associations representative of trigeminal response, which combines smell, taste, sensations linked to temperature and touch (see Tullett, 2023), might have been a factor in the seasonally changing sensory envelope of the town. No entranceways and passages on the sites were oriented directly east, towards the ocean, probably because this would also open them directly to the elements, like the strongest winds bringing storms and rains.

Interior space

The survey of interior spaces showed how important the relative height of built features was. Stairs and steps are usually encountered twice in Jumba houses – at the house entrances and within the interior courtyards, demonstrating perhaps that certain limits of access were visually accentuated in residential contexts. The relative depth of courtyards, which were slightly sunken or stepped, placed the rest of the house on a visually higher ground.

At Jumba, evidence of rebuilding and adjusting the placement of entranceways at the Great Mosque by the ocean suggests that sensory connotations of doorways placement was also regarded as important, at least in some buildings. Here, the former access to the mosque was blocked and a new opening was built just next to it, which was later also blocked (Figure 5.5). The first alteration would have little effect on movement but would affect the angle of visual access to the ocean



Figure 5.5 Doorways to the Great Mosque at Jumba la Mtwana, which were moved and blocked several times. *Source:* author.

and the old town of Mombasa on the promontory along the coast to the south-east. Later, all entrances in this direction were eventually blocked, and new access routes to the Great Mosque were built from the west and east. It is difficult to interpret the specific motivations behind this change, apart from the fact that the Great Mosque and the other two still standing mosques in the town also had entrances from the west and east.

The results of the field experiments on intelligibility of conversation and interaction were affected by the absence of original roofing in all buildings, which would have impacted the propagation of sound or smells in particular. However, the few rooms preserved up to roof-height in the block of houses at Jumba la Mtwana suggest that the acoustic properties were not favourable to speech intelligibility. Test conversations were difficult to understand when spoken in a low voice. However, the peg-holes identified in some rooms suggest the hanging of rugs. Thanks to improved reverberation properties, these would have improved intelligibility of speech (Baumanova, 2021) and so would lamps or pottery (Everest and Pohlmann, 2015: 215) placed in niches carved into some walls.

Courtyards represented the place with the best perceived acoustic properties within interior space. Two people can comfortably hold a

conversation across the courtyard (distances of 6–10 metres) with better intelligibility compared to exterior open space. Concerning smells, there was a similar contrast. In courtyards, smells would spread and dissipate well; however, the majority of houses featured rooms with only one entrance, where, with the roofing in place, smells would linger (for a similar example see Platts, 2019: 142).

Experimental conversations in the mosques brought very similar results as those in the houses. Rather, properties of the mosque space seem to be dependent on the size of the building. For example, sensory characteristics of the Small Mosque at Jumba could be compared to average-sized rooms in the houses on site. Larger mosques at Jumba and Mnarani had similar properties to courtyards, with enhanced qualities for conversation. However, most preserved mosque walls on the study sites are relatively low and not very suitable for comparing with the houses' sensory environments. For that goal, it would be more informative to conduct the study at another site, such as Gede, Kenya or Kilwa, Tanzania.

Conclusion

The experimental study presented in this chapter revealed important elements in past 'sensory regimes' and showed that the Swahili built environment acted on sensory perception in a variety of ways. One of the important new findings concern mosques, which are generally understood as defining architectural features of Islamic towns. Their placement made them visually dominant on approach to the site, from most directions, and visible from the ocean. Within the town, their visual prominence was toned down. On the other hand, residential building entranceways were accentuated by their placement on steps. Furthermore, changing elevations or constructing sunken features introduced a finer-grained visual and haptic (movement) experience of the town. The distribution of mosques, tombs and stone buildings across the towns were cross-cut by streets; everyone, even residents of wattle-and-daub houses, had their daily sensory experience shaped by the stone-built environment. Furthermore, examinations of building alterations affected sensory experiences, for example by adjusting the position of a doorway, visual sightlines were augmented without affecting affordances for movement.

Visiting the sites at various times of day showed that the sensory experience of the towns was more intensive in the morning air, facilitating

increased olfactory and auditory experiences of events occurring out of view at the beach. Observations made over several years provided consistent data. Similarly, there were no significant deviations between observations made by a local assistant and when working with a person with a European upbringing.

The presented case studies show that experimental observations in the field are complementary to more desk-based, analytical methodologies. For example, house courtyards were identified as ideal meeting spaces due to their sensory properties. This observation motivated a subsequent analytical study of their position within the house layout that ultimately confirmed the hypothesis (Baumanova, 2022). Conversely, the results of an earlier study (Baumanova, 2021) were confirmed, namely that, without any additional features in the interior rooms, like rugs, displayed porcelain, niches in walls and other furnishings, the rooms would have been difficult settings for normal spoken conversations.

Overall, studies of more sites are needed to begin to trace local trends in design choices and innovations and to establish to what extent the coastal cultural coherence, evidenced by archaeological data, applied to the sensory environment. In time, exploring sensory characteristics of individual sites may help us disentangle universal principles and patterns from their local variations as well as their potential transformations over time. The resulting picture may broaden our understanding of the preserved heritage and offer multiple perspectives when presenting sites to the public. Interpretations of the precolonial Swahili built environment have oscillated between defining it as a case study in Islamic archaeology or in African archaeology (for examples see Wynne-Jones and LaViolette, 2018). In this regard, sensory archaeology has a unique potential to situate the debate outside of both frames and facilitate a more universal understanding. In turn, examining a broader geographical arena, including datasets from sub-Saharan Africa, may enrich the theoretical and methodological stances of sensory archaeology as a whole.

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References

- Allen, J. de V. (1979) 'The Swahili house: Cultural and ritual concepts underlying its plan and structure'. In J. de Vere Allen and T. H. Wilson (eds), *Swahili Houses and Tombs of the Coast of Kenya*. London: Art and Archaeology Research Papers, 1–32.
- Barth, F. G., Giampieri-Deutsch, P. and Klein, H.-D. (2012) *Sensory Perception: Mind and matter*. New York: Springer.
- Baumanova, M. (2020) 'Sensory synaesthesia: Combined analyses based on space syntax in African urban contexts', *African Archaeological Review*, 37(1): 125–41.
- Baumanova, M. (2021) 'Precolonial soundscapes of Swahili coastal towns in East Africa', *Time and Mind: Journal of Archaeology, Consciousness and Culture*, 14(4): 501–16.
- Baumanova, M. (2022) 'Transitory courtyards as a feature of sustainable urbanism on the East African coast', *Sustainability*, 14(3): 1759.
- Baumanova, M. and Smejda, L. (2018) 'Space as material culture: Residential stone buildings on the precolonial Swahili coast in a comparative perspective', *South African Archaeological Bulletin*, 73(208): 82–92.
- Donley, L. (1982) 'House power: Swahili space and symbolic markers'. In I. Hodder (ed.), *Symbolic and Structural Archaeology*. Cambridge: Cambridge University Press, 63–73.
- Donley-Reid, L. (1987) 'Life in the Swahili town house reveals the symbolic meaning of spaces and artefact assemblages', *African Archaeological Review*, 5: 181–92.
- Donley-Reid, L. (1990) 'A structuring structure: The Swahili house'. In S. Kent (ed.), *Domestic Architecture and the Use of Space*. Cambridge: Cambridge University Press, 114–26.
- Drewal, H. J. (2020) 'Sensiotics, or the study of the senses in material culture and history in Africa and beyond'. In I. Gaskell and S. A. Carter (eds), *The Oxford Handbook of History and Material Culture*. Oxford: Oxford University Press, 275–94.
- El Zein, A. H. M. (1974) *The Sacred Meadows: A structural analysis of religious symbolism in an east African town*. Evanston, IL: Northwestern University Press.
- Everest, F. A. and Pohlmann, K. C. (2015) *Master Handbook of Acoustics* (6th edition). New York: McGraw-Hill.
- Fabian, S. (2019) *Making Identity on the Swahili Coast: Urban life, community, and belonging in Bagamoyo*. Cambridge: Cambridge University Press.
- Fisher, K. D. (2009) 'Placing social interaction: An integrative approach to analyzing past built environments', *Journal of Anthropological Archaeology*, 28(4): 439–57.
- Fleisher, J. (2015) 'Situating the Swahili house'. In S. Wynne-Jones and J. B. Fleisher (eds), *Theory in Africa, Africa in Theory: Locating meaning in archaeology*. Abingdon: Routledge, 72–88.
- Fleming, A. (2005) 'Megaliths and post-modernism: The case of Wales', *Antiquity*, 79(306): 921–32.
- Frieman, C. and Gillings, M. (2007) 'Seeing is perceiving?', *World Archaeology*, 39: 4–16.
- Garlake, P. S. (1966) *The Early Islamic Architecture of the East African Coast*. London: Published for the British Institute of History and Archaeology in East Africa, Nairobi, by Oxford University Press.
- Gensheimer, T. R. (2001) 'Cross-cultural currents: Swahili urbanism in the Late Middle Ages'. In N. AlSayyad (ed.), *Hybrid Urbanism: On the identity discourse and the built environment*. Westport, CT: Praeger, 21–41.
- Ghaidan, U. (1975) *Lamu: A study of the Swahili town*. Nairobi: East African Literature Bureau.
- Golledge, R. G. (1991) 'Cognition and physical and built environments'. In T. Garling and G. W. Evans (eds), *Environment Cognition and Action: An integrated approach*. Oxford: Oxford University Press, 35–62.
- Horton, M. (1994) 'Swahili architecture, space and social structure'. In M. Parker Pearson and C. Richards (eds), *Architecture and Order: Approaches to social space*. Abingdon: Routledge, 147–69.
- Horton, M. and Middleton, J. (2000) *The Swahili: The social landscape of a mercantile society*. Oxford: Blackwell.
- Howes, D. and Classen, C. (2014) *Ways of Sensing: Understanding the senses in society*. Abingdon: Routledge.
- Ichumbaki, E. B. and Pollard, E. (2021) 'The Swahili civilization in Eastern Africa'. In *Oxford Research Encyclopaedia of Anthropology*. Oxford: Oxford University Press, 144–55.

- Ingold, T. (2000) *The Perception of the Environment: Essays on livelihood, dwelling and skill*. Abingdon: Routledge.
- Ivanov, P. (2014) 'Cosmopolitanism or exclusion? Negotiating identity in the expressive culture of contemporary Zanzibar'. In A. Sheriff and E. Ho (eds), *The Indian Ocean: Oceanic connections and the creation of new societies*. London: Hurst, 209–37.
- Kamalkhan, K. (2010) *The Swahili Architecture of Lamu, Kenya: Oral tradition and space*. London: Lambert.
- Kirkman, J. S. (1974) *Notes on Jumba la Mtwana*. Nairobi: National Museums of Kenya.
- LaViolette, A., Fleisher, J. and Horton, M. (2023) 'Assembling Islamic practice in a Swahili urban landscape, 11th–16th centuries', *Journal of Social Archaeology*, 23(1): 99–124.
- Llobera, M. (2007) 'Reconstructing visual landscapes', *World Archaeology*, 39(1): 51–69.
- Mahongo, S. B., Francis, J. and Osima, S. E. (2011) 'Wind patterns of coastal Tanzania: Their variability and trends', *Western Indian Ocean Journal of Maritime Science*, 10(2): 107–20.
- Meier, P. (2009) 'Objects on the edge: Swahili coast logics of display', *African Arts*, 42(4): 8–23.
- Meier, P. (2016) *Swahili Port Cities: The architecture of elsewhere*. Bloomington: Indiana University Press.
- Middleton, J. (2004) *African Merchants of the Indian Ocean: Swahili of the East African coast*. Long Grove, IL: Waveland Press.
- Mills, S. (2014) *Auditory Archaeology: Understanding sound and hearing in the past*. Walnut Creek, CA: Left Coast Press.
- Molle, G., Wadrawane, J.–M., Lagarde, L. and Wright, D. (2023) 'The sacred stone from the sea: Archaeological and ethnographic perspectives on the ritual value of coral across the Pacific', *Archaeology in Oceania*, 58(1): 40–55.
- Newcomb, R. (1990 [1937]) *Spanish-Colonial Architecture in the United States*. Mineola, NY: Dover Publications.
- O'Meara, S. (2019) 'Haptic vision: Making surface sense of Islamic material culture'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 467–80.
- Pearson, M. N. (1998) *Port Cities and Intruders: The Swahili Coast, India, and Portugal in the early modern era*. Baltimore: John Hopkins University Press.
- Platts, H. (2019) *Multisensory Living in Ancient Rome: Power and space in Roman houses*. London: Bloomsbury.
- Pollard, E. (2018) 'Ocean fringe resources and archaeology of the medieval Swahili'. In S. Wynne-Jones and A. J. LaViolette (eds), *The Swahili World*. Abingdon: Routledge, 36–50.
- Rodaway, P. (1994) *Sensuous Geographies: Body, sense, and place*. Abingdon: Routledge.
- Scarre, C. (2006) 'Sound, place and space: Towards an archaeology of acoustics'. In C. Scarre and G. Lawson (eds), *Archaeoacoustics*. Cambridge: McDonald Institute for Archaeological Research, 1–10.
- Sheriff, A. (2006) 'Between two worlds'. In R. Loimeier and R. Seesemann (eds), *The Global Worlds of the Swahili: Interfaces of Islam, identity and space in 19th and 20th-century East Africa*. Münster: Lit Verlag, 15–30.
- Sinclair, P. and Håkansson, T. (2000) 'The Swahili city-state culture'. In M. H. Hansen (ed.), *A Comparative Study of Thirty City-State Cultures: An investigation*. Copenhagen: The Royal Danish Academy of Sciences and Letters, 463–82.
- Skeates, R. and Day, J. (eds) (2019) *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge.
- Tuan, Y.-F. (1993) *Passing Strange and Wonderful: Aesthetics, nature and culture*. Washington, DC: Island Press.
- Tullett, W. (2023) *Smell and the Past: Noses, archives, narratives*. London: Bloomsbury Academic.
- Verne, J. (2012) *Living Translocality: Space, culture and economy in contemporary Swahili trade*. Stuttgart: Franz Steiner Verlag.
- Wilson, T. H. (1982) 'Spatial analysis and settlement patterns on the East African coast', *Paideuma*, 28: 201–19.
- Wynne-Jones, S. (2013) 'The public life of the Swahili stonehouse, 14th–15th centuries AD', *Journal of Anthropological Archaeology*, 32(4): 759–73.
- Wynne-Jones, S. and LaViolette, A. J. (eds) (2018) *The Swahili World*. Abingdon: Routledge.

Part II

Collected, self-registering sensing research

From home to landscape: realizing a multisensory field archaeology of social space

Sue Hamilton

Sensory and phenomenological archaeological fieldwork has long concentrated on identifying heightened ritual experiences associated with vision, and on characterizing contexts of ceremonial sound performances. By comparison, studies of the roles that senses played in establishing the social parameters of past human behaviour are in their infancy. This chapter offers some redress, by tackling the multisensory dimensions of peoples' everyday routines. In particular, the importance of sensory juxtapositions is considered. For example, what might have been seen but not heard between coeval sites and intra-site locales.

The discussion commences by isolating a hierarchy of sociospatial scales to consider the role that the senses play in articulating everyday practices. These span from 'home' to 'landscape' and pertain to person, household, settlement, community and the wider world.

The chapter traces practices of embodied fieldwork that were sequentially developed during a number of field projects co-undertaken by myself and colleagues. Together, they exemplify the unique types of questions and interpretations that can emerge from undertaking *in situ* sensory fieldwork. The described methods are not mechanistic. Rather, they were flexibly adapted to different starting points in the discourse of a context-relevant, subject-centred sensory research. Our sensory field analyses were not conceived of as 'stand-alone' projects but as an 'alongside' set of methods in the archaeological and heritage toolkit. When used concurrently with other forms of archaeological and heritage fieldwork, such projects uniquely enrich understandings of how past societies functioned. It is highlighted how both qualitative and quantitative sensory analysis can be as rigorous and repeatable as any other form of archaeological recording. A case is made for a more

nuanced recording of sensory qualities and intensities. As well as having no set field method, sensory studies in archaeology and heritage have no conventions for presenting sensory data. There is a growing disciplinary debate on the role of graphics over text. In this vein, the images in [Figures 6.1–6.7](#) are grouped by their experimental modes of data-gathering and presentation.

Social senses in the field

Methodological trajectory

The examples of field projects that I use in this chapter highlight aspects of sensory experience, as applied to the archaeology of prehistoric sites. Collectively, they span both small and large social and geographic scales of sensory perception. A primary interest is in how the senses operated in contexts of everyday communication and socialization. This includes often ‘taken-for-granted’, automatically performed daily practices that are dependent on, or characterized by, sensory attributes (akin to the concept of ‘ready-at-hand’ for instinctively used tools (Heidegger, 1996: 67)).

The projects each involved between three and eight years of four to six weeks per annum of being in the field. The methods developed focused on working in teams, which were mixed in the age, gender, cultural background and sensory agility of the individuals. This collective endeavour has an element of serendipitous research (see below; Kennedy et al., 2022; Vom Lehn and Heath, 2022: 544), while at the same time being rooted in careful assessment of the qualitative intensities and quantitative dimensions of specific senses. At the broadest, it is part of an ongoing discourse about the universality of embodied experience alongside consideration of the cultural specificity of sensory perception. The early work examples relate solely to the sense of vision, as experienced by the observer, and begin with fieldwork on the UK Bronze Age site of Leskernick Hill (Bender et al., 2007). Here the sensory focus was at the scale of a settlement and its associated ritual complex, and the recognition of specific repeated visual interconnections. A subsequent exploration, of the communicatory role of vision, is described for a UK hillfort study (Drewett and Hamilton, 1999; Hamilton and Manley, 1997; 2001). The consideration was how *in situ* analysis of vision and visibility in social communication could elucidate how sites (in this case hillforts) were used and understood. This is followed by a multiscale ‘home to landscape’ exploration of the intra and inter multisensory

sensory worlds of the first farming communities of Southern Italy. The study concerned a region of c.4,500 square kilometres (the Tavoliere Plain) and embraced more than 1,000 sites of which c.17 per cent were studied *in situ* (Hamilton et al., 2006; Hamilton and Whitehouse, 2020). Lastly, the ongoing Rapa Nui (Easter Island, Chile) study elucidates an approach to sensory interfaces between people and things as part of an island-wide cosmology associated with the island's statue building period (c. AD 1200–1550) (Hamilton, 2013).

Theories of sentient socialization

Our embodied sensory outputs, interventions and responses facilitate relationships between people, places and things. The senses are 'interactional phenomena' (Gibson and Vom Lehn, 2021) and are key to collaborative daily life (Heidemann, 2013: 66). Aligned with this are the ways in which people's sensory actions and choices, and the parameters of their reception, are impacted upon or deployed, via the lenses of socialization and uses of places. Everyday communication is a nuanced interplay of multiple bodily senses. Our actions and sensory perceptions of other living things, artefacts and physical environments combine to facilitate unfolding interactions and associated comprehension. Each communicative use of a particular sense will have advantages and limitations, for instance in hearing the degree of loudness and harshness of tone of a voice, while seeing or not seeing a person's facial expressions and body gestures. The extent to which present-day *in situ* embodied sensory fieldwork can variously allow us to interpret, characterize and consider the spatial geography of the lived-in experience of past communities and their articulation is explored below. At the nub of this enquiry is the relationship between geographical space and social space. As Pierre Bourdieu (1985: 219) noted: 'These two spaces never coincide completely, but a number of differences that are generally attributed to the effect of geographical space, e.g., the opposition between centre and periphery, are the effect of distance in social space'. Socialized sensory space is dynamic and changing according to people's specific actions and their degrees of proximity, separation and movement (Heidemann, 2013). Social sensory space is thus both 'structured' and 'structuring'. In terms of being 'structured', J. J. Gibson's (1979: 127) theory of 'affordances', that is the properties that an object or the environment *offers* or suggests as being possible to utilize and how humans act upon it, is here relevant. Sensory transmission and its reception are curtailed by viable physical parameters, such as being 'beyond hearing distance'.

However, the view that our *immediate* perception of the environment is in terms of what it affords (Ingold, 2022), is counterpositioned by the role of social mechanisms in structuring cultural experiences of distinct sensory contexts, such as ‘the smell of home’. Affordance then is not a static concept. Rather, it is based on relationships between the living and their situational environments (discussion of Chemero, 2003, in Gillings, 2012: 604–6). Sensory space is simultaneously related both to the maximum possible spatial parameters of body-centred sensory affordances *and* to their actualization via culturally related behavioural choices. I do not consider these to be theoretical contradictions, but rather conceptual co-creators of an understanding of sensory living.

Field archaeologists often spend weeks working in the same place. This may be the greatest length of any individual person’s physical interface with a particular place since the time of occupation of the site(s) being studied. Being in the field can support an extended thinking-entanglement with the past. At the very least, it allows for acquiring an embodied sensory familiarity with the locale. This process of ‘being there’ prompts different questions and research lines than those of preliminary research designs (Hamilton and Barrett, 2018). Since the 2010s, objective science, and academia in general, have increasingly embraced serendipity as being both an object and a method of serious research (Thompson and Copeland, 2023). Incorporating enabling thinking-frameworks or different ways of doing the practice of field research can create the conditions that increase the likelihood of serendipitous outcomes.

Social sensory scales

The methods and case studies discussed below focus on particular senso-social spatial scales. It is recognized that there are many other possible units of social space, and that their individual scales can be ‘nested’ or overlapping (Bender et al., 2007; Hamilton and Whitehouse, 2020: 239–84). By ‘nested’ I mean that one scale and its characteristics may be a subset of, and recursive of, the next or preceding larger or smaller scale (Bender et al., 1997). These spatial scales are first briefly explained and placed in a disciplinary context, to highlight the issues and concepts that the methods subsequently described in this chapter seek to utilize, develop or address.

The embodied person

Embodied fieldwork utilizes human bodies as being the primary entities that scale and empathize our sensory connection to, and orientation in, the world. From the perspective of vision, the presence of a human being, or any recognizable life-scale representation of a human in a natural or constructed place, transforms our experience and understanding of our individual situation in that place. For example, Antony Gormley's sculptures strikingly engage with the phenomenology of space. Gormley's body casts of himself exhibited and positioned on the ground and on the rooftops in central London as part of his 2007 *Blind Light* exhibition, or those permanently set up at the visual horizon of beach and sky on Crosby Beach, Merseyside, UK (Figure 6.1a) are site-specific interventions that invited conversations about relationality between people, buildings and place (Newman, 2013). They make tangible a human's situatedness in a place at the scale of the viewer's own individual body.

The past offers similar, iconic, empathetic comparisons. A person's sensory experience of the life-sized Terracotta Army, made to guard the mausoleum of China's first emperor Qin Shi Huang (259–210 BC), near Xi'an, central China (Figure 6.1b), for example, is different to the personal impact of Rapa Nui's colossal stone statues of the ancestors, standing up to 12 m high (Figure 6.1c). In sum, the power or impact of landscape, place, building or object is experienced in terms of the relativity and accessibility to the universal proxy of the human body and its historical context. The Terracotta Army is an amassment of social currency at a human scale, while the Rapa Nui statues, discussed below, dominate the human scale and the landscapes that humans inhabit.

The socially sensed home

A living space or home is the place of everyday dwelling that we regularly return to and inhabit. Beyond practical concerns, it exists as a social and ideological space that acquires multiple tiers of meaning (Tringham, 1995). In terms of sentient socialization, the boundary of the home is one of the most culturally significant spatial demarcations. Bodily negotiating the threshold of a home involves crossing a demarcation between public and private, and between outdoors and indoors. It requires navigating physical and sensory restrictions at the points of coming and going. Home can be a place associated with the greatest social proximity. It encompasses sensory impacts and corporeal experiences that are only possible over short distances and in contained or localized spaces. Part of our sensory work on the Neolithic ditched villages (*villaggi trincerati*) of

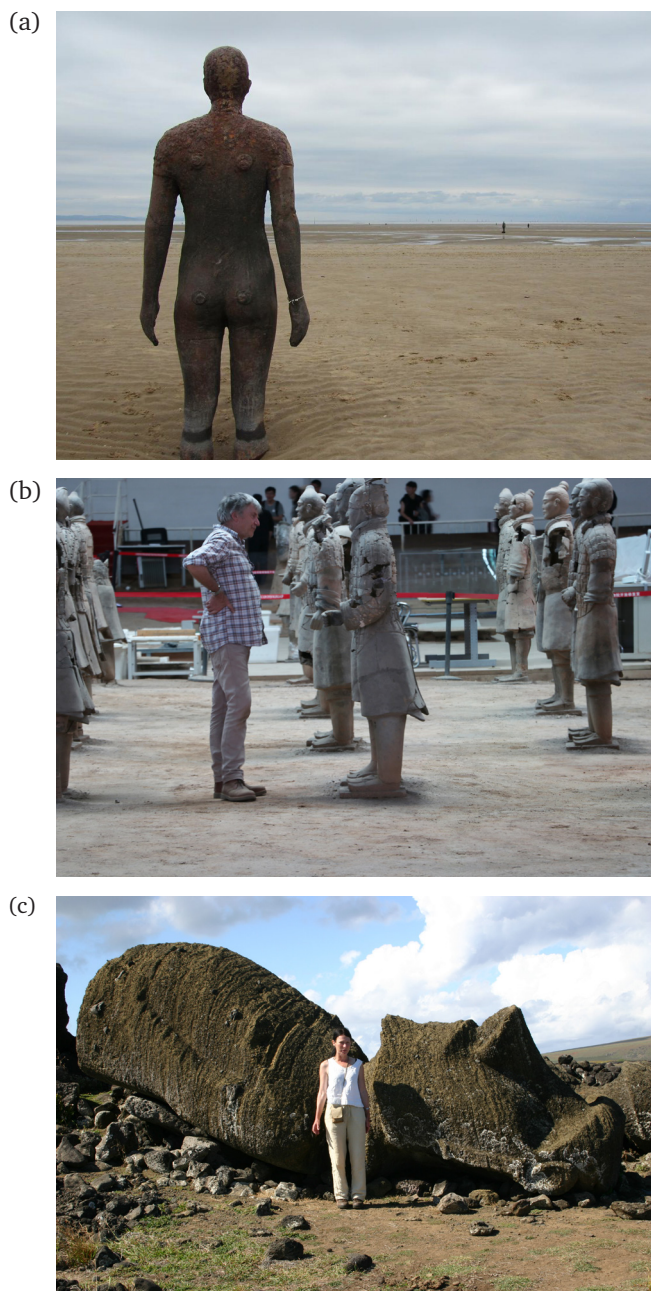


Figure 6.1 Embodied experiences of the person. a) Antony Gormley's body-cast installations on Crosby Beach, Merseyside, UK; b) the human scale of the Terracotta Army, Xian, China; c) the colossal scale of a Rapa Nui (Easter Island) statue. *Sources:* Mike Seager Thomas (a and b); Colin Richards (c).

Southern Italy, explored the unique sensory intensities associated with 'being' at home (see below).

Community sensory space

A community is here considered as a site-based aggregation of people with shared socially significant characteristics, such as a set of behaviour and experiential norms, and activities and customs in common. There are communicatory differences between the articulation of a primary social group, such as a nuclear family and its social space, and the role of the senses at the scale of structuring a whole community. Shared sensory perceptions coalesce a community. In this chapter, the role of sensory communication in enabling cohesion and collective actions of smaller social units is explored for UK hillforts and for the *villaggi trincerati*. In each case the extent to which sensory connectivity controlled, supported and encouraged coordination and cooperation of intergroup daily activities is considered. For the discussed examples there were physical boundaries that defined the arenas of collective action. In the case of hillforts, the cooperative boundary was the enclosing hilltop rampart, and for the *villaggi trincerati* it was their encircling ditches and embankments that were imposed on the relatively slight topography of their locations.

Sensed site catchments

In the 1970s archaeology acquired from geography the concept of a site's catchment. For pre-urban contexts the emphasis was on quantifying and characterizing the regularly used proximate environs of a site from a subsistence perspective (Higgs and Vita-Finzi, 1972; Higgs and Jarman, 1975). It was a functionalist approach, detached from consideration of the socio-sensory aspects of a site's locale. It was modelled on the most efficient use of resources and was related to the exploitation of an area, up to a fixed travelling time from a site's centre. Our work on the *villaggi trincerati* incorporated elements of this methodological trajectory. It developed an embodied sensory fieldwork that records both the economic and sensory characteristics of a site's catchment (see 'phenomenological site catchment analysis' (PSCA) below).

Sensing the wider world: territories and landscapes

Here I use the notion of a territory as a socially operationalized topographic area with commonly perceived end points associated with the extent of an understood co-related social belonging (Pollini, 2005: 497ff). A territory may encompass multiple communities and be linked by

a political structure and common access to economic resources. The idea of an *experiential* territory that communities quintessentially recognize and function within has had a patchy emergence in archaeology. GIS (geographical information systems) mapping was widely adopted concurrent with the development of experiential landscape archaeology (Tilley, 1994). Part influenced by this, GIS mapping integrated a capacity to generate viewsheds (the geographical area that is humanly visible in the line of sight from one or more viewing points at a location). However, a GIS viewshed is an abstract, *unembodied*, detached presentation. Marcos Llobera's (1996) GIS-based study of the topographic positioning of a series of large prehistoric ditches in Dorset (UK) is notable for introducing the idea of sensory affordance (sensory awareness of what is possible) in the use of topographic space. Llobera's GIS study used a combination of measured angles and distances that demonstrated that the ditches were positioned at the points concurrent with significantly expanded visual fields. Thus, the ditches can be understood to be fixing (rather than creating) visually afforded territories.

The idea of landscape as a perceived visual space has its origins in the eighteenth-century European landscape paintings and their portrayal of a panoramic view of land that falls within a spectator's vision (Hamilton, Chapter 1, this volume). Today's concept of a sensed landscape embraces the whole sensorium. A sensory landscape is contextual and permeable. It is not contained by access to specific resources, political boundaries or visual topographic boundaries. A landscape can be the place of both disseminated and received sensory outputs and inputs within and beyond metrically defined territories or modelled catchment zones.

The shift in the breadth of sensory 'scaping' lies in the 1990s cross-disciplinary reaction against the prevailing Western hegemony of vision as being the *de facto* dominant sensory means of interfacing with and gaining understandings of the wider world. It was consolidated using the lens of history (Classen, 1993) and anthropological exemplifications of widely differing sensory articulations of cultural worlds (Howes, 1991; Porteous, 1990). These works emphasize that societies do not necessarily divide the sensorium according to the same senses as contemporary Western society. They extend sensorially characterizing social space into the terrain beyond a settlement's boundary. R. Murray Schafer's (1977) seminal study of village soundscapes in Southern Italy and Alain Corbin's (1998) exploration of the sonic landscapes of church bells in nineteenth-century France (the times and types of chimes, and their recognized meanings), are much quoted examples. Such publications place communities in direct interaction with their wider

geographical world. They importantly foreground the society-forming aspects of sensory co-experience resulting from the shared sensorial impacts of the tasks and practices associated with daily encountered places and landscapes. This can be likened to Victor Turner's (1969) concept of *communitas*, the heightened solidarity acquired via participation in shared ritual practices.

A sensory landscape therefore is variable in its local components and can be differentially encountered through movement, from multiple vantage points and via different tasks. These variables make the past sensory articulation of daily life beyond the settlement boundary challenging to ascertain and the least explored in archaeological sensory studies, particularly in fieldwork. Methods of elucidating the patterns and characteristics of sentient-based choices and activities and their cumulative implications alongside other data are considered below at a regional scale for the *villaggi trincerati*, and at an island-wide scale for Rapa Nui's early communities. At these geographic scales the role of the senses in connecting and coordinating people's acts and choices is here presented as an elemental part of gaining insights into how particular societies were organized and how they understood their worlds.

Starting with a single social sense: vision

In this part I detail two methodologically different UK examples of 1990s–2000s landscape fieldwork that touch upon vision as a social tool. The first, on Bodmin Moor, detects a general sensory ordering of the world (to which meaning is ascribed) by identifying that the positioning of ritual monuments and domestic houses are visually orientated on significant landscape features. The mode of encountering these visual patterns was kinetic – walking the landscape. Visual association connects the animate to the inanimate, namely a person's view of the landscape when positioned at an archaeological feature. The second explores co-animated, interperson visibility on hillforts. The hillfort study is site-specific and relates to everyday activities and how these were articulated in vision-reliant practices. It involved *in situ* experimental enactments of different types of visual communication to better understand how people were able to coordinate their on-site activities. Both examples prompted novel custom-made methods of data gathering and presentation. Together, these projects were foundational to the development of the original methods of multisensory analysis that are presented in the subsequent sections of this chapter.

Embodied points of view: Bronze Age settlement, UK

The stone walls of the houses and enclosures of a Bronze Age settlement, dating to the second millennium BC, remain highly visible on the slopes of Leskernick Hill, Bodmin Moor, Cornwall, UK. These remains are grouped as ‘western’, with a ‘southern’ settlement separated by a wide stone-strewn (clitter) corridor. Below, on more gently sloping ground, there are the remains of a stone row and two stone circles, which date to the Late Neolithic/Early Bronze Age. Chris Tilley (1996) in walking the landscape had already established a pattern of visual orientations of the stone rows and circles of Bodmin Moor towards prominent natural rock outcrops (tors) on the moor’s surrounding skyline. The study of visual orientations was subsequently extended to the Leskernick Hill settlement, for example documenting what was first seen on entering and exiting each house. Often, a large backstone formed the house wall opposite the entrance and was seen straight ahead on entry, while specific tors in the surrounding landscape were seen on exit. Thus, a visual interlinking of landscape features, distinctive hill stones and architecture operated conjointly at a regional and a household level. The consistency and longevity of this pattern suggested that the house interior was a microcosm, a miniature representation, of the ideas shaping a prehistoric understanding of the wider landscape of the moor.

Concurrently, methods were developed to heighten our on-site experience and discussions of the Leskernick complex as a visually understood space. The project used the juxtaposition of individual embodied experiences of archaeological features alongside ‘art interventions’ to produce a novel conceptualization of what makes a sense of place meaningful. We marked the houses and the stones of the stone row with flags. Some of the house backstones and distinctive fieldstones were draped with cloth or wrapped with clingfilm and painted eye-catching colours (gold, red, blue and yellow, see Figure 6.4a). We used this as a way of materializing and discussing the team’s thoughts on the visually distinctive stones (be these natural or archaeological). These flagging and stone-wrapping activities were photographed, and it is argued that this provided a truer to sensorial experience representation than traditional publishing formats such as using site plans and conventional archaeological photography (Tilley et al., 2000). Subsequently, in Italy (see *villaggi trincerati*, below), we used the device of flags in quite a different way, to undertake our sensory research (Figure 6.3a).

Visibility and social coordination: hillforts, UK

The experiences of the Leskernick Hill project prompted a consideration of vision and sensory socialization when excavating and surveying on the Caburn hillfort, East Sussex, UK (Drewett and Hamilton, 1999; Hamilton and Manley, 1997; 2001). The latter work aligned with a reconsideration of the traditional view of UK Late Bronze Age and Iron Age hillforts as being defended central places (Hill, 1995; Bowden and McOmish, 1987). UK hillforts and their enclosing ramparts have a strong visual impact when encountered from the outside (Figure 6.2a). However, it was noted for some hillforts that the ramparts are positioned downslope and leave the interior wholly visible to the outsider. This suggested that some hillfort ramparts, despite being imposing, were not primarily positioned with defence in mind.

Our sensory research on Sussex hillforts focused on the practical use and parameters of vision in socially articulating activities within their interiors. The work centred on a consideration of intra-site visibility and the sensory processing of nonverbal communications. We can consider that face-to-face communication is more effective than aural-only conversations. The upper part of a person's body gives the most visual information in communication, for instance via facial expressions, hand and face gestures and arm movements. Multiple person-observation stations were set up in the interior of three Sussex hillforts (Hamilton, 2003). The maximum distances over which the face and torso of a person could be seen by an observer when positioned at each field station were recorded (Figure 6.2b) and mapped (Figure 6.2c; Hamilton, 2003: figure 5). This measurement varied according to the local topography of each hillfort. However, in each case the maximum distance for this form of intra-site visibility was restricted such that it would have been impossible to socially coordinate the laying out of the ramparts across a wholly cleared site or to coordinate across-site activities, even without any buildings being present. For persons looking out from each site it was impossible to see the near approach to the hill; only the wider landscape at a distance is visible. These observations do not on their own indicate the function and purpose of the sites concerned, but they do suggest some clear sensory parameters relating to the possible versus not-possible scale of socially coordinated activities that could have taken place on each site. In the cases of these hillforts, they did not suggest a substantial requirement for a single point of coordination for the activities of the whole site, nor the wish to maintain a secrecy of the internal activities to outsiders. In fact, it was quite the opposite; the

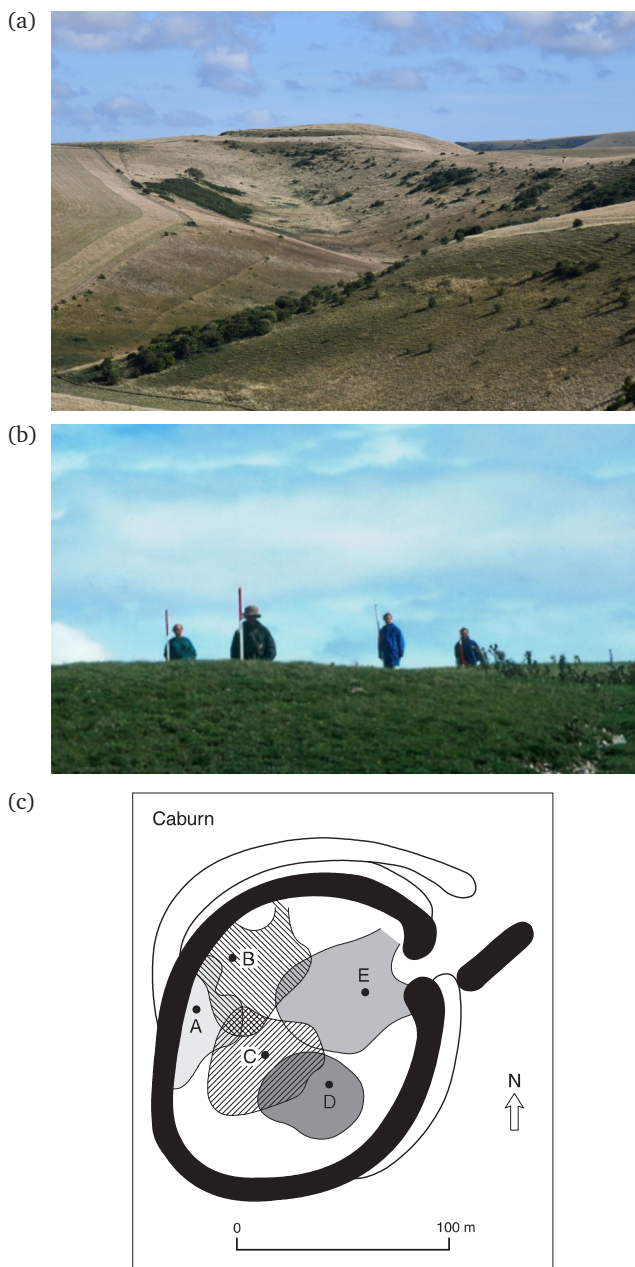


Figure 6.2 Sensing the social parameters of people and things. Caburn Iron Age hillfort, East Sussex, UK: a) external view of the hillfort; b) how people move out of sight within the hillfort; c) social distance communication mapping relating to key locations (A, B, C, D, E) on the hillfort. *Sources:* Mike Seager Thomas (a); Sue Hamilton (b); drawing by Jane Russell, © Sue Hamilton (c).

ramparts monumentalized and drew the eye to the activities of the sites' interiors.

Multisensory, multiscalar socio-scapes

The fieldwork, detailed below, for the Neolithic settlements of Southern Italy, was a major systematic endeavour to isolate differing scales and characters of social articulation based on their multisensory characteristics. The methods we developed are based on the actuality that the human body has both a maximal and an optimal spatial range in unaided physical conditions over which a thing can be properly seen, heard, smelled and understood. Today, we are 'sensorially deficient' (Porteous, 1990) with respect to such sensory properties. We are exposed to a mounting crescendo of sensorial distortions that variously dominate, homogenize, sanitize, filter out, or obscure our awareness of elements of long-gone sensory environments. The embodied fieldwork that we undertook for ascertaining these gradations of the sensorially possible, acclimatized our senses to ask new questions of these settlements and to generate new categories of data. Our experience of reskilling our senses can be likened to R. Murray Schafer's (1967) 'ear cleaning' programme for training the ears to listen more discriminately to sounds and to gain a preindustrial sound competence.

Neolithic villages, Italy

The *villaggi trincerati* (ditched villages) are the first farming settlements of Southern Italy. They are the most renowned sites of the Italian Neolithic, both for their number and their iconic plans. They were first identified from World War II aerial photographs and are invisible at ground level (Figure 6.3b). They date to the entire sixth millennium cal. bc. None were constructed after 5000 cal. bc, and they were in use and kept the same basic architectural format for approximately a millennium over a region of some 4,500 square kilometres (Whitehouse, 2014). Our sensory work was part of a wider project of site-truthing, mapping, documenting and reviewing extant interpretations of the *villaggi trincerati* (Hamilton and Whitehouse, 2020). The work was guided by our wish to devise on-site methods for considering the everyday sensory experiences of these communities at a series of social scales from home to landscape. It explored the affordances of sensory experiences that support different scales of social articulation, and significantly developed

the simple method discussed above for considering visual communication on UK hillforts. We sought to develop embodied field methods of data collection that could be undertaken in teams, that were robustly documented and that were open to review and building upon by others. This work was experimental and patchy in the completeness of the range of senses that it explored, but it did offer significantly new perspectives on the social organization of the *villaggi trincerati*. Methodologically, the work revealed the complexities of quantifying and qualifying an embodied experience of the so-called ‘five senses’ (traditionally, those of seeing, hearing, smelling, tasting and touching). This necessitated recording numerous contextual gradations due to physical factors such as local climate, time of year, and the timbre and degree of amplification of a sound, as well as thinking about the cultural filtering of experiences.

Locating, walking and ‘flagging’ (Figure 6.3)

The fact that *villaggi trincerati* have been rendered invisible at ground level provided a significant challenge to undertaking embodied sensory analysis. We needed a means of locating the positions and features of the sites on the ground. The sites were georeferenced by transcribing their features from the original aerial photographs onto 1950s maps. This was done to scale using any remaining roads and farm features (mostly now gone) that were present on the 1950s maps (Figures 6.3b and c). We were then able to use hand-held Global Positioning System (GPS) trackers to get to more than 170 of these sites and to the locations of their house enclosures (C-ditches) and the concentric ditches and banks that enclosed each village (Seager Thomas, 2020b).

The pace of fieldwork was designed to allow for an extended process of site encounter and team discourse. The greater proportion of the *villaggi trincerati* were at some distance from direct access by car and involved substantial on-foot journeys to and from and across the sites to their centres. The largest sites measured up to a kilometre across, and one extended to c.2 km across. Through walking to and within sites, walking along the transects associated with our sensory observations and across site territories (as part of our phenomenological site catchment analysis: see below), we considered the possible sensorial connections between people and the environment. For us, the physical act of walking to and across the sites was not just a physical movement but a thoughtful exploration of the individuality of their defined space (as discussed by Beaumont, 2020). On arrival at a site, we used the device of flags as a starting point for our local sensory considerations (Figures 6.3a and d). This is different to the work at Leskernick Hill, that used flags as

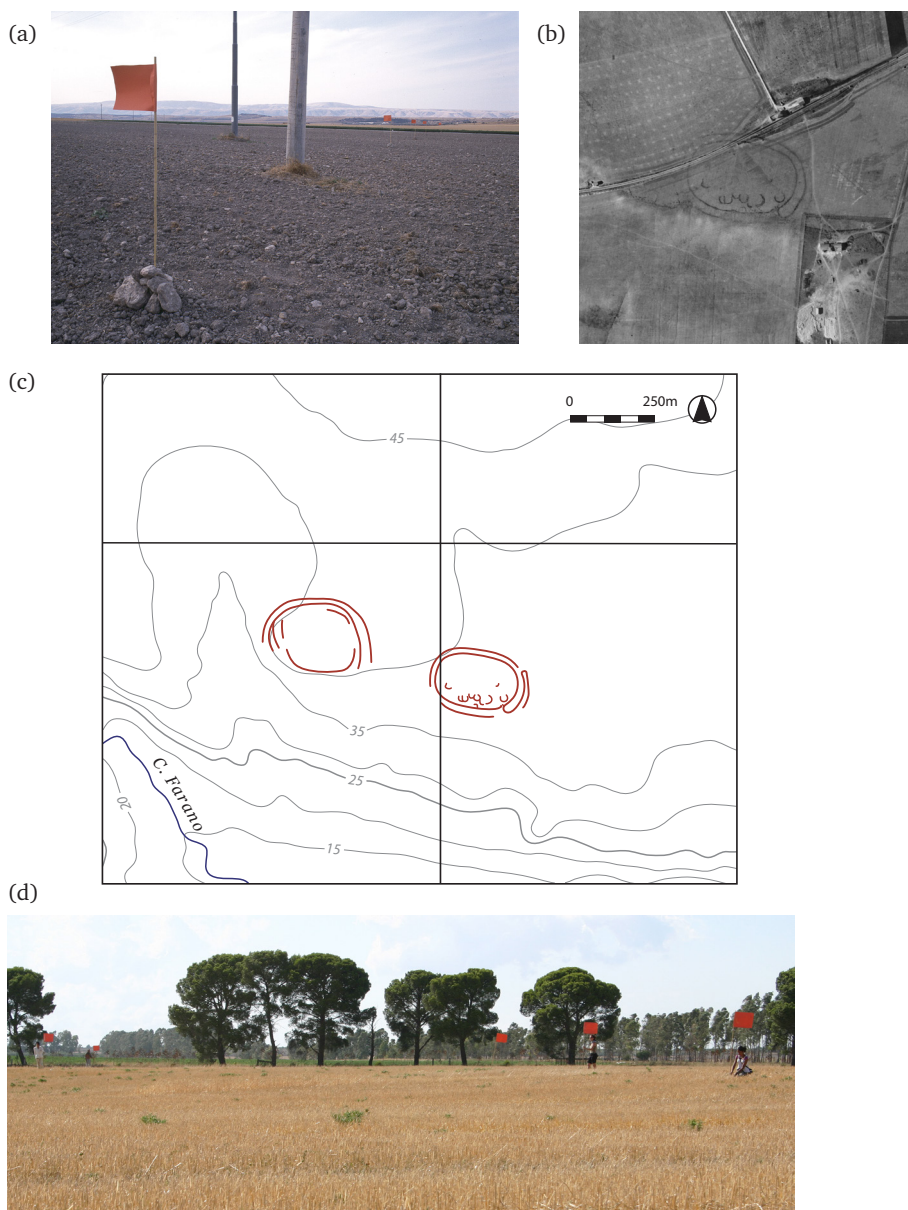


Figure 6.3 Marking out sensory space on the *villaggi trincerati* (Neolithic ditched villages), Tavoliere Plain, Southern Italy. a) setting up flags at a site's boundaries; b) World War II aerial photograph of Amendola II, Neolithic ditched village; c) outline plan and mapped location of Amendola II, Neolithic ditched village (site in red on the right); d) flags marking the locations of the site boundary and interior enclosures of Amendola II, Neolithic ditched village. Sources: Mike Seager Thomas (a, c, and d); The Bradford Archive, RAF aerial reconnaissance photo (b).

an after-survey endpoint to portray and heighten the experience of the locations of already-made visual observations. In Italy, we used orange cardboard flags attached to person-high canes to mark the GPS positions and the spaces of what is invisible in the field but known from the aerial photographs. We drew upon the extended process of positioning the flags to consider the types of questions that could be explored concerning the activities of daily life, using embodied sensory methods.

Documenting the role of multiple senses in everyday life (Figures 6.4)

Our multisensory embodied work on the *villaggi trincerati* took the form of *in situ* performances of basic forms of social communication and documenting the maximal distances over which they could be comprehended. Over the period of the project a core team of six persons and c.30 undergraduate and research students, female and male and of all ages between c.18 and 70, were involved in these performances and measurement and documentation of their sensory data. All of this was consistently documented, *not* to be treated as unambiguous facts (which they were not considered to be), but to achieve a quantified, qualitative and comparative range and understanding of the impact and scaled possibilities of different sensing scenarios and conditions. These performances took place at identified features associated with the *villaggi trincerati* (for instance, the C-ditch enclosures in their interiors and along the village boundary ditches) and along transects in the wider landscape.

Our performances were recorded by measuring and qualifying the effective transmission distances of male and female human voices and specifically for chatty conversations, stressed sentences and shouting. We likewise measured the travel-distances and characteristics of other sounds that we produced that were appropriate to the period of site occupation, such as stone percussion (Figure 6.4d), a skin and wood drum, and striking a wooden semantron. We experimented by wearing different clothing textures, colours and reflectivity, and by wearing different shapes of hats to explore how this affected the visibility and recognition of people at different distances (Figure 6.4b and e). More generally, we considered the distances over which communication by big and small body gestures was possible (Figure 6.4c). We quantified and qualified the visibility ranges of small-scale hand movements (such as a thumbs-up) and large-scale hand and arm movements (such as pointing, waving) and of facial features and gestures. These all impact upon effective recognition and communication between people. We also opportunistically documented randomly encountered live sensory

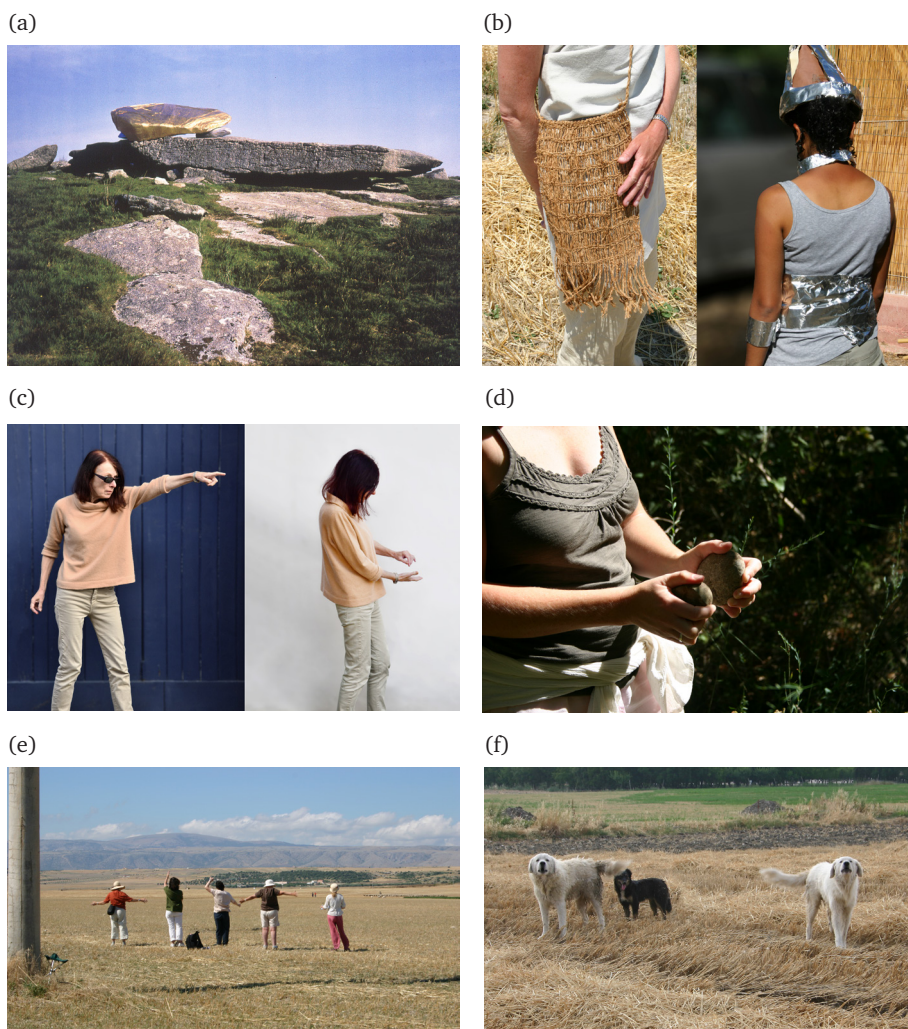


Figure 6.4 Activating and studying the parameters of social sensory action. a) wrapped stone, Bodmin Moor, UK; b) Testing visibility with cloth texture and colour, and shiny attire, Tavoliere Plain, Southern Italy; c) examples of the differential visibility of small and larger scale human actions; d) performing sound and measuring audibility with stone banging, Tavoliere Plain, Southern Italy; e) studying different scales of vision through clothing shapes, colours and human actions, Tavoliere Plain, Southern Italy (the recording team is visible lower down the field); f) measuring the audibility of opportunistic encounters, Tavoliere Plain, Southern Italy. *Source:* Mike Seager Thomas (all).

renditions that would have been difficult or inappropriate for us to stage. This included documenting the auditory reception distances of crying babies and barking dogs (Figure 6.4f) and the smell-ranges of flocks of sheep, heaps of animal dung, and cooking meat on an open fire. In each case the measured distance between the point of dissemination and the maximal distances of the qualitative categories of ‘clearly registered’, ‘faintly registered’, and ‘not registering’ were recorded. Wind direction, time of day and weather characteristics were also noted. In all, we undertook more than 140 sensory performances (Hamilton and Whitehouse, 2020: appendix 4). These performances were repeated on multiple occasions on the same and different sites and locations across the region (the Tavoliere Plain). Within and beyond the boundaries of individual *villaggi trincerati*, the outdoors locations selected for our sensory assessments included both ancient deciduous woodland and open fields under different crops. We also performed inside proxy traditional buildings of differing structures and materials.

Phenomenological site catchment analysis

Mid-twentieth-century processual archaeology drew upon use of site catchment analysis (SCA) in geography, to characterize the economy of a site by considering the resources (as afforded by soils and topography, for example) that are available within a reasonable, meaningful distance of a site. SCA was developed in archaeology by Eric Higgs (Higgs and Vita-Finzi, 1972) and was extensively used on the *villaggi trincerati* (Jarman and Webley, 1975). The interpretive value of SCA is critiqued in that subsistence economy cannot be separate from other aspects of past lives (for example cultural avoidance of certain resources). However, its use in archaeology did take a consideration of ‘the site’ into walking its associated landscape. The method that we developed to undertake embodied research of the area beyond the village boundaries, which we named phenomenological site catchment analysis (PSCA), combined this traditional SCA approach with us documenting the sensory aspects of a site’s catchment (Hamilton et al., 2006: 54–64; Hamilton and Whitehouse, 2020: 239–84). Following established SCA survey procedures, PSCA involved walking for one hour out and returning on each of the four cardinal points from the site’s centre (one hour being taken from ethnographic and geographic data, as being the walking distance around a traditional farming site that is regularly used by its inhabitants). The walking team recorded in stopwatch minutes significant experiential points and changes encountered on the journey, in addition to the topography and types of soil and vegetation and crop cover that

comprised the documentation of the original SCA. On the return journey we also noted the points at which we first could see the village (as flagged or via proxy markers), followed by when we could continuously see it. Sensory field archaeology is sometimes wrongly perceived as an easy option. It is also worth noting that embodied landscape archaeology cannot always be undertaken in a relatively unoccupied landscape or a designated heritage park. With respect to our PSCA fieldwork, a combined outward and inward journey could take up to five hours, due to deviations caused by modern roads, buildings, fences, crops and the like, that we could not walk directly across. When this happened, we paused the stopwatch until we could rejoin the prescribed orientation. PSCA thus took a very considerable time, but it importantly provided a method of robustly documenting and augmenting our understanding of the experiential environs and possible types of inter-site sociality of an extensive regional distribution of coeval sites.

Interpreting cumulative multisensory multiscalar social experience
(Figure 6.5)

The clumping of the information from more than one technique, its repetition at a regional scale of study, its integration with other archaeological data and its accretional timespan of research within a project of some longevity, allowed for a wider consideration of patterning in the data. Collectively PSCA, onsite performances, transect experiments and opportunistic sensory fieldwork indicated clear spatial patterns of senso-social relationships. These also prompted new questions that might be answered by other pieces of work. Observations included that the multiple C-ditch enclosures within *villaggi trincerati* interiors are of a size and spacing that affords the sensory containment of a family domestic unit and maintenance of its privacy. The C-ditches correlate with the boundaries of noise dissemination from their interiors, specifically of private conversations/chatting and the sound of crying babies, be it inside or outside any building. Likewise, the C-ditches lie at the boundaries for small-scale social actions and gestures being visually understood across the enclosure or from centre to boundary. In contrast, talking in stressed sentences would have been within hearing range and understood between people in adjacent C-ditched enclosures. The C-ditch enclosures are generally thought to have enclosed a domestic space and structures, but there have been relatively few excavations and other possibilities have been suggested, such as provision of animal penning. Our sensory observations had a functional interpretative role in adding support to the former interpretation.

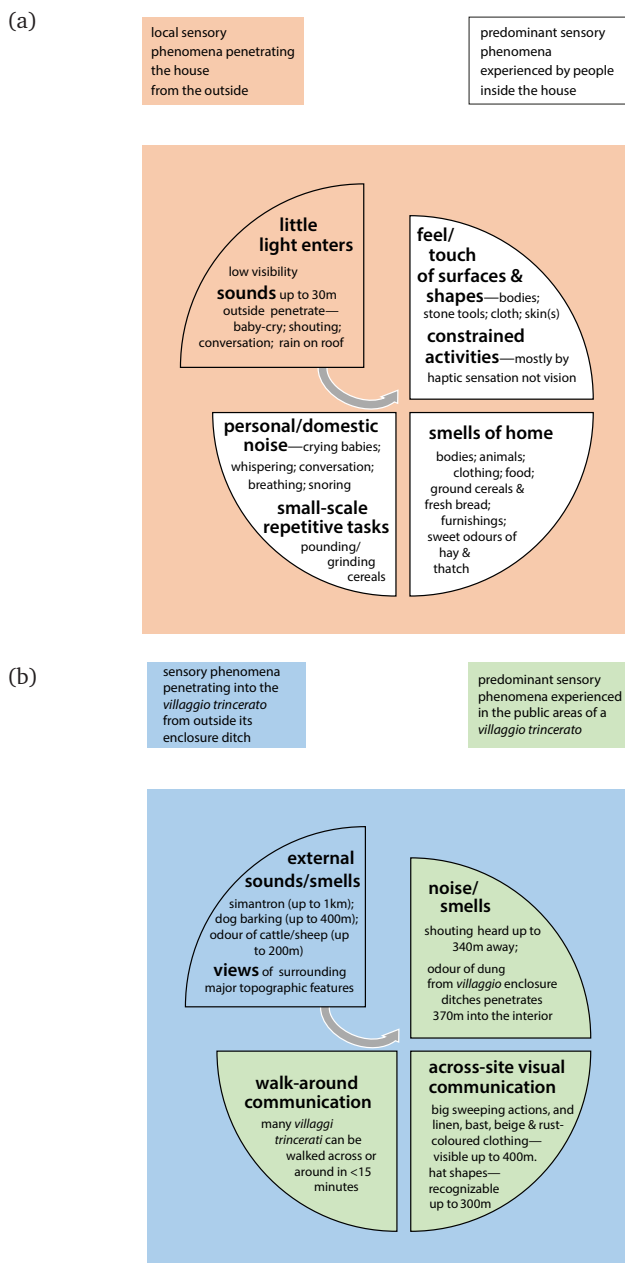


Figure 6.5 Representing sensory experience, Tavoliere Plain, Southern Italy. Word cloud representations of the multiple sensory experiences: a) inside *villaggi trincerati* houses, and b) of the general community experience within the enclosure of a *villaggio trincerato*. Sources: Sue Hamilton, adapted from Hamilton and Whitehouse, 2020.

We also considered sensory aspects of inhabiting small rectangular structures interpreted to be houses, which excavation has identified within some of the C-ditch enclosures (Figure 6.5a). This involved coalescing dispersed data. Firstly, we considered what would have been sensorially distinctive to a *villaggi trincerati* domestic interior. This led to consideration of the impacts of restricted visibility in contained, marginally lit spaces. For example, it would have been an environment that afforded a reduced awareness of colour, and one which allowed containment of personal conversations and blanked-out or softened the noises of the outside. Potentially this would have resulted in the increased role of personal haptic awareness inside dwellings. The most prolific cultural material found in excavations and fieldwalking of *villaggi trincerati* is a distinctive pottery tradition. This pottery has a basic typological division, between smooth fine wares with coloured slips and red cream and brown painted decoration, and coarser unpainted wares that have impressed and roughened decorations. The painted decoration is positioned on the fine wares such that its visual appreciation is maximized, for example on the inside surfaces of open bowls. These painted wares would have aesthetically best functioned for display and use in the light of outdoors. In contrast, the rusticated and impressed wares would have been more readily distinguished by handling and touch in the restricted lighting of the house interiors. This could be explored by excavation and the spatial plotting of the distribution of pottery types in lesser disturbed sites. In such a scenario material culture is a collaborative component of a socially constituted scale and type of sensory space.

At the scale of the whole village, the village boundary comprising one or more concentric encircling ditches and banks was consistently within visibility-range of large sweeping gestures and in intelligible shouting distance of a site's centre (Figure 6.5b). This suggests the viability of the boundary positioning to allow for coordinated communal activity in their laying out and maintenance (in complete contrast to the hillfort examples discussed above). On approaching or returning to a site, crossing the ditched boundary would not only have been a physical interruption to motion but also impactful in an olfactory sense, due to the large amount of dung identified as having been deposited in them (Seager Thomas, 2020a: chapter 10, appendix 1). Our experiments suggest that a whiff of the village boundary would have been vaguely discerned from c.350 m away and with increased intensity from c.70 m distance (Hamilton and Whitehouse 2020: chapter 4, appendix 4) (Figure 6.6c).

The *villaggi trincerati* were not generally intervisible (Dufton, 2020), but many were likely inter-audible. For example, in our performances of

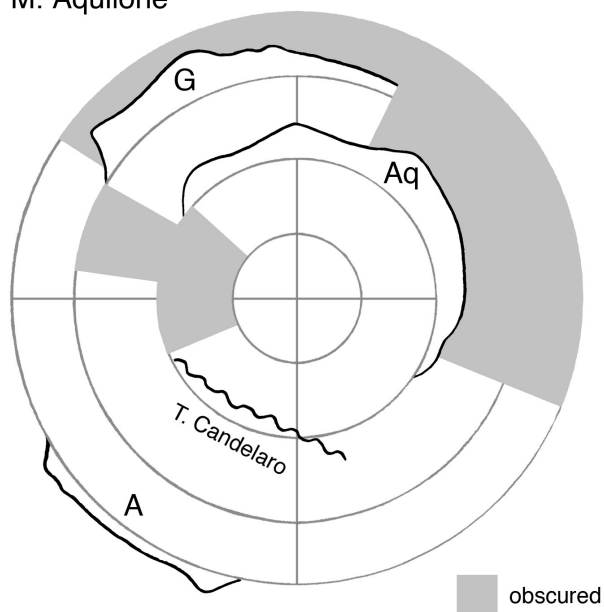
wood-on-wood percussion, the sound of a struck semantron travelled up to 900 m (Figure 6.6c). Many more activities outside the village boundary would have been out of sight but still sensorially distinct, such as the smell of flocks of sheep and the sounds of barking dogs. These sounds and smells constitute a sensory landscape that also included the documented visibility from within the site's interior of key topographic features, such the distinctive profiles of ancient volcanic peaks (Figure 6.6a). Collectively these likewise would have supplied a sense of a settlement's landscape (Figure 6.5b; Figure 6.6c).

The sensory methods and social scales of multisensory investigations encompassed by the project led us to a reconsideration of the *villaggi trincerati*. The sites have been considered to have become socially hierarchical with time, with smaller villages coalescing into larger centres/settlements with a more differentiated social and economic structure. Instead, we suggest a version of complexity that does not correlate with social hierarchy but one that is associated with egalitarian organization. The sites do demonstrate complexity in the variety and elaboration of their plans, in the reproduction of settlement structure at different sensory scales, and in the deliberate location of settlements so as not to overlook their neighbours. However, we suggest that the social organization remained centred on the nuclear or extended family, based on the sensorial affordances of the houses and C-ditched enclosures and the extension of the same types of socio-sensory parameters. This is clearest in terms of interperson visibility and the viable communication by human voice up to the scale of the village boundary. The relationships between different scales of domestic habitation, sensorial communication and distinctive sensory landscapes effectively materialized an ideology based on the nonhierarchical nature of society, even in the largest villages (Hamilton and Whitehouse, 2021).

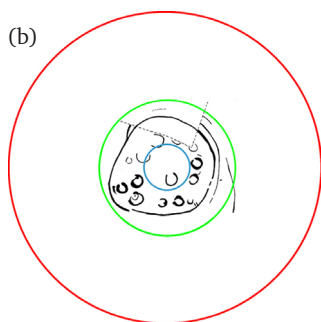
Making sense of the world, sensory meaning personified

So far, this chapter has focused on the role of embodied senses in creating and coordinating differing scales of being social. What I now turn to is the attachment of sensory characteristics and meanings to inanimate things (personification) to reiterate and operationalize a culturally unified understanding of the world. Here, I specifically consider the deployment of the sense of 'seeing' and visual colour symbolism in material culture.

(a) M. Aquilone



(b)



(c)

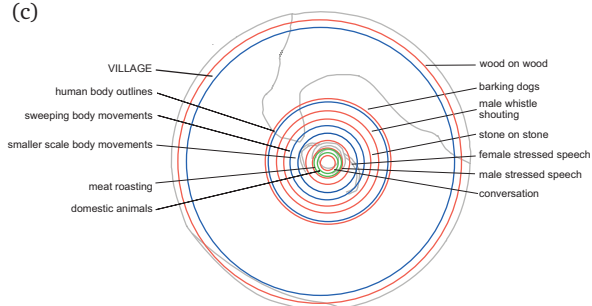


Figure 6.6 Re-presenting everyday static and moving sensory experience, Tavoliere Plain, Southern Italy. a) 360-degree visual experience of sequential horizons from the centre of Monte Aquilone, *villaggio trincerato*; b) The parameters of varying volumes of voice communication from within a structure at the centre of La Panetteria, *villaggio trincerato*: a private chat (blue), a conversation with stressed sentences (green) and shouting (red); c) sound, smell and vision in motion: the first points, while walking 'home' to Monte Aquilone *villaggio trincerato*, from where specific sounds, sights and smells become intelligible. Sources: adapted from Hamilton and Whitehouse, 2020 (all).

Rapa Nui statue landscapes: sensory interactions with ‘seeing’ statues

This example is drawn from a small part of a wider field project on the social articulations of constructed landscapes during Rapa Nui’s (Easter Island, Chile) statue-building period (AD 1200–1550) (Hamilton, 2013; Hamilton et al., 2008). Rapa Nui is a small triangular island that is geographically extremely remote. It lies in the East Pacific, thousands of kilometres from other islands and from its nearest continental landmass. Today, standing on the highest point on the island’s apex, the whole island is in view. With the major loss of trees during the statue-building period, it would have visually constituted a sensorially-contained world, with only the sea and sky on the horizon. From such a viewing point the interconnections between landscape places and their architectural components would have been evident (Hamilton, 2016). The studies already discussed in this chapter worked from embodied fieldwork observations to the implications of these for the organization of daily social practice. For Rapa Nui, we worked from observing patterns of sensory elements associated with inanimate things and structures at local and island-wide scales, to their implications for a past understanding of the island world from an embodied perspective.

Here, I return to attributes that are sight-recognized. The Rapa Nui statues (*moai*) are considered to represent ancestral chiefs. Most of those that left the quarry were set up on ceremonial platforms (referred to as ‘image *ahu*’), which are situated at the coast. These statues are charismatic in visual scale and are people-facing, being up to 12 m in height and placed ‘looking’ inland with their backs to the sea. The statues only received ‘sight’ on arrival at the *ahu*. Here their eye sockets were carved, and their eyes inserted, which were made of a white coral iris inset with a red scoria pupil. In effect, the statues could be made to appear animated and sensible. Dale Simpson (2009) demonstrated the sensorial oversight of *ahu*, and by implication the statues, using GIS viewshed and chi-square analyses, and showed how the distribution of the agricultural features of an associated landscape fell within the ‘visuallandscape’ of each image *ahu*. He suggested this facilitated the monitoring and overseeing of agricultural production and domestic life from the *ahu* and thereby an elite control over staple resources. GIS viewsheds were constructed ‘from the *ahu*’, presumably (but not stated) at platform height. Our embodied field study experimented by reversing the locus and direction of the sensing and ‘visuallandscape’. We walked the landscape inland of a selected *ahu* and plotted from where people (we) could see the statues’

eyes. This formed a distinct view zone which correlated with the ancient agriculture and domestic structures from up to 2 km inland of the *ahu*. The essence of sensing is different in each case: what can be seen of the statues versus what can be seen from the location of the statues; and embodied fieldwork versus technologically generated viewsheds. However, here both methods arrive at a comparable viewpoint, namely that the gaze of the statues on each *ahu* was a domestic and territorial-based experience (Figures 6.7a and b).

Eyes are a recurrent theme in Rapa Nui's ancient cultural world and prompted our consideration and survey of other features, objects and places animated by depicted eyes. For example, large eyes, each c.30 cm across, were carved on the quarry walls at Rano Raraku, the island's main statue quarry, after statues were removed. This could suggest that the quarry or its geological fabric was understood to be a living entity overseeing the place from which statues were carved and, in some cases, removed. This wider 'sensification' of rock, including the presence of carved eyes in Rapa Nui's rock art, suggests an island-wide code of sensory animation.

The same sensory cross-island connections might be found in the selection of specific colours from Rapa Nui's landscape geology (Hamilton et al., 2011; Seager Thomas, 2014). Our field and museum work documented the colour components of Rapa Nui's geology and the distribution of colour choices in its stone-based material culture in settlement and ritual contexts (Hamilton et al., 2011). This included:

- 1) White sea coral – carved into the irises of *moai* eyes, and lumps placed in rock gardens and crop enclosures.
- 2) Red scoria (mostly from one place, Puna Pau quarry) – carved into large statue hats (*pukao*), fashioned into rock basins, placed as fragments in rock gardens and crop enclosures, included among the foundation stones for houses (*hare paenga*), and used for the pupils of *moai* eyes.
- 3) Mingled white, red and black – pulverized red scoria, white fired bones and coral and black obsidian flakes. These, at the most diminutive scale, introduced the same colour-coding into the fill of the crematoria associated with the *ahu*.

These materials and their colours metaphorically brought different resources and parts of the island together. At a microscale they visually and symbolically marked the worldly end of a being.

Thus, a material object or fragment of the natural environment can have agency as a 'sensory carrier' that sequesters extant sensory

(a)



(b)

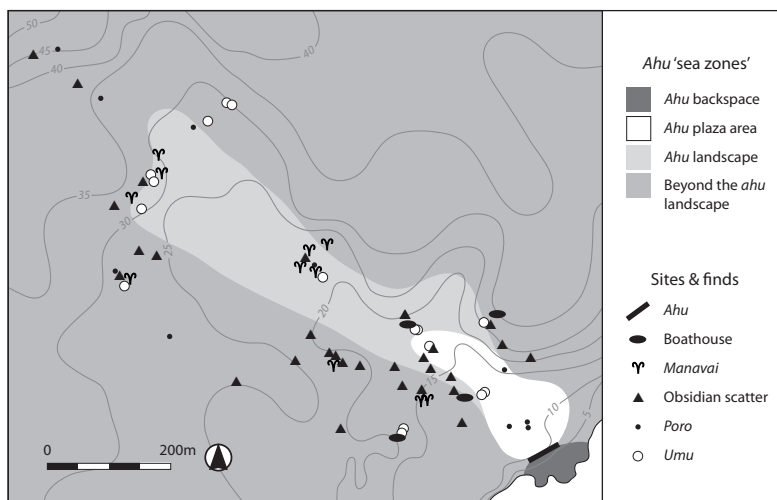


Figure 6.7 Personifying sensory meaning. *Ahu Tongariki*, Rapa Nui: a) photo of the landscape that the eyes of the standing statues overlook; b) map of the places of daily activities (houses, crop enclosures, ovens and rock gardens) from where the eyes of standing statues on *Ahu ura Uranga*, Rapa Nui, would have been seen. Sources: Colin Richards (a); Mike Seager Thomas, in Hamilton, 2010 (b).

reactions and understandings of the world. Humanly sensed attributes can be deployed on inanimate things as a form of sensory personification that reinforces a generative understanding of the world. The patterns described above for the archaeology of Rapa Nui suggest the use of sensorial conventions at different spatial, life-experience and social scales. They are identified by drawing upon many lines of material culture and coordinated fieldwork in multiple locales across the island. The Rapa Nui project was not initiated from a primarily embodied perspective but was prompted by our entangled sensory and other interfaces with Rapa Nui's landscape and observations that organically emerged during our work. Here the method of sensory archaeology was but one version of a landscapist approach to Rapa Nui's archaeology.

Conclusion

Inter-person sensory experiences are founded on 'live' social interactions. By 'live', here I mean actions and gestures experienced directly when they happen. In embodied field archaeology there is an inevitable tension between past 'live' and present-day sensory equivalents mediated through the archaeologist. There is likewise a tension between experiencing 'liveness' and its deadened documentation and archiving. Each inevitably raises the question of what remains and what gets lost in the process of simulation and mediation. What is detailed in this chapter is a personal and team-associated trajectory of embodied archaeological enquiry with a focus on the role of the senses in socializing. The multiscalar, practice-based research that is described suggests ways in which field teams can articulate the more ineffable embodied components of human social experience. By working in teams, experiences can be shared and rationalized. Such synchronized experiencing goes some way towards bridging the gap between our on-site sensory experiments and the social 'liveness' of long-gone worlds.

Acknowledgements

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References

- Beaumont, M. (2020) *The Walker: On losing and finding yourself in the modern city*. London: Verso.
- Bender, B., Hamilton, S. and Tilley, C. (1997) 'Leskernick: Stone worlds; alternative narratives; nested landscapes', *Proceedings of the Prehistoric Society*, 63: 147–78.
- Bender, B., Hamilton, S. and Tilley, C. (2007) *Stone Worlds: Narrative and reflexivity in landscape archaeology*. Walnut Creek, CA: Left Coast Press.
- Bourdieu, P. (1985) 'The social space and the genesis of groups', *Social Science Information*, 24(2): 195–220.
- Bowden, M. and McOmish, D. (1987) 'The required barrier', *Scottish Archaeological Review*, 4: 70–84.
- Classen, C. (1993) *Worlds of Sense: Exploring the senses in history and across cultures*. London: Routledge.
- Corbin, A. (1998) *Village Bells: Sound and meaning in the 19th-century French countryside*, translated by Martin Thom. New York: Columbia University Press.
- Drewett, P. L. and Hamilton, S. (1999) 'Marking time and making space: Excavations and landscape studies at the Caburn hillfort, East Sussex, 1996–98', *Sussex Archaeological Collections*, 137: 7–37.
- Dufton, J. A. (2020) 'Addressing the why and how of Neolithic settlement location through a hybrid quantitative/qualitative use of Geographic Information Systems'. In S. Hamilton and R. Whitehouse, *Neolithic Spaces*, Volume 1: *Social and sensory landscapes of the first farmers of Italy*. Specialist Studies on Italy. London: Accordia Research Institute, University of London, 131–58.
- Gibson, J. J. (1979) *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.
- Gibson, W. and Vom Lehn, D. (2021) 'Introduction: The senses in social interaction', *Symbolic Interaction*, 44: 3–9.
- Gillings, M. (2012) 'Landscape phenomenology, GIS and the role of affordance', *Journal of Archaeological Method Theory*, 19: 601–11.
- Hamilton, S. (2003) 'Sussex not Wessex: A regional perspective on southern Britain'. In D. Rudling (ed.), *The Archaeology of Sussex to AD 2000*. King's Lynn: Heritage Marketing, 69–88.
- Hamilton, S. (2010) 'Back to the sea: Rapa Nui's ahu seascapes'. In P. Wallin and H. Martinsson-Wallin (eds), *Migration, Identity and Culture*. Visby: Gotland University Press, 167–82.
- Hamilton, S. (2013) 'Rapa Nui (Easter Island)'s stone worlds', *Archaeology International*, 16(1): 97–109.
- Hamilton, S. (2016) 'Materialising island landscapes: The case of prehistoric Rapa Nui (Easter Island)'. In I. Conrigh and H. Mückler (eds), *Rapa Nui: Easter Island, cultural and historical perspectives*. Berlin: Frank & Timme, 129–48.
- Hamilton, S. and Barrett, J. (2018) 'Theory in the field'. In A. Gardner, M. Lake and U. Sommer (eds), *The Oxford Handbook of Archaeological Theory*. Oxford: Oxford University Press.
- Hamilton, S. and Manley, J. (1997) 'Points of view', *Sussex Archaeological Collections*, 135: 93–112.
- Hamilton, S. and Manley, J. (2001) 'Hillforts, monumentality and place: A chronological and topographic review of first millennium bc hillforts of south-east England', *European Journal of Archaeology*, 4(1): 7–42.
- Hamilton, S., Nahoe, S., Richards, R. and Torres Hochstetter, F. (2008) 'Quarried away: Thinking about landscapes of megalithic construction on Rapa Nui (Easter Island)'. In B. David and J. Thomas (eds), *Handbook of Landscape Archaeology*. Walnut Creek, CA: Left Coast Press, 176–86.
- Hamilton, S., Seager Thomas, M. and Whitehouse, R. (2011) 'Say it with stone: Constructing with stones on Easter Island', *World Archaeology*, 43(2): 167–90.
- Hamilton, S. and Whitehouse, R. (2020) *Neolithic Spaces*, Volume 1: *Social and sensory landscapes of the first farmers of Italy*. Specialist Studies on Italy. London: Accordia Research Institute, University of London.

- Hamilton, S. and Whitehouse, R. (2021) 'Complexity takes many forms: The Neolithic *villaggi trincerati* of the Tavoliere Plain, Southeast Italy'. In L. Magnini, C. Bettineschi and L. Burigana (eds), *Traces of Complexity: Studies in honour of Armando de Guio*. Sesto Fiorentino: All'Insegna de Giglio, 27–36.
- Hamilton, S., Whitehouse, R., Brown, K., Combes, P., Herring, E. and Seager Thomas, M. (2006) 'Phenomenology in practice: Towards a methodology for a "subjective" approach', *European Journal of Archaeology*, 9(1): 31–71.
- Heidegger, M. (1996) *Being and Time*, translated by J. Stambaugh. Albany: State University of New York Press.
- Heidemann, F. (2013) 'Social aesthetics of proximity: The cultural dimension of movement and space in South India', *Aesthetics*, 23(1): 49–67.
- Higgs, E. S. and Jarman, M. R. (1975) 'Palaeoeconomy'. In E. S. Higgs (ed.), *Palaeoeconomy: Being the second volume of papers in economic prehistory by members and associates of the British Academy major research project in the early history of agriculture*. Cambridge: Cambridge University Press, 1–7.
- Higgs, E. S. and Vita-Finzi, C. (1972) 'Prehistoric economies a territorial approach'. In E. Higgs (ed.), *Papers in Economic Prehistory*. London: Cambridge University Press, 27–36.
- Hill, J. (1995) 'How should we understand Iron Age societies and hillforts? A contextual study from southern Britain'. In J. Hill and C. Cumberpatch (eds), *Different Iron Ages: Studies on the Iron Age in temperate Europe*. Oxford: BAR, 45–66.
- Howes, D. (ed.) (1991) *The Varieties of Sensory Experience: A source book in the anthropology of the senses*. Toronto: University of Toronto Press.
- Ingold, T. (2022) 'Anthropological affordances'. In Z. Djebbara (ed.), *Affordances in Everyday Life: A multidisciplinary collection of essays*. Cham: Springer International, 51–60.
- Jarman, M. R. and Webley, D. (1975) 'Settlement and land use in Capitanata, Italy'. In E. S. Higgs (ed.), *Palaeoeconomy: Being the second volume of papers in economic prehistory by members and associates of the British Academy major research project in the early history of agriculture*. Cambridge: Cambridge University Press, 177–221.
- Kennedy, I. G., Whitehead, D. and Ferdinand-James, D. (2022) 'Serendipity: A way of stimulating researchers' creativity', *Journal of Creativity*, 32(1): 1–5.
- Llobera, M. (1996) 'Exploring the topography of mind: GIS, social space and archaeology', *Antiquity*, 70(269): 612–22.
- Newman, M. (2013) 'Body as place: Antony Gormley outside-in'. In M. Newman, *Antony Gormley: Model*. London: White Cube.
- Pollini, G. (2005) 'Elements of a theory of place attachment and socio-territorial belonging', *International Review of Sociology*, 15(3): 497–515.
- Porteous, J. D. (1990) *Landscapes of the Mind: Worlds of sense and metaphor*. Toronto: University of Toronto Press.
- Schafer, R. M. (1967) *Ear Cleaning: Notes for an experimental music course*. Toronto: Clark and Cruickshank.
- Schafer, R. M. (ed.) (1977) *Five Village Soundscapes*. Vancouver: A. R. C. Publications.
- Seager Thomas, M. (2014) 'Stone use and avoidance on Easter Island: Red scoria from the topknot quarry at Puna Pau and other sources', *Archaeology in Oceania*, 49(2): 95–109.
- Seager Thomas, M. (2020a) 'Fortuitous interventions: Geomorphological and artefactual investigations on Neolithic features exposed at two [Puglian] gravel quarries'. In S. Hamilton and R. Whitehouse (eds), *Neolithic Spaces*, Volume 1: *Social and sensory landscapes of the first farmers of Italy*. London: Accordia Research Institute, University of London, 295–319.
- Seager Thomas, M. (2020b) *Neolithic Spaces*, Volume 2: *The Bradford archive of aerial photographs*, Specialist Studies on Italy. London: Accordia Research Institute, University of London.
- Simpson, D. (2009) 'Rapa Nui's political economy and the visibility of its monumental architecture', *Rapa Nui Journal*, 23(2): 131–48.
- Thompson, D. C. and Copeland, S. M. (2023) 'Serendipity in research and development: The promise of putting into place patterns for paying attention', *Drug Discovery Today*, 28(8): 103648.
- Tilley, C. (1994) *A Phenomenology of Landscape: Places, paths and monuments (explorations in anthropology)*. Oxford: Berg.
- Tilley, C. (1996) 'The powers of rocks: Topography and monument construction on Bodmin Moor', *World Archaeology*, 28(2): 161–76.

- Tilley, C., Hamilton, S. and Bender, B. (2000) 'Art and the re-presentation of the past', *Journal of the Royal Anthropological Institute*, 6(1): 35–62.
- Tringham, R. (1995) 'Archaeological houses, households, housework and the home'. In D. Benjamin (ed.), *The Home: Words, interpretations, meanings and environments*. Aldershot: Avebury Press, 79–107.
- Turner, V. (1969) 'Liminality and communitas'. In V. Turner, *The Ritual Process: Structure and anti structure*. Ithaca, NY: Cornell University Press, 41–9.
- Vom Lehn, D. and Heath, C. (2022) 'Embedding impact in research: Addressing the interactional production of workplace activities', *British Journal of Management*, 33: 539–52.
- Whitehouse, R. (2014) 'The chronology of the Neolithic ditched settlements of the Tavoliere and the Ofanto valley', *Accordia Research Papers*, 13. London: Accordia Research Institute, 57–77.

Hidden battlefields: sensoriality and the underworlds of war, Hulluch, Northern France

Matthew Leonard

This chapter discusses the First World War centenary project, Loos Big Walk 2018, organized by the Durand Group,¹ during which, over the course of three days, a large section of the British Great War tunnel system, near Hulluch in France, a few miles north of Loos-en-Gohelle, was made accessible to the public. The exercise enabled members of the local community to gain a sensory understanding of this underground world and built on Laurajane Smith's notion that 'heritage is ... ultimately a cultural practice, involved in the construction and regulation of a range of values and understandings' (Smith, 2006: 11).

As background to the project, here, I will briefly explain how the Western Front was created and still 'lives' (Bender, 1993: 276), and the importance of subterranean landscapes in war. I will then outline existing attempts to preserve subterranean battlefields on the Western Front and elsewhere, assessing how effective this approach to 'heritage' (Harrison, 2010: 9) has been. Finally, I will discuss the effectiveness of Loos Big Walk 2018, describing how it transported the past into the present through an entanglement of modern life and the hidden corporeal landscapes of the First World War.

Landscapes are largely defined by sensorial interaction, and underground, in constricted and unfamiliar space, the importance of the senses to understanding the environment is amplified. As this chapter will demonstrate, corporeal public engagement in these intensely sensorial places is an effective way of engaging with landscapes of the past, enabling, at least in part, a better comprehension of frontline life during the Great War. It is an approach largely absent from existing outdoor or underground museums, and not always through choice. Health-and-safety legislation, legal restrictions and other factors intrinsic to

the contested nature of modern conflict landscapes (see Saunders, 2004: 8) limit the effectiveness of permanent exhibitions. Authenticity (see Cameron, 2008; Jerome, 2008; Jordan and Mura, Chapter 9, this volume) is necessarily sacrificed for safety.

The use of underground defences in conflict was not new in 1914, but it was essential to the creation of the First World War's front lines, and thereby the experience of frontline life. Tunnels and trenches, albeit on a smaller scale to those of the Great War, have been employed in conflict for as long as conflict itself. Alexander the Great used mines at the siege of Halicarnassus (334 BC) and again two years later in Gaza (Fuller, 1960: 200–19), and it is thought the defences of Jericho were likely felled by an Israelite mining operation (Robinson and Cave, 2011: 1). Since 1918, mining operations and underground warfare have been deployed on numerous occasions. During the Second World War, on the island of Iwo Jima, in the tunnels beneath Mount Suribachi, the Japanese kept a garrison of over 1,200 people (Beevor, 2014: 701).

During the Vietnam War, the Viet Cong guerrilla force was driven underground by the superiority of American fire and airpower (Mangold and Pennycate, 2005: 30). So successful were the Viet Cong tunnels that for a long time the Americans remained completely unaware of their existence. During the Cold War, many used the sewer systems that ran under the Berlin Wall to escape from East to West (Hertle, 2008: 56) and when these were shut off, escapees dug numerous tunnels instead (Hertle, 2008: 60–5). In Gaza, today, tunnels are regularly carved out beneath its borders with Egypt and Israel (Hecht, 2015), subterranean systems that have played a central role in the Israel–Hamas conflict that began in 2023. Likewise, subterranean warfare has expanded in significance in Ukraine, since the full-scale Russian invasion that began in February 2022.

Considering the scope of subterranean warfare through the ages, and particularly over the last 150 years, there are relatively few preserved subterranean battlefields around the world. Museums recording the subterranean Great War in France will be discussed later in this chapter, but all underground museal landscapes necessitate an alteration from their wartime states. They must conform to modern health-and-safety regulations, requiring extensive modifications, eroding traces of their sensual properties. Accordingly, underground conflict landscapes, difficult to access and maintain, are largely still hidden, and consequently misunderstood.

Today's Western Front

Today's Western Front offers a particular version of Great War history. According to UNESCO, a world heritage property may be understood to meet the conditions of authenticity if 'its cultural values are truthfully and credibly expressed through a variety of attributes' (UNESCO, [n.d.](#)). These attributes and values range from form and design to use and function, location and setting, and other external factors. In 2023, UNESCO protected several sites along the Western Front as part of the Funerary and memory sites of the First World War (Western Front) scheduling (UNESCO, [2023](#)), but little else of the Western Front visitor experience would qualify in terms of authenticity.

Villages and towns along the old battlefields all reference the war in some way and each contain memorials to *Les morts pour la France*. Bars and cafés display pieces of trench art (see Saunders, [2003](#)) and offer souvenirs. Battlefield tourism companies abound, or for those preferring to explore by themselves, helpful 'remembrance routes' meander their way through an A-to-Z of the war's sites. The experience prioritizes what can be 'seen' and seemingly everywhere and everything is removed from its corporeal past. The First World War was a conflict rarely 'seen' by those who lived at the front (Fussell, [2000](#): 51) yet much of what we know of it has been sourced with our eyes. Visitors to France and Belgium witness magnificent memorials, moving cemeteries and even 'preserved or reconstructed' sections of trench. Museums packed with artefacts are found in buildings that came to objectify the war. For example, in the small Flemish town of Ieper (Ypres) the In Flanders Fields Museum resides in the mediaeval Cloth Hall, a place reduced to almost nothing by 1918, then rebuilt to perfectly imitate its old form, the last brick cemented in place during 1967. Almost all traces of the conflict have been erased, yet the town thrives on the business generated by battlefield tourism. Likewise, at Albert, a place synonymous with the ferocious battles fought across the Haute de France region, the Somme 1916 Museum is in the undercroft of the town's famous basilica, its impressive *Madonna and Child* statue rebuilt and resecured.

Deep in the forests of the Argonne or high up in the Vosges, decaying trenches still carve their way through the undergrowth. Now overgrown, they hint at former events, but offer an unsatisfactory impression of the past. Occasionally, sections of trench or mine craters have been preserved for financial gain. Near the infamous village of Passchendaele, at the base of Hill 62, lies Sanctuary Wood and a small museum and café typical of those found along the old frontlines. To the

rear is a preserved section of trenches, almost absent of context but accessible to visitors for a fee. The trench walls have been reinforced with modern materials and methods, duckboards replaced numerous times, sandbags likewise, and the dugout entrances have been secured to keep out overenthusiastic tourists. The trenches are not visible from the outside world, screened with thick hedges and high fencing – perspective, context and authenticity are sacrificed for profit.

Income is not always the driving force. On Vimy Ridge lies a memorial site, given to Canada in perpetuity after 1918 and free for all to visit. Vimy has a special place in the Canadian national psyche, widely regarded as where, in 1917, the nation was born (see Hucker, 2009: 90; Cave, 2009). Crowned by Walter Allward's magnificent memorial on Hill 145, Vimy is also home to several cemeteries, preserved trenches (Canadian and German) and a section of tunnel, open to visitors. Nevertheless, increasingly the Western Front has become what Gough (2004) would term a collection of 'sites in the imagination'.

These mythical places, seen, obscure the very real ones still hidden. Beneath the surface, travelled by so many tourists, the war's underground passageways, caves and deep fighting tunnels remain largely untouched, underpinning the history of the conflict as well as the physical foundations of modern life. Their continuing relevance is readily apparent. Near Loos, a prison was recently built over a First World War British tunnel system. Elsewhere, thousands of houses straddle old trench networks and ancient underground quarries. As Saunders (2010: 48) observed, archaeological excavations regularly uncover 'trenches, dugouts, material and human remains often perfectly preserved, just centimetres beneath the surface'.

This hidden heritage can be problematic and difficult to categorize. Subterranean conflict landscapes are dark, claustrophobic, terrifying places that threaten the body's safe boundaries (Douglas, 2002) – dangerous to enter and even lethal. They cause surface collapse from below, creating problems with the everyday and the mundane, such as obtaining home insurance. They create complex issues for town planners, building developers, road and railway construction.

For many farmers, random field collapses are increasingly common, a problem with no obvious solution. Nixon (2009) argues that slow violence is attritional, delayed, often invisible and disproportionately impacts some of the poorest communities. It's also an aspect of the past shunned, kept hidden, not discussed. Large swathes of the Western Front are today farmland; reclaimed, reploughed and replanted. Yet the 'iron harvest' (ordnance revealed by the farmer's plough) still annually

produces several tonnes of unexploded shells, and farmers know too well the risks of working their land. Thick sheets of steel are welded to the underside of machinery, protecting the operator should the worst happen. This excessive weight crushes the ground from above and works in tandem with the unseen (and often unknown) collapsing underground to unsettle the land further. Surface collapses are common, and tractors, animals and crops are regularly consumed by the failing substrata. At some point it's likely that hundreds of square miles of agricultural land will simply disappear, bringing more misery to communities already ravaged by a war more than a century old.

The challenges these landscapes present to both heritage professionals and the French public today are 'difficult' (Macdonald, 2009), even 'negative' (Meskell, 2002). They could also be termed 'toxic' (Wollentz et al., 2020: 294–312), places still capable of causing injury or death, repositories of live explosives, gas shells and vast mine charges. They represent the malignant (foreign) remains of a devastating war, hidden and tolerated until dramatically exposed, usually through catastrophic collapse. They also testify to the sheer scale of global conflict, 'the battle zone remains a fact in the geography of northern France many decades after the conclusion of the war' (Flares, quoted in Clout, 1996: 1). The importance of understanding this heritage, therefore, goes beyond historical memory, education or human interest. Its exposure shows the war still impacts modern life.

First World War subterranean space

By the end of 1914 the First World War had largely entered stalemate and as 1915 dawned the lines became deeply entrenched, meandering uninterrupted some 475 miles from the Belgian coast to the Swiss border (Keegan, 1999: 199) creating what became known as the Western Front. On the surface, fields of barbed wire, machine guns and artillery defended opposing trenches, themselves often three lines deep, connected by shallow tunnels or narrow communication passages. Beneath, dugouts and tunnel systems were hewn from the chalk and clay substrata, building an entire underworld to which few could initially adapt, but all would come to know.

Henceforth, war would inflict wholesale destruction on a terrifying scale, quite literally 'ruining the idea of ruins' (Dyer, 2009: 120). Millions of artillery shells and thousands of enormous underground mines turned the earth inside-out, reconfiguring it on an hourly basis. No Man's Land, the

space between opposing trenches, was a place where nothing visibly lived, yet the dead were there, in their thousands, rotting on the barbed wire or lying in shell holes. Bucolic fields, so long the agricultural backbone of France, were now quagmires of unexploded shells, missing people, misery and mud, undermined by mile after mile of labyrinthine tunnel systems.

For many at the time, the landscape no longer made sense. The soldier's relationship with it had to be renegotiated. This war would not feel like any other, trench life meant it could not be seen and hearing quickly became the primary survival sense. 'You can't explain what war really is to someone who has never been there ... they simply don't have the necessary sensory organs' (Babchenko, 2007: 398–9).

Paradoxically, to escape a world that no longer made sense, both sides chose the relative safety of one almost unknown. By mid-1917, the subterranean battlefield had expanded to encompass almost all life at the front. Thousands lived a troglodyte existence underground in caves and expanded quarries. 'Subway' tunnels offered passage to and from the front in relative safety, dugouts became deeper and more expansive, sometimes even equipped with running hot and cold water. Men were buried in underground cemeteries, after dying in underground hospitals. They were mourned in underground chapels.

Things largely remained this way until the war of movement regained impetus in late 1918, rendering the static fortifications redundant. Nevertheless, they were repurposed, adapted for storage, shelter or safe passage. At the war's end, where possible, towns and villages were rebuilt, and cities were repaired and repopulated. Fields were demined and ploughed over, rid of the unexploded ordnance, human remains and detritus from four years of war. Many (but by no means all) tunnel entrances were closed, either deliberately or by nature's recovery, and soon there was little left of the old battlefields to see, let alone to engage the other senses.

Unearthing the underground

As the former battlefields began to heal, so too did those damaged by war, both in public and private, through acts of mourning and remembrance. Pilgrimage offered the chance to visit places where relatives or loved ones fell, or for soldiers to return and remember those they fought with. It rapidly became big business and hoteliers, travel bookers, tour guides, souvenir sellers and many others were quick to fill the void left by the conflict.

Not far from Arras, the Maison Blanche souterrain was a popular stop on battlefield tours, operated by travel companies. Although no longer open to the public, the walls of the cave still sport large black arrows, painted to guide visitors in the gloom (Leonard, 2016: 114–15). The author Henry Williamson was among those who visited, commenting on ‘the regimental crests engraved in the chalk, maple leaves predominate. The signatures and initials in indelible pencil may have been made yesterday. All drowned far under time!’ (Williamson, 2009: 116–17). The ruins of war were being ‘maintained’ from the moment the conflict ended (Waterton, 2005).

The popular image of the Western Front as simply a network of trenches belies its corporeal character – almost all life at the front played out beneath the surface, lived in the ground not on it. This paradox leads to a conundrum. How can a past that was rarely seen, but intensely felt, be satisfactorily portrayed, and can the public be exposed to the innate nature of frontline life without themselves being placed at risk?

There are several sites in France that record the underground war, although as with other similar places around the world, most have significant limitations to their authenticity imposed on them by health-and-safety legislation. Artificial lighting, permanent walkways, emergency exits, air conditioning and access features (such as lifts) all detract from the sensoriality of this heritage. Not far from Verdun is the Butte de Vauquois, a place where mine warfare perhaps reached its zenith. Here, an entire village was destroyed, as 519 mines were blown, and there are over 17 km of tunnels beneath the hill. It is a place that defies belief and while the subterranean landscape is closed to the public, it is possible to walk through the massive craters, and private visits can be arranged into the shallowest tunnels.

The Caverne du Dragon (Dragon Cavern), on the Chemin des Dames ridge, above the obliterated village of Craonne, is a quarry dating from the sixteenth century, appropriated by both sides during the war, at times simultaneously. Internal walls, constructed to keep the French and Germans apart, were regularly breached in the darkness with machine guns, hand grenades and poison gas. As impressive as this ‘living’ museum is, health-and-safety restrictions mean the visitor’s experience is somewhat banal, as artificial lighting, air conditioning and structural alterations leave it shorn of its sensorial qualities. It feels more a place of sanctuary and comfort, as opposed to one of nightmares.

Beneath the Northern French city of Arras lies Carrière Wellington (Wellington Caves), a pre-existing cave system expanded by British and New Zealand engineers in 1916 and 1917. Here too is a museum, above

and within the souterrain. Visitors' safety is paramount, but again a place impressive in size and scope is devoid of somatic engagement. Wooden walkways must always be followed, graffiti and carvings are preserved behind screens and artificial lighting. Only a small section of the larger cave system is accessible. On the eve of the Battle of Arras, in April 1917, some 27,000 British and Commonwealth soldiers were crammed into these caves, ready to exit into the trenches above, yet the sensorial chaos of so many in such a small place, awaiting battle, is difficult to imagine. There is no noise, no odour, no restriction of personal space and vision is untroubled.

On Vimy Ridge, adjacent to its concrete trenches, the preserved Grange Tunnel offers a similar experience. While benefiting from the surrounding environment, the addition of concrete and steel reinforcement, a widening of the tunnel and the use of electric lighting all again contribute to sanitization. The Grange played a vital role during the battle for Vimy Ridge in April 1917, one of several tunnels constructed for the attack, and the only one partially open to the public. Another, the Goodman Subway, and its connecting deep-fighting system, La Folie, has been home to my own research (in conjunction with the Durand Group and Veterans Affairs Canada (VAC)) for the past decade, enabling a comparison between a sanitized landscape and one still unrefined.

The absence of sensorial interaction in Grange is amplified upon entry to Goodman. Immediately space is severely restricted and the air full of chalk dust. The floor is uneven, covered in debris from the slowly collapsing ceiling. Unexploded ordnance is ubiquitous, graffiti commonplace and carvings prominent. Despite the months it took to construct these tunnels, they were designed to 'live' for just a few hours, to facilitate the attack on the ridge. The engagement between human beings and the landscapes of war here was a powerful and intimate one, and the experience of being inside these tunnels would have been overwhelming. The cacophony of high explosives screaming overhead and into the German positions was heard deep underground. It was also felt, as the walls shook, the ground trembled and those in the tunnels clung to each other for support, enduring what must have seemed a subterranean earthquake.

The tunnels rapidly filled with dust and breathing became laboured. Sanitary conditions were appalling, the latrines not capable of sustaining so many for so long, and within hours foetid conditions made the tunnels almost uninhabitable. Bodies were forced to adopt unnatural positions and muscles screamed under the weight of kit, weapons and

ammunition. Making things worse was the weather. Despite being almost summer, it was snowing, turning the surface into a swampy mess, which in turn seeped down into the tunnels, causing the walls to drip with battlefield effluent – a putrid mix of trapped gas, human remains, excrement and the detritus of war (see Leonard, 2016: 123–5).

Researching sensorial landscapes

Gaining access to conflict subterranea is difficult and requires a professional team with a broad range of skills, and my own work has greatly benefited from my membership of the Durand Group. Born some 25 years ago, the group has researched many kilometres of tunnel and cave systems across the Western Front, particularly in the Artois and on the Somme. The Durand Group is not primarily an archaeological organization nor an academic entity (for an alternative approach, see Hamilton, Chapter 6, this volume); rather it comprises an eclectic mix of archaeologists, anthropologists, medical professionals, cave and mine rescue experts, bomb disposal technicians, retired and still serving members of the armed forces, film makers, historians and surveyors, whose aim it is to explore these places from a holistic perspective. This team ethos is essential to working underground in places with many potential hazards.

Landscapes and those that use them create each other (Miller, 2010: 60) and the senses play an intrinsic role in this development, as sensorial engagement creates both person and artefact (Howes and Classen, 2014: 13). This realization was as important to the Great War engineers driving the tunnels as it is to the Durand Group's research methodology today. Underground, people must rely on each other for their personal safety. Trust is paramount. Control of the sensorium aids calmness, creating place from space.

Clear from the group's work is that the sensorial dimensions of these places are of central importance in understanding First World War subterranean landscapes. Using the senses as a guide or an archaeological tool forms what David Howes termed 'an archaeology of perception' (Howes, 2017: xxi; see also Leonard and Breithoff, 2020: 282) and builds on the notion that 'through living in the landscape it becomes part of us, just as we are a part of it' (Ingold 2000: 191). Without this approach, understanding the underworlds of war, places rarely seen (yet always felt) and seldom visited, becomes problematic. Photographs, even in colour, make them appear benign, scale is difficult to judge, and tunnels hewn from chalk or clay begin to look the same. Documentary

records are therefore of limited use and are surpassed by an archaeological, fieldwork-led approach.

Humans are ocular-centric by nature, and in trying to decipher the past using visual imagery, whether grainy black-and-white footage or the remastered efforts of modern film directors, we augment our imagination with a sensorial perspective absent from most who were there at the time. Paul Nash's brilliant painting *The Menin Road* is perhaps one of the most powerful images of the Western Front, and a scene, most probably, almost nobody witnessed. His abstract landscape echoes our confusion of a place not understood, it conveys scale where for many there would have been none. Immediacy with the landscape was (and is) vital and the sensorial relationship we have with our *stuff* and our surroundings is central to deciphering our corporeal past. Here the work of several scholars working in the wider field of sensorial studies is important to realizing the corporeality of life underground in conflict, not least Constance Classen's work on the power of touch (2005), Marcel Detienne's (1994) study of the properties and impact of smell on the creation of space, and Alain Corbin's (1998) investigation of the relevance of sound on rural communities during the nineteenth century, places defined by their sonic landscapes.

Despite its importance, recreating for purposes of tourism the sensorial experience of being in a tunnel on the frontlines of war is neither wholly achievable nor particularly desirable. Without extensive modification and enormous costs, these hidden landscapes are not readily accessible (or safe) to enter, and those subterranean spaces that are open to the public fail to adequately transmit the scale and proliferation of these landscapes, the experience of their occupation or their inherent dangers. These restrictions to a somatic experience of underground conflict landscapes (necessary or otherwise) contributed to the Durand's Group work around Loos and eventually to what became known as Loos Big Walk 2018.

The Loos battlefield, then and now

In 2013, the Durand Group began work on a decade-long endeavour to better explain the experience of living in the Loos battlefield, both during the Great War and today. This included physical assessments of the underground space, interviews with residents and research in French, British and German archives. Loos has been largely overlooked by historians, perhaps because only two engagements of note were fought

there during the war – ‘Loos’ (September 1915) and ‘Hill 70’ (August 1917). The 1915 Battle of Loos is perhaps best known for the British use of chlorine gas in quantity for the first time, with mostly disastrous results. By the end of the three-week battle, the British had sustained over 50,000 casualties, almost 16,000 of them killed. It was a poor choice of battlefield, with no cover for attacking troops. From then on, there would be no more grand attacks across the plain of Loos. All life on this section of front would go underground for the rest of the conflict. As Charles Bean, one of Australia’s official war correspondents noted in 1918:

To the north of Lens near Hulloch [sic] ... the whole defence of the front appears to be underground. The infantry garrison lives underground, Trench Mortars and their crews and their embrasures are underground. The Machine Guns are underground. The men’s living rooms are underground, and for a mile behind the front line the communication trenches are all 35 feet underground. (Charles Bean’s interview at Noeux les Mines on 19 March 1918 with Major Alexander Sanderson [courtesy of his grandson, Robin Sanderson]).

In the trench system itself, underground passages were dug some 15 to 25 feet deep, from the reserve line up to the front. These, in due course, were connected with the mine levels and shafts, and eventually rooms were excavated off the passages, timber and wire beds put up, electric light plant installed, cook houses and cooking apparatus fixed, wells sunk, and in fact a sort of underground barracks was formed, and all within 100 to 400 yards of the enemy frontline. It was a remarkable development (Weetman, 1920: 200).

The Durand Group’s initial work underground reaffirmed the existence of subterranean railway systems, complete with working turntables, large dugouts, machine and pump rooms, kitchens, wells, heavy mortar positions, communication, command and control centres, and ingenious bascule doors and moveable defensive walls designed to stop unwanted ingress, ‘(there was) an elaborate arrangement of doors and gas blankets fixed at entrances, and at various intermediate points in the tunnels, made to protect them in case of ... attack’ (Weetman, 1920: 200). For all intents and purposes, the war was waged underground at Loos, and this ‘unseen war’ has resulted in a dearth of museums and sites of historic interest there, although the large Dud Corner Cemetery, Loos British Cemetery and St Mary’s Advanced Dressing Station² demonstrate the ferocity of this forgotten battlefield.

Before 1914, Loos was an important area for both agriculture and coal mining and was quickly reclaimed afterwards (see Ford, 1920; Clout, 1996). For many local people, the fighting was something to be forgotten. Vast tracts of civilization had been destroyed; farmland reduced to mud and barbed wire, coal mines flooded, inhabitants evacuated. Rebuilding was paramount. Around Loos, that the war's heritage was largely hidden helped foster amnesia, as the fields were cleared and the coal mines drained. Before long, things seemed almost normal again.

When the Durand Group started work in the area, despite some local knowledge, largely gleaned from farmers on an ad hoc basis, most of the community was unaware of what lay beneath their feet. This represented a unique opportunity. Could the existence, as well as the extent, of the underground system be adequately revealed to the local community? Could people once again walk through these places? And, perhaps most importantly of all, could this be done while preserving the sensoriality of being in subterranean conflict space?

Planning Loos Big Walk 2018

By 2015, the Durand Group had established itself in the local area and community and had begun to solidify plans to offer local people a tour of an 'untouched' tunnel system that snaked its way beneath the vicinity. The project was led by Andy Prada, a founder member of the group, with the broad aim of returning to local inhabitants agency over their recent past (see Kirkbride, Chapter 8, this volume, for a comparison of sensory walks and a community's past; see also Jordan and Mura, Chapter 9, this volume). As Andy Prada notes:

The idea was to give back to the community, to enable them to better understand their history, and give them something tangible they could call their own. For too long, places such as Loos, Hulluch and Givenchy have been largely ignored by tourists and most historians, merely seen as a pitstop on the way from Ieper to the Somme. (Prada, 2023: personal communication)

During initial work in the area, the Durand Group provided talks to the local community, regular updates on our work, and produced information, posters and maps that were displayed at dig sites. Curious passers-by were warmly welcomed and invited to drink tea with the team and discuss the group's work. In 2016, with financial assistance from the

Durand Charitable Trust, members of the group designed and supervised the installation of an information plaque at St Mary's Advanced Dressing Station Cemetery, acknowledging the work of the British and Australian tunnellers in the area during the conflict. Remarkably, this was the first of its kind in the vicinity to describe the multinational character of the war's subterranean landscape.

Much of the Durand Group's work around Loos has centred on the communes of Hulluch and Haisnes, and concerned the excavation of several extensive, connecting subterranean systems, namely Hulluch, Saint Elie, Quarries and Hairpin. Unlike most other Great War tunnel systems, Hulluch and St Elie also have a Second World War component. In 1939, aware of the impending threat, members of 240 Field Company Royal Engineers revisited the Hulluch and St Elie tunnels to assess their suitability as a rear headquarters for II Corps of the British Expeditionary Force (see Prada, [forthcoming](#)). In 1940, 240th Field Company Royal Engineers, alongside the reformed 170th Tunnelling Company, excavated it further, altering the layout of Great War tunnels deemed surplus to requirement.

The result is an interesting melange of history, a combination of landscapes embedded through and in conflicts. Secondary tunnels were given new names, reflecting the cultural and social changes in Britain between the wars. For instance, the main underground hub (where tunnels running in different directions branch off) was originally named the 'Oval', a nod to the popularity of that area of London in the early 1900s. Some twenty years later, the 'Oval' was renamed 'Piccadilly Circus'. Times had changed, not least in the conduct of warfare. Germany's blitzkrieg tactics largely rendered static underground defences redundant. The Engineers soon closed the system and along with the rest of II Corps, advanced into Belgium to engage the Germans once again.

Loos Big Walk 2018: methodology

Phase 1: research

The overarching aim of the project was not overtly scholarly, as the Durand Group is not an academic organization. Rather, it was conceived to enable the local community (and a wider audience through future publications, lectures and presentations) to experience the physical past that lay hidden beneath their feet. The group wanted to achieve a somatic experience to prove this hidden history could be revealed

in its 'natural' state. In effect, this would be an experiment in 'pop-up' heritage, designed to be ephemeral but intense – a visceral, corporeal experience. Laurajane Smith argues that 'heritage is not a thing, it is not a site, building or other material object ... rather heritage is what goes on at these sites' (Smith, 2006: 44). The plan was to bring people into direct contact with an authentic conflict landscape, acknowledging that the 'past is not abstract; it has material reality as heritage, which in turn has material consequences for community identity and belonging ... it is someone's heritage' (Smith, 2006: 29).

Initially, members of the group conducted comprehensive desk-based research, obtaining maps of the area from 1915–18, detailing the tunnel complex, its scope, many of its features, the original entrances and exits and, through diaries and personal correspondence held in archives, the experience of some who occupied the system. Much of this data was available through the National Archives at Kew and at the Royal Engineers Museum archives at Chatham, in Kent. Added to this research was a qualitative contribution, experience yielded from the group's work beneath the Western Front for many years.

With the desk-based research and fieldwalking completed, a section of the Hulluch Tunnel was selected for the purpose. Here, fieldwalking involved tracing the ground on the surface using contemporary tunnel maps, the digitized Linesman trench-mapping system and the use of dousing rods. By doing so, a better understanding of surface and sub-surface cartography was established. Today, the wider tunnel system lies mostly under agricultural land, but also at least two main roads, First World War Commonwealth War Graves Commission cemeteries, and modern industrial and commercial buildings. More importantly, the land is today the property of several different owners, most of whom are unaware as to the extent of what lies beneath. Before any invasive work was undertaken, all involved parties had to be contacted, consulted and then their permission sought, for access. Once everyone was satisfied, excavation work could commence.

Phase 2: excavation

After initial discussions with landowners and local authorities it was decided to excavate an original incline (entrance), which today sits nestled in a small copse of trees to the side of a field. Although it required considerable engineering, after several months the group were able to install a preconstructed shaft, built using railway sleepers, ensuring safe and permanent access to the system. At the time, the group had not

finalized its plans for Loos Big Walk 2018, but the permanent entrance was later to prove invaluable.

With the new shaft in place, the system could be properly accessed. It was found to be in remarkable condition, mainly dry and the temperature stable at around 11 degrees Celsius. The entrance led directly to a central hub serving three extensive tunnels, the main one known as ‘Wing’s Way’ (named after Major-General Frederick Wing, killed in 1915 at Loos), and two others blocked by partial collapse along their length. Wing’s Way extended for around a kilometre and featured, among other things multiple side tunnels, access to trench mortar pits, latrines, command and control rooms, a large well, several sumps to control flooding, a rescue chamber (known as a proto-room) and several defensive mechanisms to protect the tunnel from enemy ingress. There was also a large quantity of unexploded ordnance in the form of hand grenades, small arms ammunition and several larger calibre artillery shells. Along its length were numerous examples of graffiti and carvings from the war, some crude, others works of art. It was a time capsule, hidden heritage (see [Figure 7.1](#)).

A permanent ‘exhibit’ was out of the question. The extensive modifications required for safety and the massive investment that would entail, as well as allocation of permanent staffing, comprehensive insurance and official permissions, were beyond the scope of the project. It would also defeat the purpose of the project. However, the aim was not to make the system accessible to the public at large, rather just to the local



Figure 7.1 A Grenadier Guard’s image carved on the wall of the Hulluch tunnel. *Source:* author, Durand Group.

community. Therefore, the idea of a ‘pop-up heritage’ experience was conceived. The system would temporarily be made safe and opened for just one weekend during September 2018. Visitors would be guided along Wing’s Way by members of the Durand Group and experience the tunnel largely as it was during the war, seeing for themselves the material culture that propagated the structure, feeling the claustrophobic environment, breathing the chalk dust that filled the air. It would be a one-off experience.

Phase 3: preparation

The biggest issue the group faced was that there was only one entrance to the system. To safely take the public under ground a second entrance/exit had to be constructed. This was done by utilizing an existing (although now collapsed) entrance known as Mac’s Shaft. It was located on the surface using contemporary maps and modern GPS, and then found underground and re-engineered to the surface. With the second entrance established, it was now possible to enter the tunnel through Mac’s Shaft (see [Figure 7.2](#)) and walk around 800 m underground, re-emerging through the railway sleeper shaft already *in situ* at the original entrance. Over many months the group prepared the tunnel for visitors, ensuring any unexploded ordnance was removed and the floor was cleared of trip hazards. However, other than these basic measures the tunnel was left as much as possible in its existing state. For



Figure 7.2 The original entrance to the tunnel complex known as ‘Mac’s Shaft’, re-engineered by the Durand Group. The famous ‘double crassier’ can be seen in the background. *Source:* author, Durand Group.

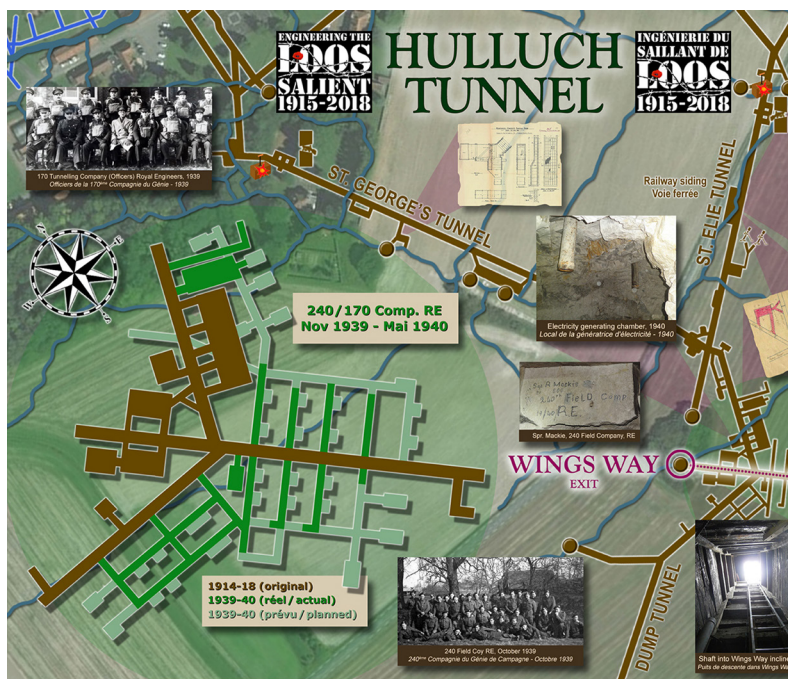


Figure 7.3 Plan of the Hulluch Tunnel. For the full plan, showing the route taken during the tour, see <https://durandgroup.org.uk/loosbigwalk2018.html>. Source: Durand Group.

the pop-up heritage experience to work, it was vital to keep things as authentic as possible. The tunnel had to be presented in the condition in which it was (re)discovered, replete with its sensorial qualities and, as far as possible, physically unaltered.

Although mainly one long tunnel, Wing's Way has several side tunnels, linked rooms, short cuts and other features along its length. It was important to devise a route through that was safe but also informative. Accordingly, several of the main features along the route were earmarked and further researched (see Figure 7.3). Members of the Durand Group produced a script, to be used by those conducting the tours so that all visitors would get the same experience across the weekend.³ The local authorities were invited to the site, along with the local Gendarmerie, fire brigade and rescue services, to ensure all stakeholders were happy with the plan. Finally, a field telephone system was installed along the tunnel's length, an added safety feature to ensure effective communication underground.

Phase 4: execution

On the weekend of 22–3 September 2018 the Durand Group gathered in France for Loos Big Walk 2018. The weekend had been advertised to the local community in the months beforehand, and locals were invited to attend at their leisure. On site, the group erected several large tents where guests could prepare to be taken underground. They were briefed on what they would experience, the safety aspects of the trip and then equipped with hardhats, torches and suitable clothing. Over the weekend, some 300 visitors were organized into groups of around a dozen and then taken underground, accompanied by a guide and three other Durand Group members. Group members employed GoPro cameras and other video and imaging devices to record the experience, and visitors were also encouraged to record their own experiences of the visit on their phones and cameras, and were free to publish their experiences on social media.

Entry was through the Mac's Shaft incline and exit via the original sleeper shaft. The first item of interest visited was the 'proto-room', so named after the wartime breathing equipment which had been used to rescue tunnellers trapped by explosion or carbon monoxide gas, a substance undetectable by the human nose. To mitigate that danger, the tunnellers had kept canaries, or mice. These animals would warn of the presence of carbon monoxide gas, by dying quickly, thereby alerting the tunnellers to toxic air. The animals became known as 'tunnellers' friends' (Grieve and Newman 1936: 311–15). An original photograph of the room featuring a tunnel rescuer in full breathing kit was enlarged and mounted on the room's main wall. This not only set the scene for visitors, but also served as the ideal place for a further safety briefing on the hazards and sensorial experience of life underground.

Guests were then accompanied along the length of the tunnel and briefed on points of interest, from particular physical features to items of more personal material culture. Light sticks were used to mark these artefacts, enabling guides to refer to the pre-devised script. Particularly impressive pieces of graffiti had been pre-researched and, where possible, were linked to war diaries or personal correspondence, found during archival work, revealing the names, rank and war experience of their authors, bringing home the human aspects of landscape creation.

The senses are amplified underground, straining the sensorium's ability to operate, inverting the established sensorial hierarchy. As they walked single file along Wing's Way, guests were exposed to this corporeal assault. The air was dank, an atmosphere added to by the

laboured breath of people packed together in a closed environment. Visitors could feel and taste the chalk-dust laden air on their lips and the uneven floor beneath their feet. As Elaine Scarry (1985: 48) notes: ‘smell is a sensory mode that has emerged to watch over the entry of the world into the body’, and the nose’s olfactory sensors were simultaneously dulled by chalk dust and amplified by bodily odours, deodorants, aftershave and perfume.

Of all the senses, smell was perhaps used least underground, but it was still relevant. Odours could give away a soldier’s location, even through the tunnel walls. As the anthropologist Anna Tsing notes: ‘describing smell can seem as difficult as describing air’ (Tsing, 2015: 46), and yet strange odours are immediately recognized by the brain. Different nationalities used different kinds of soap, washed their uniforms in different detergent, smoked different tobacco and ate different foods. Even the candles used for illumination carried different olfactory properties, all of which produced a cornucopia of smell (Leonard, 2016: 55).

As visitors adjusted to the darkness and sensorial disorientation, punctured by torchlight, they realized the extent to which the senses dictated space, with many visitors using the tunnel walls for balance, to anchor themselves in such an alien place (see Figure 7.4). Sound travels in strange ways underground, reflecting off rough walls, confusing distance and direction. Wing’s Way had a small light railway running its



Figure 7.4 Conditions in the tunnel were cramped, forcing people to stay in close proximity to each other, allowing for a better understanding of the sensoriality of underground landscapes. *Source:* author, Durand Group.

entire length. Today some of the track remains, along with sidings cut into the chalk, old rail carts and turntables. The track is made of wood and the carts' wheels, rubber, all of which helped to subdue noise. For wartime tunnellers, silence was often a matter of survival, 'the darkness is a huge mass; you seem to be moving through a yielding substance; sight is a superfluous sense. Your whole being is concentrated on the faculty of hearing' (Leed, 2009: 144). Sounds cause vibration, which could be detected, initially by crude, often homemade, listening devices akin to a stethoscope, and later by advanced electronic seismo-microphones. Listening tunnels were dug at regular intervals, prying tentacles reaching out towards the enemy, dummy tunnels were created using sound as a ruse or a lure, instructions such as 'dig here' or 'quiet here' were scrawled on the walls, to avoid talking. To those visiting Wing's Way during the Loos Big Walk 2018, this relationship with sound underground was immediately apparent. Voices were sometimes difficult to hear, due to the way that sound reverberated and the sound-dulling effects of chalk. Many things needed repeating by the guides and instructions had to be passed along the tunnel as people walked in single file.

Visitors were initially apprehensive on entering, although quickly adapted to the environment. They were informed as to how, during the conflict, tunnels provided sanctuary from the chaos above, enabling soldiers to operate in relative safety, albeit in a strange and unforgiving world, and how important the senses were to this existence. This feeling of security seemed to be replicated during the tours, with many declaring on exiting the tunnel that they found a place so far removed from their normal daily lives soon became tolerable as their senses adjusted. It's very difficult to judge distance underground, and although the length of tunnel used was around 800 m, on reaching its end most visitors felt they had walked much further. Guests spent around 45 minutes underground, and the environmental challenges of being in such a space left most of them exhausted from the endeavour.

As the project was not an academic exercise, records of the visitor experience were not officially recorded. Nevertheless, after the tour all guests were invited to spend time with Durand Group members to discuss their impressions of the tunnel, their feelings of being underground and the opportunity to participate in their own heritage. Several contacted the Durand Group afterwards to reflect on their experience, and this correspondence, along with all the video footage, the initial research and planning, was saved digitally for future use and possible publication by group members.

Discussion

The preservation of modern conflict subterranean landscapes is complex, requiring a holistic perspective and methodology to achieve. There are multiple challenges to public access, not least the oppressive environment, claustrophobic space, lack of oxygen, risk of tunnel collapse and proliferation of unexploded ordnance. Despite these impediments, their erasure disassembles Laurajane Smith's (2006) concept of the truth of heritage as practice. Enlarging the space and making it 'safe', adding air conditioning, and so on, alters the fabric of the artefact and accordingly its sensorial dynamic, perhaps the most important element in conceptualizing how the underground is made landscape.

Nevertheless, the Durand Group has shown it is possible to take part in heritage directly, putting Smith's (2006: 44) theory into practice and showing that heritage is not a static experience, but rather is 'what goes on at these sites'. A 'pop-up' approach to heritage necessarily restricts those who can participate in it, and the amount of time available for such participation, but with particularly complex landscapes of the past, this seems a price worth paying, as Merleau-Ponty (2002: 241) noted: 'all knowledge takes place within the horizons opened up by perception'.

Loos Big Walk 2018 was an ambitious project aimed at involving the local community in their own hidden and forgotten heritage, forging a link between the present and the past. By design, the 'pop-up' experience was ephemeral, and opening Wing's Way for just three days required several years of work: liaison with multiple authorities, building trust with the community, gaining approval from emergency services, underground engineering to construct a second entrance, removal of ordnance and a great deal of manpower, time, dedication and money.

Despite the success of the project, its logistic demands mean it's unlikely to be repeated in the foreseeable future. The Durand Group's endeavours certainly forged a link with the local community's recent past, as reflected in subsequent increased community engagement and the planning of further projects. Many residents were not aware of the hidden landscape beneath their feet, and those that were, particularly local farmers and landowners who live daily with the consequences of collapsing tunnel systems and dugouts, knew little of its true extent.

Landscapes are 'always imbued with meanings that come from how and why we know them' (Relph, 1976: 122) and the alternative

to what here might be termed ‘pop-up heritage’ has proved largely unsatisfactory. That sections of First World War subterranean space are preserved at all has brought this hidden world back into public consciousness, but there is a risk we will visit these places and misconstrue their past life through a lack of bodily and somatic interaction. In the underground landscapes of the First World War, people suffered appalling privation, living and dying in the dank gloom, claustrophobically waging a blind battle with an unseen foe, through touch and hearing. The experience was intense. To better appreciate this, we must embrace its uneasy sensoriality, feel its truths, embody its privations and hardships, even if only for a moment.

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Notes

- 1 A volunteer organization dedicated to the exploration and understanding of subterranean conflict (see <https://durandgroup.org.uk/>).
- 2 St Mary's Advanced Dressing Station, was the final resting place of 1,810 men, Rudyard Kipling's son, John, killed on 27 September 1915, among them.
- 3 This covered important features along the tunnel route, such as graffiti and carvings, as well as physical features such as storerooms, command and control areas and sealed-off routes to the surface. General background information to tunnelling during the war was also offered.

References

- Babchenko, A. (2007) *One Soldier's War in Chechnya*. London: Portobello Books.
- Bean, C. E. W. (1938) *The Official History of Australia in the War of 1914–1918*. Sydney: Angus and Robertson.
- Bevor, A. (2014) *The Second World War*. London: Weidenfeld and Nicolson.
- Bender, B. (1993) ‘Stonehenge: Contested landscapes (Medieval to present-day)’. In B. Bender (ed.), *Landscape Politics and Perspectives*. Oxford: Berg, 245–79.
- Cameron, C. (2008) ‘From Warsaw to Mostar: The World Heritage Committee and authenticity’, *APT Bulletin: The Journal of Preservation Technology*, 39 (2/3): 19–24.
- Cave, N. (2009) *Vimy Ridge*. Barnsley: Pen and Sword.
- Classen, C. (ed.) (2005) *The Book of Touch*. Oxford: Berg.
- Clout, H. (1996) *After The Ruins: Restoring the countryside of Northern France after the Great War*. Exeter: Exeter University Press.

- Corbin, A. (1998) *Village Bells: Sound and meaning in the 19th century French countryside*. New York: Columbia University Press.
- Detienne, M. (1994) *The Gardens of Adonis*. Princeton: Princeton University Press.
- Douglas, M. (2002) *Purity and Danger*. Abingdon: Routledge Classics.
- Dyer, G. (2009) *The Missing of the Somme*. London: Phoenix.
- Ford, G. (1920) *Out of the Ruins*. New York: Century.
- Fuller, J. F. C. (1960) *The Generalship of Alexander the Great*. New Brunswick, NJ: Rutgers University Press.
- Fussell, P. (2000) *The Great War and Modern Memory*. New York: Oxford University Press.
- Gough, P. (2004) 'Sites in the imagination: The Beaumont Hamel Newfoundland Memorial on the Somme', *Cultural Geographies*, 11(3): 235–58.
- Grieve, W. G. and Newman, B. (1936) *Tunnellers: The story of the tunnelling companies, Royal Engineers, during the World War*. London: Herbert Jenkins.
- Harrison, R. (2010) *Understanding the Politics of Heritage*. Manchester: Manchester University Press.
- Hecht, E. (2015) 'The tunnels in Gaza'. Testimony before the UN Commission of Inquiry on the 2014 Gaza Conflict. Accessed 9 January 2025. <https://www.mideastdig.com/wp-content/uploads/2017/01/testimony.pdf>.
- Hertle, H.-H. (2008) *The Berlin Wall: Monument of the Cold War*. Berlin: Christoph Links Verlag.
- Howes, D. (2017) 'Foreword: The engagement of the senses'. In N. J. Saunders and P. Cornish (eds), *Modern Conflict and the Senses*. Abingdon: Routledge, xix–xxii.
- Howes, D. and Classen, C. (2014) *Ways of Sensing: Understanding the senses in society*. London: Routledge.
- Hucker, J. (2009) 'Battle and burial: Recapturing the cultural meaning of Canada's National Memorial on Vimy Ridge', *The Public Historian*, 31(1): 89–109.
- Ingold, T. (2000) *The Perception of the Environment: Essays on livelihood, dwelling and skill*. London: Routledge.
- Jerome, P. (2008) 'An introduction to authenticity in preservation', *APT Bulletin: The Journal of Preservation Technology*, 39(2/3): 3–7.
- Keegan, J. (1999) *The First World War*. London: Pimlico.
- Leed, E. J. (2009) *No Man's Land: Combat and identity in World War One*. Cambridge: Cambridge University Press.
- Leonard, M. (2016) *Beneath the Killing Fields: Exploring the subterranean landscapes of the Western Front*. Barnsley: Pen and Sword.
- Leonard, M. and Breithoff, E. (2020) 'War on the Senses: Conflict and sensory archaeology'. In R. Skeates and J. Day (eds), *Handbook of Sensory Archaeology*. London: Routledge, 281–92.
- MacDonald, S. (2009) *Difficult Heritage: Negotiating the Nazi past in Nuremberg and beyond*. London: Routledge.
- Mangold, T. and Penycate, J. (2005) *The Tunnels of Cu Chi: A remarkable story of war in Vietnam*. London: Cassell.
- Manthravadi, U. (2022) 'On how I become an acoustic archaeologist'. In U. Manthravadi (ed.), *An Archaeology of Listening: A slightly curving place*. Berlin: Archive Books, 25–94.
- Merleau-Ponty, M. (2002) *Phenomenology of Perception*. Abingdon: Routledge Classics.
- Meskel, L. (2002) 'Negative heritage and past mastering in archaeology', *Anthropological Quarterly*, 75(3): 557–74.
- Miller, D. (2010) *Stuff*. Cambridge: Polity Press.
- Nixon, R. (2009) 'Neoliberalism, slow violence and the environmental picaresque', *Modern Fiction Studies*, 55(3): 443–67.
- Prada, A. (forthcoming) *Blood, Rust and Chalk: Engineering the Loos salient*. Barnsley: Pen and Sword.
- Relph, E. (1976) *Place and Placelessness*. London: Pion.
- Robinson, P. and Cave, N. (2011) *The Underground War: Vimy Ridge to Arras*. Barnsley: Pen and Sword.
- Saunders, N. J. (2003) *Trench Art: Materialities and memories of war*. Oxford: Berg.
- Saunders, N. J. (2004) 'Material culture and conflict: The Great War, 1914–2003'. In N. J. Saunders (ed.), *Matters of Conflict: Material culture, memory and the First World War*. Abingdon: Routledge, 5–25.

- Saunders, N. J. (2010) *Killing Time: Archaeology and the First World War*. Stroud: The History Press.
- Scarry, E. (1985) *The Body in Pain: The making and unmaking of the world*. Oxford: Oxford University Press.
- Smith, L. (2006) *Uses of Heritage*. Abingdon: Routledge.
- Tsing, A. (2015) *The Mushroom at the End of the World*. Princeton: Princeton University Press.
- UNESCO (2023) Funerary and memory sites of the First World War. Accessed 3 December 2023. <https://whc.unesco.org/en/list/1567/>.
- UNESCO (n.d.) Website Glossary. Accessed 12 January 2024. <https://whc.unesco.org/en/glossary/187>.
- Waterton, E. (2005) 'The communicability of "heritage" without words: A discourse-analytical approach', unpublished paper. Theoretical Archaeological Group Conference, Glasgow.
- Weetman, W. (1920) *History of the 1/8th Sherwood Foresters 1914–18*. Nottingham: Thomas Forman.
- Williamson, H. (2009) *The Wet Flanders Plain*. London: Faber and Faber.
- Wollentz, G., May, S., Holtorf, C. and Hogberg, A. (2020) 'Toxic heritage: Uncertain and unsafe'. In R. Harrison, C. DeSilvey, C. Holtorf, S. MacDonald, N. Bartolini, E. Briethoff, H. Fredheim, A. Lyons, S. May, J. Morgan and S. Penrose (eds), *Heritage Futures*. London: UCL Press, 294–312.

Scent surveys: decay and transformation in the Kirkbride Plan hospitals of North America

Robert Kirkbride

*The period of (national) significance is the period when the historic events associated with a proposed National Historic Landmark occurred. This period **must** reflect the dates associated with the property being nominated.*

United States National Park Service, US Department of Interiors (2018)¹

Who is preservation for? Who is it done by? Is there a clear distinction or a spectrum of nuance between specialists and non-specialists, and does it matter? What does a ‘period of significance’ signify if the value of a place or building is a palimpsest from all its periods, including watershed moments and thorny pasts, as well as its present and future states? And how does the term ‘significance’ change if we fully acknowledge the scarcity of our resources, disrupt the pattern of erase and replace, and demolish nothing?²

Reflecting on an iconic family of psychiatric hospitals with chequered histories, this chapter investigates the multisensorial continuum between personal experience and cultural memory through the scent of decay. It considers the poignant olfactory encounters of ten explorer-preservationists with abandoned Kirkbride Plan hospitals, alongside the ‘miasma theory’ that informed their site locations, physical arrangements and characteristic architectural features. With their unique layouts and complex backstories, Kirkbride Plan hospitals embody three-dimensional lessons that illuminate ongoing challenges to providing physical and social infrastructures for mental health care. In addition to benefiting hospitals whose futures are currently in jeopardy, it is hoped that the scent-centred reflections and methods offered herein may

as the first superintendent of the Pennsylvania Hospital for the Insane in 1840, Dr Kirkbride embarked on a tour of four hospitals, in the north-eastern United States, that were known as centres for treating the mentally ill.⁵ In one account of Kirkbride's tour and its formative influences on his superintendency and theoretical approaches, a single-sentence paragraph stands out: 'Everywhere Kirkbride watched the heating and the ventilation of every building' (Bond, 1947: 40). Dr Kirkbride's preoccupation with light and ventilation proved to be a lifelong through-line. In the second edition of his treatise, published three years before his death, he offered the following axiom: 'No plea of expediency or economy can justify a neglect to provide the most essential agents for securing the proper degree of warmth and abundance of pure air throughout any hospital buildings' (Kirkbride, 1880: 91). What was the source of this preoccupation?

There were several converging factors. As an Orthodox Quaker, Kirkbride was predisposed to appreciate both the scientific benefits and symbolic significances of light (Tomes, 1984: 47; Hamm, 2003: 15). He was also influenced by his internship at the Friends' Retreat, established in the countryside north of Philadelphia in 1817, whose Quaker founders had placed the utmost importance on the provision of light and fresh air. In his 1825 assessment of the Friends' Retreat, Robert Waln observed:

the free admission of light and air [and] their influence on organic and inorganic bodies, requires no elucidation. The free circulation of air, the great supporter of life, is of primary importance; without proper ventilation, the resources of medicine may be developed in vain; the miserable sufferers are suffocated in the effluvia of their own bodies, and a long train of physical evils are added to their mental miseries. (Yanni, 2007: 33, 171)

Dr Kirkbride's recommendation to situate asylums amid generously landscaped grounds beyond the city perimeter was also informed by his experience at the Pennsylvania Hospital for the Insane.⁶ Located on a former 101-acre farm at the western outskirts of Philadelphia, the site reinforced treatment through occupational therapy and beauty-as-therapy. From an operational standpoint, the peri-urban context was also pragmatic. By setting aside at least one hundred acres for a self-sustaining community, which many of the asylums were planned to be, Kirkbride's advice also reflected the influence of Enlightenment science on urban planning, which was transforming cities from epicentres of pungent, everyday olfactory encounters into increasingly optically

organized and sanitary enterprises, with slaughterhouses, hospitals and cemeteries relocated to the urban periphery (Gissen, 2022: 51).

Formally trained as a physician, not as an alienist⁷ or architect, Dr Kirkbride considered the workings of the hospital from a physiological perspective, promoting generous flows of fresh air and natural light and innovations in internal plumbing and heating, while also focusing on the flows of everyday life – the daily regimen of patients, doctors and staff. In an article published several years prior to his treatise, Kirkbride described the physical arrangement of wings that step back from a main central building, in what would become the trademark formation of *The Kirkbride Plan*.⁸

This echelon configuration of contiguous structures, illustrated in Figure 8.2, was conceived to improve natural ventilation and more effectively disperse the foul odour of miasma, the poisonous vapours of decaying organic matter that were thought to be the source of an array of contagious diseases (Illich, 1985: 27–30). Originating with Hippocrates in the fourth century BCE, miasma theory remained a tenet of Western medicine until the emergence of germ theory, in 1880. Focused through the lens of Enlightenment science, these ancient beliefs about noxious fumes and air-borne contagions reshaped European city planning in the eighteenth century (Illich, 1985: 50–64) and imbued Kirkbride’s own education in ‘humours, fluids and electrical impulses’ through his

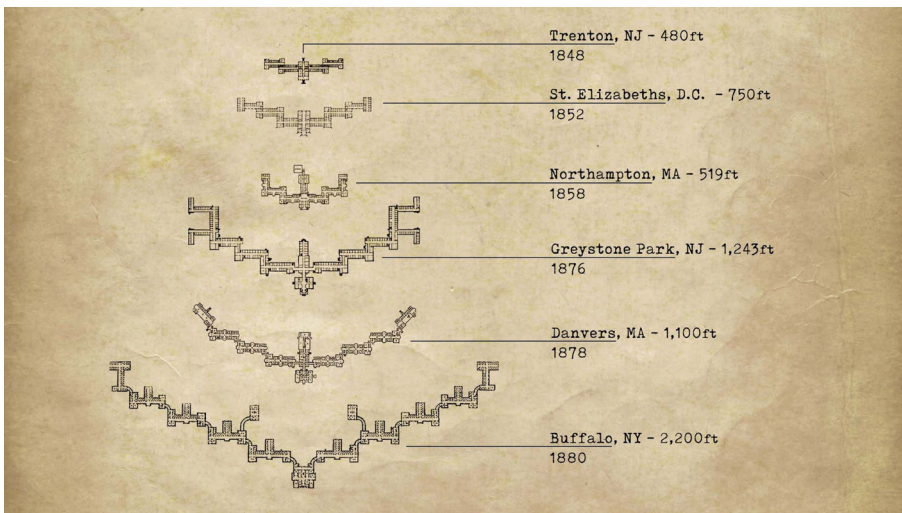


Figure 8.2 Selection of several Kirkbride Plan hospitals illustrating their rapid growth in size. *Source:* illustration by R. Tagliareni and R. Kirkbride, by permission of PreservationWorks.

apprenticeship to the French-born physician, Nicholas Belleville (Tomes, 1984: 54–7). From early in their training, Dr Kirkbride and his contemporaries had been steeped in miasma theory and were acutely aware of the imperative to provide ample ventilation for a healthful environment.

Although Kirkbride does not specifically mention the term in his treatise, Google's Ngram Viewer reveals that the word 'miasma' reached its peak usage in English in 1854, the same year the first edition was published (see Figure 8.3, bottom left). This convergence is not coincidental. Nor is it coincidental that the term 'vitate' (spoil), which Dr Kirkbride utilizes in his second edition, peaked in 1880, the year in which his treatise was republished.⁹ Such olfactory concerns were very much in the air of cultural awareness, as Carla Yanni observes: 'this near obsession with ventilation may be found in almost all written works about [nineteenth-century] asylum and hospital construction, reflecting the widely held miasma theory of contagion, the medical assumption that noxious exhalations from humans polluted the air and caused disease' (Yanni, 2007: 33). In the 1854 edition, Kirkbride devotes a lengthy chapter to 'Heating and ventilation', which he expanded in 1880 with two additional chapters, 'Axioms on heating and ventilation' and 'Hot air and ventilating flues' (Kirkbride, 1880: 90–6). Therein, Kirkbride details a more comprehensive system of ducts and towers (illustrated in Figure 8.4) to provide natural and forced ventilation throughout the facilities, from basement to the roof.

The importance of keeping cellars dry and clean, and of having pure air in them, is not generally appreciated in regard either to private or public buildings. Whatever there is offensive or deleterious to health in the cellar, is sure, sooner or later [...] to penetrate to the upper parts of the structure. Ventilating flues should always lead from the cellar to the main ventilating stack, or to something equivalent in character, or they should at least pass directly upwards through the roof of the building. (Kirkbride, 1880: 61)

These interior functions were expressed outwardly by ventilation towers and a central dome that became common features of Kirkbride Plan hospitals. The styling of these features was considered by Kirkbride to be 'matters of taste' left up to the architect (Kirkbride, 1880: 130), providing memorable points of visual orientation for their local communities. Unfortunately, these innovative features also proved to be an Achilles heel for the hospitals, as we will see.



(a)



(b)



(c)

Figure 8.3 (composite). a (top left): Central administration building of Hudson River State Hospital, designed by Frederick Clarke Withers, Calvert Vaux and Frederick Law Olmsted (opened 1871, currently abandoned). b (top right): Traverse City State Hospital (a.k.a. The Village at Grand Traverse Commons), designed by Gordon W. Lloyd (opened 1885, multipurpose adaptive reuse since 2001). c (bottom left): Google Books Ngram Viewer, featuring peak use of term ‘miasma’ in 1854 and recent resurgence (retrieved 1 February 2024). d (bottom right): Outermost west wing of Athens State Hospital (a.k.a. The Ridges) in Athens, Ohio, designed by Levi T. Scofield (opened in 1873, multipurpose adaptive reuse in central main and east wing; west wing adaptive reuse currently in planning stages). Sources: Yvonne Laube (a); R. Kirkbride (b and d); Google Books (c).

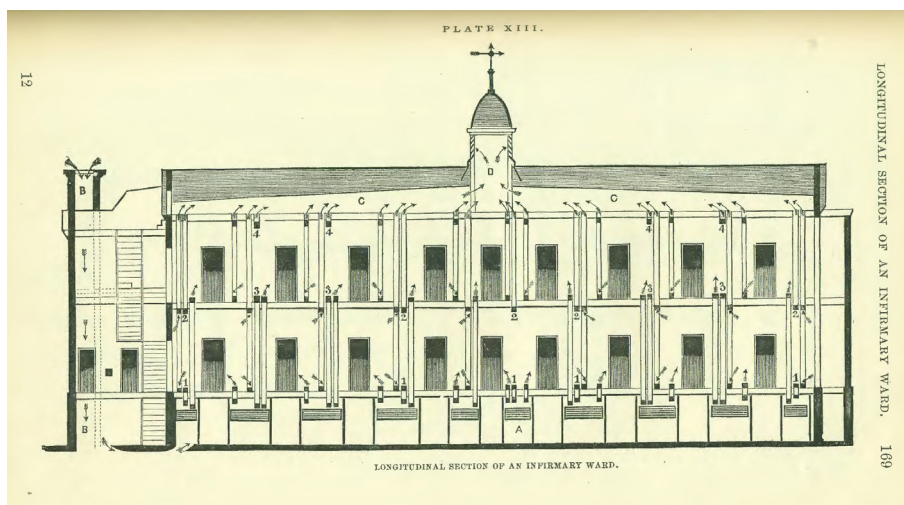


Figure 8.4 Longitudinal section illustrating the natural ventilation of an infirmary ward and each individual room through a system of flues and towers. Plate XIII from the 1880 edition of T. S. Kirkbride's treatise, *On the Construction, Organization, and General Arrangements of Hospitals for the Insane with Some Remarks on Insanity and Its Treatment*. Source: scans used by permission of Q. Hamlin.

Contemporary context: Kirkbride Plan hospitals – preservation and adaptive reuse

Despite the enlightened intent of their builders and the generosity of their designs, these structures would come to symbolize the decay of the American mental health care system. As psychiatric hospital populations increased following the American Civil War and subsequent economic depressions, world wars and the global pandemic of 1918–19, likelihood for recovery at these institutions sharply decreased. Among the interlacing forces that undermined the hospitals' capacity to perform as conceived, overpopulation and under-resourcing proved the most debilitating. Over time, the places for the placeless became convenient places for inconvenient people (Scull, 1980), and by the mid-twentieth century public confidence in the nation's mental health care system and its asylums had eroded. Consequently, Kirkbride Plan hospitals have haunted the popular imagination and over half of the original structures had been demolished by 2015, when Greystone Park Psychiatric Hospital, one of the largest and most architecturally significant remaining Kirkbrides, was erased under dubious circumstances (Kirkbride, 2016).¹⁰

In the wake of Greystone's highly contested demolition, an impassioned advocacy network emerged, whose members embrace the Kirkbride Plan hospitals' difficult histories, mindful of the multifaceted value these sites represent. I am a founding trustee and the spokesperson for PreservationWorks,¹¹ a non-profit organization committed to finding new lives for the remaining Kirkbride Plan hospitals by sharing knowledge and resources to support local preservation efforts and raising awareness about their historical significance and future potentials. Unabashedly, I share my colleagues' enthusiasm for these remarkable and problematic structures and strongly advocate the preservation and adaptative reuse of the remaining Kirkbride Plan hospitals, though not necessarily for the reasons one might assume.

Regardless of my distant relation to Thomas Story Kirkbride,¹² my primary concern for the remaining Kirkbride Plan hospitals is their capacity, as historical documents, to inform ongoing efforts to provide adequate physical and social infrastructures for mental health care. For this very reason, coupled with the ecological imperative to adaptively reuse – and not squander – our existing infrastructures, it is critical to preserve and repurpose the hospitals. These two principles, together with the need to broaden and sustain conversations about difficult places and their difficult memories, underpin the methodology and methods pursued in this enquiry.

Methods and methodology: who is preservation for and by?

Kirkbrides smell a little bit different because the space and the ventilation is a little bit airier. It smells like the natural materials used in the building.

Christian VanAntwerpen, explorer-preservationist, founding president of PreservationWorks

This enquiry coalesces direct and indirect research methods. For primary sources, it considers both editions of Dr Kirkbride's influential treatise (1854 and 1880) and the structures built according to its specifications. For secondary sources, it examines the anecdotal reflections of explorer-preservationists from their scent-centred encounters with abandoned Kirkbrides, some of which have been subsequently demolished, some of which have been adaptively reused or continue in their original uses, and others that are currently at risk. As such, there are multiple sites and

periods of significance at play in this enquiry, including the idealized original plans for the hospitals, the complex lives they led, and the transitional phase of the structures encountered by the explorers, post-occupancy and pre-renovation.

From a perspective of traditional historic preservation or archaeology, PreservationWorks' membership represents an untraditional cross-section of preservation-minded individuals that includes urban explorers, architects, paranormalists and concerned citizens, who engage and inform communities through in-person, on-site tours and events, and social media and interactive online databases (see [Figures 8.1](#) and [8.2](#)). Since many of our members document abandoned buildings and had explored multiple Kirkbride sites, I took the opportunity of a special weekend of photographic tours led by our organization at the Richardson Olmsted Campus (ROC, formerly the Buffalo State Asylum), in the autumn of 2023,¹³ to invite fourteen explorer-preservationists to respond to one simple prompt: to video record themselves recounting their most poignant scent-based memory of a Kirkbride Plan hospital. Ten of the group accepted the invitation and self-recorded short videos.

Why request a self-recording from participants rather than interviewing them myself? While also respecting their tour-related responsibilities, my intention was to give them latitude to choose the registration time and location during their site explorations, to allow for a reflective moment between themselves and the building. Why such a small sample size? In part, it was due to expediency. While organizing the Richardson Olmsted Campus site visit, we'd been informed that renovations were soon to begin in the abandoned areas we were planning to explore. With this limited window of access, a small survey sample size was most expedient. Ostensibly, such a survey could be conducted with a larger group, although such constraints to access are likely to be encountered at similarly complex sites (former or current asylums, hospitals and prisons) due to institutional concerns for security, safety and liability.

Of all the senses, why did I ask the group of explorer-preservationists to focus on scent? First, scent is powerfully connected to memory and reflection. It is also rooted at the origins of PreservationWorks. At an April 2015 gathering to galvanize support for Greystone, held at the successfully adapted Kirkbride Plan hospital in Traverse City, Michigan – a gathering that led to the creation of PreservationWorks – I was told by the conference organizer, Christian VanAntwerpen, that there were explorers who could describe nuances of scent among the Kirkbride Plan hospitals. In that instant, a seed lodged in my mind for future consideration, a seed that burst open with the opportunity to explore the Buffalo

State Asylum with a non-traditional group of preservation-minded explorers and conduct multisensorial research that might contribute to a broader conversation about the value of these sites and, more generally, to reflect on assumptions and practices in heritage preservation.

As we will see, several of the reminiscences express fond memories of exploring a specific abandoned Kirkbride, or several, typically in the company of other explorer-preservationists. Given the difficult histories of these structures, one might wonder how such grave settings could inspire such positive memories. Yet this positivity reveals the potency of these unorthodox preservation advocates: they are deeply knowledgeable *and* deeply invested, perhaps through an indirect connection with a given building during its former use, by way of a family member who was a patient or worked at the site. This connection compels them to know more about the building. Or, they may have formed an attachment more directly by having explored the structure, post-occupancy. Both modes of subject-centred engagement are significant and consistent with recent currents in sensory archaeology, representing what Sue Hamilton (Chapter 1, this volume, 7) describes as ‘a valuing of the role of feeling in interpretation, instead of primary disinterested scrutiny’.

It is worth noting that the term I use to describe my colleagues, ‘explorer-preservationists’, might appear to some an oxymoron – like ‘jumbo shrimp’ or ‘civil war’. Explorers are often rule-breakers who are willing to trespass to slake their fascination, while preservationists have historically tended to be the rule-makers whose efforts are often pitched to restrict unreflective development. Not all explorers are necessarily driven to preserve, and not all preservationists may be inclined to explore, but a group such as PreservationWorks represents a mycorrhizal network of advocacy that reflects the growing interest in an overlap of both activities and reinforces the exploration of ‘multi-sensory experiences as vehicles for building deeper connections between people and place’.¹⁴ Their alternative approaches to preserving places for reflection and repair offer a rich understory to the overstory of more traditional preservation practices.

Why is the scent data of the explorer-preservationists valuable? Here it is worth unpacking our loaded associations with terms such as ‘informed’, ‘expertise’, ‘specialist’ and ‘nonspecialist’. Although fields such as archaeology and historic preservation have traditionally revolved around the specialized research of informed participants, project fieldwork may substantially benefit by broadening the scope of project participants and incorporating the range of experiences and sensory perceptions they bring to a site. For Jordan and Mura, ‘including

nonspecialists ensured that a diverse array of responses was gathered' (Chapter 9, this volume, 227). The explorer-preservationists involved in the present study are nonspecialists, professionally speaking; and yet, where Jordan and Mura included participants who may have been unfamiliar with the site (Chapter 9, this volume, 214), the present study engaged with participants whose direct familiarity with multiple Kirkbride Plan hospitals would enable them to reflect comparatively on nuances in their olfactory character.

To establish the degree of the survey participants' familiarity with Kirkbrides, I sent a note to the group, enquiring how many sites with Kirkbride Plan hospitals each had visited, and how many hospitals they had been able to enter and encounter their scents. The distinction, between site visit and entry, acknowledges that not all Kirkbrides may be entered, due to their restricted access. Among them, the group of ten participants had visited two-thirds (22) of the remaining 35 Kirkbride Plan hospitals and had directly experienced the interiors of 19. Several sites had been visited by many of the participants, so there was both breadth and depth to their encounters with Kirkbride Plan hospital interiors.

From the vantage of disciplinary expertise in preservation, architecture, or archaeology, the participants represented a cross-section consistent with the broader PreservationWorks community. Although one is a trained architect, none are formally trained in historic preservation, archaeology, psychology or ethnography. Consequently, while the participants in this survey might be considered nonspecialists, they are deeply invested and well-informed nonspecialists. Based on their experiences exploring abandoned buildings, including numerous non-Kirkbride Plan hospitals, their informed observations offered invaluable prompts for closer interpretation.

Data

The following texts have been transcribed verbatim from the self-recorded videos produced by the ten explorer-preservationists. For durational consistency, I suggested to everyone to aim for one minute, yet once participants began recording themselves in the space – at their own pace and in whichever space they felt inclined – several expressed a concern about speaking for a full minute. We agreed on the option to speak for one minute or twenty seconds, and this difference in duration is reflected in the length of the texts: three spoke for one minute (Lewis, Grabow Tirado and Blohm), and the others spoke for twenty seconds.

Whether or not they spoke from a script was at the discretion of the participants. As evident in the video and may also be discerned from the transcripts below, all opted to extemporize. Not all participants were able to record their reflection within the Buffalo Kirkbride (Duffy, Stephens, VanAntwerpen, Grabow Tirado, Laube), and did so later at another location. There was not an imperative to have recorded within the Kirkbride: my suggestion to do so was merely to stimulate participants' memories by their immersion in the scent of one abandoned Kirkbride (Buffalo) to reflect on the scents of others. In one video, Robert Lewis visibly draws inspiration for his reflections from the atmosphere in the Richardson Olmsted Campus.

When I think of the scent of asylums ... the best words to describe that scent would be a wet smoke from years of infiltration of moisture and ... most of the buildings have had a fire in them at one point or another ... and my fondest memory is the first time I ever went into Traverse City State Hospital, it was definitely a distinct smell that I remember to this day ... as I step in this building [Buffalo State Asylum] the scent reminds me of all the other buildings that I've been in, they have the same scent and it really depends on how long the asylum has been abandoned, how much moisture, it's a very variable scent. (Robert Lewis)

Thinking back to a morning at Hudson State Hospital, up at the South Wing Tower – a little area we called the clubhouse – that early morning mist rising, the beautiful air, the smell, a little burnt wood smell, a little bit of nature, it was just – beautiful, one of the most beautiful moments ever. (Robert Duffy)

Probably the most notable scent I can recall from going into a Kirkbride hospital would have been the smell of walking into Danvers State Hospital; it was a scent of really old paper, almost like an old book you took off the shelf for the first time after years. (Bill Stephens)

I'm talking about the Kirkbride smell, that's one of my favourite smells ... I've been in abandoned buildings and actually Kirkbrides smell a little bit different because the space and the ventilation is a little bit airier, it smells like the natural materials used in the building – the ventilation helps as well – it's hard to even smell fire damage. It's really a great smell. (Christian VanAntwerpen)

When I think of scent-related memory and Kirkbride hospitals I immediately think of the contrast between the old, unremediated spaces of the Buffalo State Hospital and the current remediated and reused spaces of the Buffalo State Hospital that are now the Richardson Hotel; when you take a tour and you travel through the unremediated spaces that scent that hits you is very unaltered and it's very original and it kind of brings you back in time, it's like a time-travelling device, almost; but when you are travelling into the Richardson Hotel and that scent is not there, it's been altered by the new paint and new construction, it doesn't have that same time-travelling effect, which I think is very interesting when I visit the space. (Jaime Grabow Tirado)

Whenever I smell mould, or that stagnant moist air, it always brings me back to the four and a half hours I was trapped in the basement of the Fergus Falls Regional Treatment Center during Project Kirkbride. (Vincent Verna)

When I first set foot inside of a Kirkbride, and I inhaled, I was reminded very much of the scent a few hours after it rains and you walk past a house that might have moss or perhaps mould spores – that smell. (Rachael Pollack)

So the cool thing about the smell of an abandoned Kirkbride building is that once you get past the fact that it smells like a bag of baby carrots, is that in the summer when the sun is beating down on you and you get close to one of these buildings and you get to an area where the scent is escaping from the building, it's cool ... it's cooler than the ambient temperature outside; even though it's a musty smell it's kind of welcoming and inviting, and likewise in the winter you can almost feel the warmth of whatever air is carrying the smell of the building and that ... draws you in; and I know it sounds silly but it's the comfort you need, in the cold you get warm, and in the hot [you] get cool. (Lisa Marie Blohm, current President of PreservationWorks)

Kirkbrides smell like mould and mildew, rotting wood and musty fabrics and curtains, but at the same time I also smell freshly turned soil because in a lot of these buildings nature's taking over and there is this new earth smell. (Yvonne Laube)

The smell is a mixture of life and death; the death and decay of an old building and its materials, and the life being the new ecosystem which is developing inside of it. (Rusty Tagliareni)

Methods and methodology: what time is this?

Although much has been written about Thomas Story Kirkbride (Tomes, 1984; Bond, 1947) and the historical significance of Kirkbride Plan hospitals (Scull, 1980; Yanni, 2007; Ziff, 2012; Upton, 2016), their pneumatic mechanics have been only lightly addressed, and none have yet approached the Kirkbrides from an olfactory perspective. This may change due to growing interest in scent-related preservation. In a 2016 issue of *Future Anterior*, Adam Jasper and Jorge Otero-Pailos observed that:

Olfaction is a major part of the experience of historic places and is intimately involved in the formation and recall of memories. Yet preservationists receive no training in this area. A tradition of denigration of the sense of smell can be traced back to the Enlightenment, and there is still surprisingly little serious research on a topic that, on the face of things, might be central to the discipline. (Jasper and Otero-Pailos, 2016: iii)

Explorer-preservationists would offer great contributions, some might urge, by developing forensic skills to detect the stages of decay. This is perhaps true; equipped with such training, explorer-preservationists might assist asylum owners, developers and contractors to pinpoint the sources and degree of (typically) moisture-related deterioration. The use of scent as a diagnostic technique, however, is not necessarily the crux of this chapter. In fact, such a preservation tool may unexpectedly become double-edged, equipping avaricious developers and complicit politicians with the rationale to demolish rather than to preserve and adaptively reuse an at-risk facility. Nor is this scent-fuelled enquiry concerned with the heritage-centred reproduction of an authentic asylum scent, although as Hamilton notes (Chapter 1, this volume, 15) heritage scents have greatly increased in popularity. (What a curiously ironic venture would it be to reproduce the very olfactory phenomenon that Dr Kirkbride and his colleagues had sought to eliminate?¹⁵) Instead, this project centres on different *kinds* of preservation tools that scent might offer.

The scent of ‘wet smoke’ and ‘fire’, mentioned in several of the explorers’ accounts, offer cautionary reminders of the high risk of arson when a structure has been abandoned, as occurred in 2018 at Hudson River State Hospital in Poughkeepsie, NY (see [Figure 8.3](#), top left), and at The Babcock, in Columbia, SC, in 2020. Indirectly, these comments also highlight the double-edged efficiency of the Kirkbrides’ ventilation systems: while their ducts, towers and domes were effective in replenishing air during their inhabitation, they also proved to be highly conducive to fire following their decommission. Despite the preventative measures described in Kirkbride’s treatise and implemented in the structures,¹⁶ fire could spread rapidly and catastrophically, especially among sites no longer actively protected by their own firefighting resources.¹⁷ Consequently, several of the remaining Kirkbrides have either sealed off the inner workings of their towers, as at Traverse City, Michigan, or the towers have been removed altogether, as at Athens, Ohio.

Other accounts reflect more expansively on time, building life cycles, and slow decay by moisture. Yet, any building gets mouldy. Why are these asylums any different? Why might this scent research matter?

In their scent reflections of abandoned Kirkbrides, the explorer-preservationists consider a transitional moment in buildings’ life cycles, post-occupancy and either pre-renovation or pre-demolition. Why is this transitory phase worth documenting? Kirkbride Plan hospitals provide the opportunity to meditate on the cycles of life and death of a place through the scent of decay, enabling ‘a more expansive understanding of historic places as complex living systems whose components by their very nature grow, change, and die’.¹⁸ Such olfactory experiences may contribute to discussions regarding the structures in jeopardy, whose communities may have difficulties engaging in (or sustaining) such conversations.¹⁹ It is hoped, too, they might inform discussions of other structures with similarly complex histories.

In a nation where land value exceeds the value of the buildings upon it, due to 15- and 30-year mortgage cycles, the compulsion has become to build for the shorter term rather than to build for permanence. Older structures are swiftly erased and replaced, especially those whose complex historic values are not easily embraced by the public imagination, including asylums, hospitals and prisons. For this socio-economic climate, architectural ruins offer a liminal space to question our patterns of consumption, with moments of reflection and circumspection necessary to change our habit of conveniently erasing inconvenient histories.

A recent international symposium on sensory research in archaeology posed the provocative question: 'is it possible to isolate and record the sights, sounds, tastes and smells of decay within the continuum of deterioration of a site', rather than to 'freeze historic places to their periods of significance?'²⁰ Why does this matter? According to the United States National Park Service, a building or place's period of significance 'may be thousands of years (in the case of an archaeological property), several years, or even a few days, depending on the duration of the event'.²¹ Yet the notion of a period of significance – the valorization of a singular instant or a continuous, extended period – ignores the reality that there are multiple histories at play in a place at any given time, experienced from multiple perspectives. Buildings and places manifest many histories *simultaneously*, as palimpsests of their phases of inhabitation and abandonment. These histories include the liminal phase of a building's life cycle, post-occupancy, and pre-repurposing. Privileging one period over another perpetuates cultural habits of privileging a singular 'History', whether out of convenience or in complicity with a predominant narrative (Smith, 2006: 29).

According to US National Park Service (USNPS) stipulations, 'properties listed in the National Register of Historic Places (NRHP) may be locally significant, significant at the state level, or nationally significant, while National Historic Landmarks **must** be nationally significant'.²² Kirkbride Plan hospitals are significant at all three levels – local, state and national. Built as state-run facilities, each individual hospital embodies local histories – often quite literally, through the extraction, fabrication and use of local or regional materials – and they were the catalysts for American towns and cities such as Fergus Falls and Traverse City, with which they symbiotically coevolved. At these two levels, state and local, at least twenty of the remaining Kirkbrides have been listed on the National Register of Historic Places, although that has not guaranteed their preservation.

In addition to the historical significance of their therapeutic origins and pneumatic principles, abandoned Kirkbride Plan hospitals invite sensory research not only because of their current material states but also for 'the potent moment' in their trajectories as heritage objects (Jordan and Mura, Chapter 9, this volume, 209), and their salient place in the unfolding story of mental health care. Of the original 78 hospitals, only 35 remain, several of which are presently abandoned and at risk of demolition. Moreover, of the 13 asylums that continue to be used according to their original purposes, several are in decline in part or whole and could swiftly disappear following decommissioning, echoing

the fate of the facility at Pontiac, Michigan. Despite being listed on the NRHP, Pontiac State Hospital was demolished soon after its closure, in 2000, underscoring that NRHP listing in no way guarantees a building's preservation. At least ten Kirkbrides have been demolished despite having received NRHP status.²³

For a property to be of 'national significance', the USNPS asserts, it must 'tell important stories that have meaning for all Americans, regardless of where they live'.²⁴ Currently, five Kirkbride Plan hospitals are designated National Historic Landmarks.²⁵ Yet, with the increasing likelihood that Americans – from any background and at any age – will experience mental illness, one may convincingly argue that each remaining Kirkbride satisfies this formal definition.²⁶ Each Kirkbride represents 'an outstanding illustration of a broad theme in American history', manifesting an early example of the nation's approach to mental health care and serving as reminders of the urgent need to better understand and support mental wellbeing in the present. Each embodies a local variation of a universal human condition, with lessons that continue to unfold through our engagement with the buildings, over time.

Abandoned places and architectural ruins exist between materiality and disappearance, as ghosts of their former selves (see [Figure 8.3](#), bottom right). This in-between state resonates with melancholy reflection, not only upon what was but also on what might have been or what might be, both for the buildings and for ourselves. Ruins enable us to 'see ourselves in a state of decay', as Leila Taylor observes. 'In ruined spaces, nature, the original master builder, takes over, defying gravity and eschewing structural integrity, reminding us of what we once were and how small we really are' (Taylor, 2019: 173).

Although the documentation of ruins and abandonment by urban explorers preserves valuable evidence about our built environments, with few exceptions such registrations are generally ocularcentric.²⁷ The buildings themselves are the primary sources, offering settings for our private and public memories. No digital reconstruction can simulate the time-travelling vehicle that scent affords. What matters, at present, is the material cultural history of the hospitals, and their preservation and reactivation through adaptive reuse. If failure is the greatest teacher, we have much to learn from our histories of mental health care, and the Kirkbride Plan hospitals are vital to our illumination.

The return of miasma as metaphor

There was a miasma of despair over this place.

(Upton Sinclair, 1917: Book 2, Section 28)

Although Dr Kirkbride conscientiously described the structures and technologies to evacuate the effluvium of the living, places were not adequately considered for the bodies (or spirits) of those who died at the hospitals. This oversight held grave consequences that continue to haunt the hospitals, the descendants of patients, their families and their communities, and more broadly, our cultural psyche. Although ‘miasma’ may have been scientifically transformed into ‘vitiating air’, at the time of Dr Kirkbride’s 1880 edition, broader (and deeper) metaphoric significances have re-emerged in the public imagination, as reflected in the excerpt from Upton Sinclair’s *King Coal* (1917). Although he was writing about coal mines, Sinclair’s use of miasma as metaphor is true to its origins.

Miasma has mythical roots that extend further back, even, than Hippocrates’s medicalization of the term. Connoting a ‘stain’ or the ‘stain of guilt’, miasma was ‘a god-sent disease that is caused by a murder that has not been atoned for (with proper purification rituals)’ (Mellenthin and Shapiro, n.d.). Without atonement, such a miasma was contagious, infecting an entire family, cadre, community or city, by association with the guilty individual. Ironically, even as Kirkbride and his colleagues sought to eliminate it from hospitals, according to medical procedures, miasma gathered around the structures symbolically. Through the deepening stigmatization of mental illness, families abandoned family members to live the rest of their lives in asylums, refusing to collect them even after their deaths.

How many memorials must be constructed and consecrated to atone for the sufferings of the hundreds of thousands of individuals with mental illness who have died in asylums across the United States? Such memorials will never be adequate, but they are an acknowledgement and embodiment of respect for those who lived, worked and died at these institutions. Better to be recognized and remembered than a stain to be erased and forgotten (Dickey, 2016: 173–85). Yet, perhaps memorialization is as much to remind *us*, as Taylor suggests, ‘of what we once were and how small we really are’. Through our continuing inability to better understand and support mental illness, we the living bear the stain of miasma.

In a similar return of the mythical within the scientific, the scent of rain, moss, mustiness and baby carrots, described in several recollections,

reveals the olfactory power of geosmin, a scientific term created in 1965 to represent the scent that is released from the ground on contact with raindrops. Combining ‘geo’ (earth) with ‘osme’ (smell), geosmin is the main contributor to the phenomenon of petrichor, the earthy scent produced when rain falls on dry ground, which etymologically derives from the Greek ‘petra’ (rock) + ‘ichor’ (the ethereal blood of the ancient Greek gods which, like miasma, is toxic to humans). The human nose is highly sensitized to geosmin and petrichor, perhaps due to the innate human memory of sensing the imminent arrival of life-supporting rain, admixed with the deadly blood/spoors/mould of the gods.

Scent is a time machine, capable of transporting us back and forth across the multiple histories and concurrent lives of a given place. These histories may be difficult to understand, like mental illness itself. Perhaps the scent of decay in a Kirkbride Plan hospital is the death of an aspirational dream that was too big to succeed. And yet, perhaps the scent of newly turned earth and baby carrots is also the scent of transformation, the scent of a dream finding new life.

Acknowledgements

To the participants in this research project, my colleagues at PreservationWorks, our members, and the broader community of Kirkbride enthusiasts; I am deeply grateful for your passion, patience and tenacity – a powerful elixir to preserve and adapt these remarkable structures.

Notes

- 1 Emphasis on ‘must’ by the US National Park Service, Department of the Interior. Glossary of terms. Last updated 29 August 2018. Accessed 16 March 2024. <https://www.nps.gov/subjects/nationalhistoriclandmarks/glossary.htm>.
- 2 The July/August 2023 ‘New into Old’ awards issue of *The Architectural Review* begins: ‘Since the first AR New into Old awards in 2017, there has been a sea change. While practitioners, judges and editors have long championed the preservation of buildings of architectural significance, today it is clear that all buildings must be saved and readapted, and that the resource scarcity facing us makes hardly any act of demolition justifiable’ (3).
- 3 Published in two editions: 1854 (80 pages) and 1880 (341 pages).
- 4 <https://www.thepreservationworks.org/kirkbride-navigator>.
- 5 Kirkbride visited the original Bloomingdale Asylum in New York City, the Hartford Retreat in Connecticut, the McLean Hospital outside Boston, and the original Worcester State Hospital, in Massachusetts.
- 6 ‘Every hospital for the insane should be in the country, not within less than two miles of a large town, and easily accessible at all seasons.’ This is the first of twenty-six propositions

- for construction of hospitals for the mentally ill, set forth in 1851 by Dr Kirkbride and the Association of Medical Superintendents of American Institutions for the Insane, a precursor to the American Psychiatric Association. Kirkbride included the propositions in both editions of his treatise.
- 7 An early term for a psychologist, that emerged in the late 1850s.
 - 8 This description originally appears in Dr Kirkbride's January 1847 article for *American Journal of Insanity* (precursor of the *American Journal of Psychiatry*), which he expanded in his 1854 treatise (p. 13) and its second edition (1880: 59). See also: R. Kirkbride, 2024: <https://doi.org/10.22269/241200>.
 - 9 He writes: 'to ventilate a room by the vitiated air of a corridor regularly occupied by patients, whatever may be its temperature, could hardly be recommended as desirable under any circumstances' (Kirkbride, 1880: 91).
 - 10 The demolition of Greystone was ranked by the National Register of Historic Places among the top five architectural losses in North America for 2015.
 - 11 PreservationWorks (<http://thepreservationworks.org>) absorbed its 501c3 charter from Preserve Greystone, a community group that valiantly contested the demolition of Greystone Park Psychiatric Hospital.
 - 12 Thomas Story Kirkbride and I share a common ancestor, Joseph Kirkbride (1662–1737), a Quaker who emigrated from England in 1681, at the founding of Pennsylvania. Thomas Story descends from Joseph's second wife, Sarah Stacy, and I descend from his third wife, Mary Fletcher Yardley.
 - 13 Co-hosted by PreservationWorks and the Richardson Olmsted Campus, on 21 and 22 September 2023.
 - 14 Sensory Decay Symposium (2023), Sensing the Past research group.
 - 15 Such a pursuit might be appropriate for the Trans-Allegheny Lunatic Asylum (formerly Weston State Hospital), in Weston, West Virginia, whose recreated settings and engaging tours and activities have attracted 70,000 guests per year. Would such a perfume be called 'Miasma'?
 - 16 Kirkbride expands the discussion of fire prevention and fireproofing from one chapter in 1854 to three in 1880.
 - 17 Sites often had their own on-site fire protection, as at Greystone Park Psychiatric Hospital. Listen to an oral history interview, from 19 March 2018, with Butch Acker, a second generation fireman at Greystone, reflecting about his father's role as Greystone's Fire Chief from 1935–61 (the central dome had burned on 26 November 1930). <https://www.greystoneoralhistory.com/historians-preservationists-documentarians/#Kirkbride>.
 - 18 Sensory Decay Symposium. Pamela Jordan and Sara Mura (eds) 2–3 November 2023. Amsterdam School of Heritage, Memory and Material Culture, University of Amsterdam.
 - 19 For example, Fergus Falls, Minnesota, listed on the National Register of Historic Places (1986, with a boundary increase in 2016), has the largest remaining Kirkbride, since the fall of Greystone, with strong local advocacy. Yet those advocates have become fatigued over the past decade, due to entrenched local politics. Degradation by moisture and mould currently plays to the advantage of those who wish to demolish the buildings despite their national significance.
 - 20 Sensory Decay Symposium, 2023.
 - 21 National Park Service, US Department of the Interior, Glossary of Terms.
 - 22 National Parks Service, US Department of the Interior, Glossary of Terms (emphasis in the original).
 - 23 Kirkbrides that were demolished despite their NRHP listing include: Pontiac, MI (listed in 1981); Dixmont, PA (1980); Worcester, MA (1980); Taunton, MA (1994); Northampton, MA (1994); Willard, NY (1975); Cleveland, OH (1973); Columbus, OH (1986); Jacksonville, IL (1970); and Lakeland, KY (1983). Kirkbrides currently not NRHP listed and at risk include: Cherokee, IA; Independence, IA; Clarinda, IA; Anna, IL; Kankakee, IL; Warren, PA; Danville, PA; Trenton, NJ; Eastern Oregon State, OR; St Joseph's, MO; Bloomingdale, NY. Technically, Danvers, MA, is also on this list, although it was NRHP-listed in 1984, before its extensive adaptive reuse into residential apartments.
 - 24 National Parks Service, US Department of the Interior, Glossary of Terms.
 - 25 At least five Kirkbrides have received National Landmark Status: Thomas Story Kirkbride's own hospital in West Philadelphia, which he co-designed with Samuel Sloan in 1856–9; Buffalo State

- Hospital, in Buffalo, NY; Weston State Hospital, in Weston, WV; St Elizabeths in Washington, DC; and Hudson River State Hospital, in Poughkeepsie, NY. Of these sites, St Elizabeths was thoroughly eviscerated in its transformation into the headquarters for the Department of Homeland Security, and Hudson River State Hospital is abandoned and at risk of demolition, despite local preservation efforts and public commitments by the current developer.
- 26 In 2023, the National Alliance on Mental Illness reported that 20 per cent of US adults experience mental illness, one in twenty experience severe mental illness, and 17 per cent of youths between 6 and 17 years of age experience mental health disorder. <https://www.nami.org/NAMI/media/NAMI-Media/Infographics/NAMI-You-Are-Not-Alone-FINAL.pdf>. Accessed 2 March 2024.
 - 27 Videographers of Kirkbride Plan hospitals typically substitute unrelated atmospheric music in lieu of low-quality onsite sound capture. One exception is offered in the recent project, *Sound the Asylum*, produced by Melissa Grey and David Morneau, which features binaural recordings of the resonant frequencies captured at Buffalo's Richardson Olmsted Campus and the Ridges in Athens, OH. <https://flowercat.org/sta/>. Accessed 16 April 2024. The ROC recordings were featured in a talk given by Grey and Morneau for the Sensory Decay Symposium, 3 November 2023.

References

- Bond, E. D. (1947) *Dr. Kirkbride and His Mental Hospital*. Philadelphia: J. B. Lippincott.
- Dickey, C. (2016) *Ghostland: An American history in haunted places*. New York: Viking.
- Gissen, D. (2022) *The Architecture of Disability: Buildings, cities, and landscapes beyond access*. Minneapolis: University of Minnesota Press.
- Grey, M. and Morneau, D. (2023) 'Sound the asylum'. Accessed 15 April 2024. <https://flowercat.org/sta/>.
- Hamm, T. D. (2003) *The Quakers in America*. New York: Columbia University Press.
- Illich, I. (1985) *H₂O and the Waters of Forgetfulness*. Berkeley, CA: Heyday Books.
- Jasper, A. and Otero-Pailos, J. (2016) 'Editors' introduction: Smell and preservation', *Future Anterior: Journal of Historic Preservation, History, Theory, and Criticism*, 13(2): iii–viii. Accessed 9 January 2024. <https://doi.org/10.5749/futuante.13.2.0iii>.
- Jordan, P. and Mura, S. (eds) (2023) Sensory Decay Symposium. 2–3 November 2023. Amsterdam School of Heritage, Memory and Material Culture, University of Amsterdam.
- Kirkbride, R. (2016) 'Introduction'. In R. Tagliareni and C. Mathews (eds), *Greystone Park Psychiatric Hospital*. Mount Pleasant, SC: Arcadia Press, 7–9.
- Kirkbride, R. (2024) 'Phantoms of the Kirkbride hospitals', *Places Journal*, December. Accessed 9 January 2025. <https://doi.org/10.22269/241200>.
- Kirkbride, T. S. (1854) *On the Construction, Organization, and General Arrangements of Hospitals for the Insane*. Philadelphia: Lindsay and Blakiston.
- Kirkbride, T. S. (1880) *On the Construction, Organization, and General Arrangements of Hospitals for the Insane* (second edition). Philadelphia: J. B. Lippincott.
- Mellenthin, J. and Shapiro, S. O. (n.d.) 'Miasma', *Mythology Unbound: An online textbook for classical mythology*. Accessed 2 February 2024. <https://uen.pressbooks.pub/mythologyunbound/chapter/miasma/>.
- National Alliance on Mental Illness (2023) 'Mental health by the numbers'. Accessed 8 August 2024. <https://www.nami.org/mhstats>.
- National Park Service (2018) 'Glossary of terms'. US Department of the Interior. Accessed 16 March 2024. <https://www.nps.gov/subjects/nationalhistoriclandmarks/glossary.htm>.
- PreservationWorks (2024) Accessed 15 April 2024. <https://www.thepreservationworks.org/>.
- Scull, A. (1980) 'A convenient place to get rid of inconvenient people: The Victorian lunatic asylum'. In A. D. King (ed.), *Buildings and Society: Essays on the social development of the built environment*. London: Routledge & Kegan Paul, 37–50.
- Sinclair, U. (1917) *King Coal*. New York: Macmillan. <https://www.gutenberg.org/files/7522/7522-h/7522-h.htm>.
- Smith, L. (2006) *Uses of Heritage*. New York: Routledge.
- Taylor, L. (2019) *Darkly: Black history and America's gothic soul*. London: Repeater Books.

- Tomes, N. (1984) *A Generous Confidence: Thomas Story Kirkbride and the art of asylum-keeping, 1840–1883*. Cambridge: Cambridge University Press.
- Upton, D. (2016) 'Persuasion and coercion: Therapeutic landscapes of the early national period', *Change Over Time*, 6(2): 116–37. Accessed 9 January 2024. <https://dx.doi.org/10.1353/cot.2016.0009>.
- Yanni, C. (2007) *The Architecture of Madness: Insane asylums in the United States*. Minneapolis: University of Minnesota Press.
- Ziff, K. (2012) *Asylum on the Hill: History of a healing landscape*. Athens: Ohio University Press.

Meaning gleaned in motion: public sensory heritage at the Dutch Fort bij Uithoorn

Pamela Jordan and Sara Mura

Introduction

*An authentic fort, as if a soldier could come around the corner in an instant.*¹

There is no single location that defines the Defence Line of Amsterdam (Stelling van Amsterdam), the series of defensive forts and infrastructure that surrounds the city of Amsterdam in the Netherlands. Rather it is the aggregation of these elements into a singular defensive function that is recognizable as a historic place today, and which contributes to its inclusion in the Dutch Water Defence Lines UNESCO World Heritage designation (UNESCO, 2021). The architectural design of the included forts varies, depending on their period of construction, but the majority were built with a very similar layout and relationship to their surroundings. As such, it can be a surprising experience to visit any number of these remaining forts and see how they have been repurposed for contemporary visitors, from rustic accommodation and event spaces to luxurious spas, restaurants and wine cellars. In these conversions, much of the original materials have been scrubbed, stabilized or covered with comfortable finishes – a far cry from the original military configurations.

In contrast, the Fort bij Uithoorn sits on the verge of conversion with its original (albeit deteriorated) built fabric relatively undisturbed. Original materials and evidence left by stationed soldiers can still be smelled, touched, heard, walked upon and looked through. Superficial deterioration has been allowed to take place, what Caitlin DeSilvey (2017) describes as ‘curated decay’, underscoring the passage of time within. The caretakers have been keen stewards in facilitating this

‘authentic’ interface, clearly valuing it. The sensory experience here stands in stark contrast to other redeveloped forts, where the smells, sounds, visual and other sensory cues often communicate the expectations of a new use. At the time of study in 2021, the owners of Fort bij Uithoorn had been considering redevelopment options that could maintain a primarily historical interpretation (rather than a wine bar, for instance), and any option additionally had to follow UNESCO guidelines for maintaining the site’s integrity.² The site thus presented an opportunity to investigate the significance of sensory cues to visitors’ experience of history at the fort, at both a physical and interpretive level, simultaneously.

The ensuing public study, carried out at the fort, was conceived as a pilot project to explore whether and how current sensorial conditions in the fort (such as smells, sonic features, disorientation or discomfort), alongside physical elements, such as soldiers’ graffiti and rusted window shutters, were internalized by visitors as components integral to the site’s historical value. The study sought to determine whether there was a collective connection to sensory cues of this nature, or whether such engagements were unique to each visitor. For this reason, the study methodology combined quantitative and qualitative data gathering in a survey; this provided data that could be analysed for group averages, alongside descriptive details particular to each participant. The survey questions targeted what the senses elicited about the past for each participant *in situ*, with a particular focus on the role that movement through the space played in perception. The study essentially examined current conditions; the explicit research question was whether such sensory context meaningfully reflects a lived and sensorially evocative *past* in such a way that it should be included in future conservation work. Could the fort’s sensory environment be considered intact and thus contributing to the overall integrity of the UNESCO site?

The Fort bij Uithoorn: historical uses

The Defence Line of Amsterdam (‘the Line’) is a 135-kilometre-long circular defensive landscape, built approximately 15–20 km from the city of Amsterdam. Following the Fortification Act (*De Vestingwet*) of 1874, a series of defence lines were constructed, or reinstated, around the Netherlands that used ground inundation (flooding) to prevent or hinder land-based invasions. The Line was built by the Dutch Ministry of War between 1881 and 1914 as a series of forts, casemates and batteries.

Most of the forts were built according to standard designs that evolved during this period, which included earthen berms and some tree cover, to camouflage the profile of the buildings. Each structure was built within sight of the next fort in line; the assembly south of Amsterdam was connected by a canal system and built on peat meadow, which enabled this sector to be flooded easily to prevent invading ground forces from advancing further towards the city while also being too shallow to allow boat passage.³

The Fort bij Uithoorn (also colloquially known as Fort Amstelhoek) is located in the south-eastern part of the Defence Line – *Sector Ouderkerk* – along the banks of the Amstel river. The land hosted a simple earthwork with ramparts as early as 1885, with an engineer's storage shed built in 1894. The concrete fort structure was completed to the standard Type B design in 1911 where the earthwork had stood (Ros, 2024a) (see [Figure 9.1](#)). Few details are known about its use, but available occupation records of posted regiments show 321 men were stationed in 1911, 324 in 1913, and 266 stationed in 1920.⁴

The technology of the entire network was rendered mostly obsolete with the advancement of air warfare in World War II, and active conflict never took place at the fort. Nevertheless, the Fortification Act continued to be enforced into the 1960s, preventing the public from coming within a kilometre of any fort in the Line and not allowing the forts to be marked on civilian maps. As it was designed to withstand explosions, the Fort bij Uithoorn continued to serve as a passive defence until 1959, safeguarding the provincial road traversing the inundation zone of the Line. After World War II, the fort ceased active operations, but The Royal Netherlands Army retained control of the site until 1997. Rumours of its utilization by 'Organisation B' began circulating in the 1980s. Originally known as part of the Dutch Operations and Intelligence, this underground resistance provided strategic information and military support in case of a Soviet invasion. However, whether the fort was used to store weapons and ammunition supplies remains classified.⁵ Clearly, the fort and the entire line have persisted in the collective, public memory of the region and nation.⁶

Without much active maintenance during the Cold War, many structures, including Fort bij Uithoorn, became overgrown and took on a 'natural' appearance, further rendering them and their use invisible to the public. The structures passed from military to government control, and, after the end of the Cold War, they were sold to municipalities or individuals. This marked their reintroduction to the public eye. Soon after, in 1996, the entire Line was inscribed to the UNESCO World

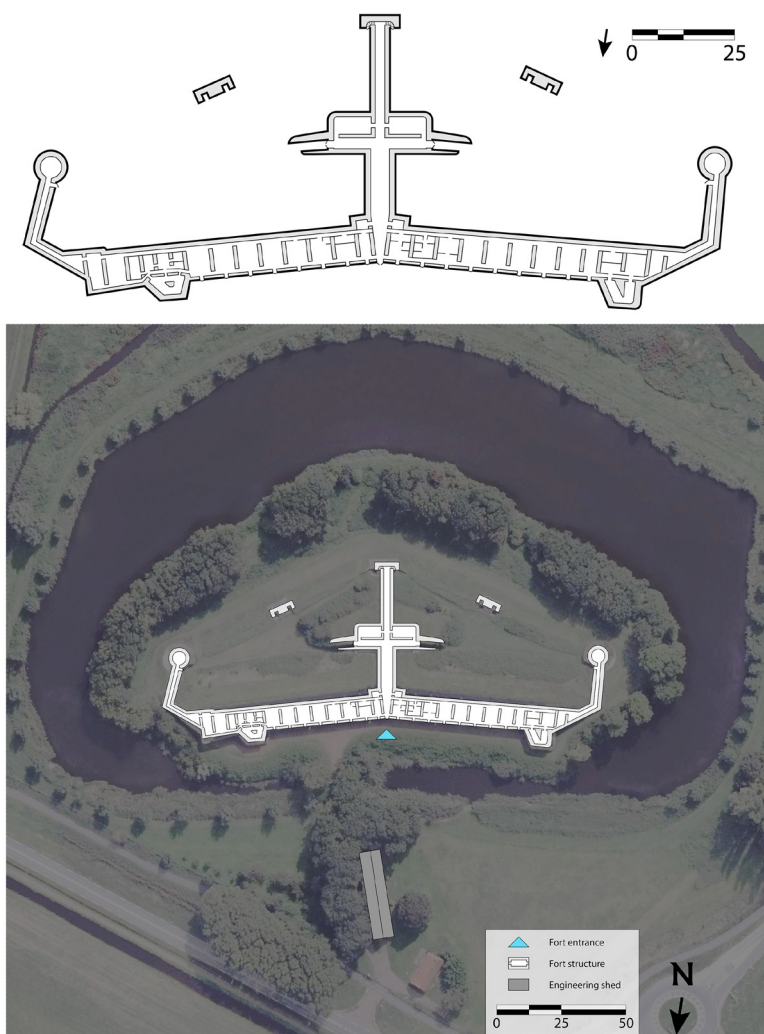


Figure 9.1 Diagrammatic plan of Fort bij Uithoorn. *Source:* P. Jordan, with Google Earth background image.

Heritage List. The listing was extended in 2021 to include the nationwide New Dutch Waterlines – *Nieuwe Hollandse Waterlinie* – and named the Dutch Water Defence Line. Since the first UNESCO inscription, many forts have been repurposed for recreational or gastronomic ventures without significantly altering their structural integrity.

As with many of the Line forts, the Fort bij Uithoorn is now used for nonmilitary purposes: currently owned by the National Forest Service,

it is rented out for outdoor functions and historical interpretation. The occupier's family have been the caretakers for over two decades, helping to organize a dedicated group of volunteers to maintain the property and open it to the public by appointment. The exterior and interior have been stabilized against significant damage from water infiltration, but most other deterioration mechanisms have been allowed to manifest as expressions of an 'untouched' historical relic. Without starkly contemporary additions, and unlike other forts in the Line, the Fort bij Uithoorn presents an experience of time passing without intervention, yet with evident maintenance care.⁷ The overriding character is far removed from comfort or ease; it has not been neutralized as a backdrop for outdoor adventuring, dining or spa experiences. Thus, the fort presented an opportunity for sensory research, not only because of its material state, but because of this potent moment in its trajectory as a heritage object. While the caretakers resist a functional repurposing of the building, they have explored the possibility of rehabilitating its interior to allow for greater (and more comfortable) public access for historical interpretations and group activities. A masterplan concept, visible during the study, included the introduction of modern bathroom facilities, heating, lighting, ventilation, greater material stabilization and new finishes, as well as the possibility of an additional outbuilding and parking lot, to facilitate the hosting of events. It was hoped that our study could provide sensory-related findings to renovation discussions.

The Fort bij Uithoorn today

While the intention is that the fort affords an unenhanced experience of its material remains, this is not equal to a sensory encounter fully representative of original conditions during military use. Some elements can be readily identified as bearing strong similarities to past conditions. On the exterior, the fort structure remains integrated into the landscape, with the original berm landscaping surrounded by a purpose-built moat and subsurface access on the north side. An engineering shed is the only other structure, positioned near the entrance to the enclosed terrain. A bridge still leads from the main road to the fort entrance, where an arched doorway is centred in a one-storey, north-facing wall composed of regularly spaced arched windows with metal shutters (Figure 9.1). Gun turrets stick out from the east and west ends of the north wall; two elevating gun turrets, the metal dismantled by German troops during World War II, are located on the south side of the building, connected to the main building by shellproof

corridors (poternes). Small casemates are also accessible on the south side via stairs at the back of the central hallway. There is some visible weathering on the exposed brick exterior and window openings, and the elevating gun turrets are clearly heavily damaged, but otherwise the exterior conditions appear intact and the building inhabitable.

The general composition of the fort interior remains quite spare. A central hall extends from the main entrance, back to the south of the fort. The living quarters were consolidated in the central area, off this central axis, with gun turrets placed on the peripheries. The building employs brick and concrete for its structural walls, floors and barrel-vaulted ceilings. Interior partitions are primarily of wood, as are the floors of the officers' quarters. Original windows and casements are mostly intact, though with significant rusting and patina. Natural air-ventilation louvre systems are visible and semi-operable, as are wall niches for oil-burning lamps. Elements such as a telegraph room, iron removal system for drinking water, laundry room and lavatories are partially or fully intact, while almost all furnishings and other fittings have been removed. The elevating gun turrets are still accessible, with World War II damage evident. Significant material deterioration due to water is also evident in the lavatories and adjacent hallways, less so in the living quarters and main transit hallways. Sensory impressions of the interior can be dominated by moisture and rust, limited lighting, reverberant sounds and the rough textures of building materials.⁸ Thus, while the material remains of the fort are structurally similar to conditions in the first half of the twentieth century, the current physical deterioration, combined with the absence of military function, draws a strong contrast with presumed original sensory conditions.

Research context: sensory walking through heritage

As far as work is concerned, our fort is almost ready, and now comes the worst time: there is nothing to do but wait, wait. Occasionally a military walk, but soon we have finished walking; and for us artillerymen, practicing with cannons cannot be endured for more than five minutes, because the handling of modern artillery is so simple that the stupidest lout needs no practice.⁹

The above quote is one of very few accounts available of daily life in the fort. The pilot study had to approach the fort as an architectural and sensorial space, with recognized historical value but with little known

about the details of its past daily life. The project approach recognized that such a premise would be familiar in all kinds of archaeological sites, not just military infrastructure. So while the study took account of the site's militarized context by consulting other sensory-based studies of military heritage (Leonard, 2019; Leonard and Breithoff, 2019; Denman, 2020; Virilio, 1994), it did so from the perspective of heritage consumption as a general category of engagement, rather than from a position of seeking accountability from a site of historical conflict.¹⁰ The dearth of first-hand accounts of historical users pushed participants to question whether their experience created an embodied understanding of past lives, in place of absent narratives. It is an approach that acknowledges the associative interplay between object, individual experience, official heritage narrative and personal memory in creating meaningful encounters with places. Moreover, it requires this interplay to be a conscious process, in contrast to typical navigation through space in our daily lives. Put another way, and borrowing from related work carried out by Sumartojo in other historical settings, participants were asked to interact with the site as a means to 'provoke effective engagement' with its history (Sumartojo, 2019). Such an engagement first entailed confronting the formal intent of the architecture, as expressed through the building's organization and detailing, and through its material remains in all its sensorial complexity. The remaining evidence is currently the best first-hand account available of the building's history of use, and the study gathered participant assessments of the entire building assembly rather than focus on rooms in isolation. But with a focus on the senses, the 'effective engagement' also entailed a confrontation with one's individual associations, memories and expectations at the site.

As a means of placing the participants squarely at the centre of an 'engaged' study, the survey included self-mapping one's movements. Integrating bodily motion through walking practices privileged body-centric knowledge of the territory as a research method for understanding a continuum of experience, instead of static snapshots.¹¹ It additionally helped participants transcend the limits of an internalized Cartesian model by re-establishing the connection between sensation (for example, the corporeal body) and perception (cognitive understanding). The simple act of tracing one's movements through a pen and paper also served as a direct translation from one sense (movement) into another (visual marking), enhancing accessibility and facilitating documentation. The project encountered challenges in gathering documentation based on personal experience from the participants and communicating

the results in readily comparable ways. Mapping presented one solution that addressed both these needs. The extent of the site, both interior and exterior, as well as the original practices of soldiers patrolling the grounds, reinforced the value that a walking research approach could offer.

A primary reference in constructing the sense-based walking approach of the project derived from soundscape research, with its origins in work by M. F. Southworth (1969). In 1967, Southworth employed sensewalking to delve into the sonic environment of Boston, laying the foundation for subsequent soundwalk research advanced by R. M. Schafer and the World Soundscape Project (Schafer, 1977; 1994). Soundscape study has proliferated since, codified recently with international standards of research and analysis that emphasize the primacy of perception in walking analyses of sonic environments (ISO, 2018; ISO, 2019). The sensory turn ushered in analogous shifts in history, anthropology, archaeology, and within the social sciences as well, extending to other senses beyond auditory experiences that proved instructive for shaping the study (for example, see Erlmann, 2004; Bull et al., 2006; Samuels et al., 2010; Pellitero, 2011; Pellini et al., 2015). Recent multi-disciplinary studies centred in mapping were also consulted, including Madalina Diaconu's exploration of the tactile and olfactory qualities of cities (Diaconu, 2011), and Victoria Henshaw's smellwalks in Doncaster, UK (Henshaw, 2013).

In shaping the proposed study, a walking approach, as pioneered within archaeology by Christopher Tilley, proved quite influential. Tilley's framework, rooted in phenomenological enquiry, advocates for the inclusion of subjective experience in archaeological research methods (for comparison, see Tilley, 1994; 2004). His emphasis on moving beyond the traditional objectification of landscapes prompts a re-evaluation of how researchers engage with archaeological sites. However, we were cautious, being aware of challenges to Tilley's perceived bias toward visual perception and male Western sensibilities generally (among others, see Thomas, 1993; Hamilakis, 2013), as well as what Tim Ingold describes as Tilley's 'hyper-interpretation' of the landscape as an authentic representation of past meanings. In contrast, Ingold emphasizes that firsthand encounters generate contemporary interpretations rather than accessing the thoughts and meanings of people from the past (Ingold, 2005: 123). Our study navigated this discourse by acknowledging both Tilley's ideas and Ingold's critique, integrating subjective insights while maintaining a critical perspective on historical interpretation.¹² Expanding on a similar point articulated

by Hamilton (Chapter 1, this volume), archaeologists are reimagined as actively engaged participants rather than distant outsiders, both culturally and temporally. Considering this perspective shift, our study emphasizes the challenge of interpretation these critiques have raised, rather than achieving direct access, which this study seeks by amalgamating diverse methods, often influenced by the unique backgrounds and viewpoints of the researchers involved.¹³

Walking methodologies are much less pervasive in heritage research, perhaps found as community initiatives for raising awareness or in pathway identification rather than as a common research tool.¹⁴ At the fort, heritage research integration took other forms as a result, especially leaning on the rich literature available on sensory and affective heritage, to pursue a common language for discussion.¹⁵ For instance, walking techniques have been applied in smaller and controlled musealized environments to improve the interaction between public and heritage.¹⁶ Heritage work on ruins (in addition to military contexts mentioned earlier) also provided fruitful thoughts on the deployment of original material and evident deterioration to emplace and connect a visitor with a (distant) past (Ashurst, 2007; DeSilvey and Edensor, 2013; Pétursdóttir, 2013). Such reference points moved the study away from narrative-based structures of historical research and towards material engagement over time, so that sensory experiences were not associated with only one moment in the building's history.

As the study was carried out at a UNESCO listed building, the survey inherently was freighted with the influence of such authorized heritage discourse and terminology, which can limit interpretations and descriptive language (Smith, 2012). Participants additionally had to navigate their own associations and expectations of a site deemed 'world heritage'. To help prevent participants from simply mapping their responses immediately onto UNESCO-related concepts of ascribed material value, the survey intentionally avoided using associated terms such as 'authenticity' or 'integrity'.¹⁷ The terms 'historical accuracy' and 'historical longevity' were used instead to capture similar themes, as discussed below.

Nevertheless, the survey was purposefully conducted at a site where the parameters for possible future development were set by UNESCO, spelled out under the 'protection and management requirements' of its official listing: 'For highly dynamic areas it is key that the capacity of the property to accommodate potential developments is assessed through focused area analyses defining the specific conditions and locations for development that can support or enhance the *integrity*

of the property and where this might pose challenges' (UNESCO, 2021; emphasis added). Notions of historical integrity thus formed a through-line to research.

Field investigations with a self-guided public

As discussed, the field research methodology of the study centred on the gathering of multiple sensory perspectives, and it was decided early on that these should include a range of disciplinary backgrounds and life experiences. A public survey was structured so that responses could be compared, allowing us to test the potential for statistical analysis of the data.¹⁸ As a pilot study carried out during COVID-19 restrictions, the small sample size of the participant group meant that results could only be used to determine the effectiveness of the methods and whether scaling up the study would be possible.

A diverse team composition – coming from different academic fields, ages, nationalities, genders, native languages and previous exposure to Dutch military history and/or the site – was necessary to include a wide range of subjective responses and sensitivities.¹⁹ To translate this mixture into measurable data, walking and mapping modes of investigation were designed so that participants could chart their own paths and build their sensory impressions according to their preferences. The study also prioritized reproducibility, to facilitate the easy expansion and accumulation of findings by other researchers and participants.

There is no single standard for structuring a public sensory survey – each manifests the research focus under scrutiny and the particularities of the site. Despite the limits of an Aristotelian classification of five senses, the study nevertheless used them as a starting point to give all participants a common language from which to begin categorizing their experiences. The use of this language also made later analytic comparisons between results more straightforward. For the purposes of this study, smell and taste were combined, while sight, hearing and touch were maintained as separate sense categories. As a pilot, the study was not designed expansively to collect detailed information on sensory relationships and overlaps, despite the role of sensory combination and synaesthesia in perception.²⁰ Instead, one aspect was chosen, to push participants' sensory considerations beyond the five senses: the role of movement through the site.

The emphasis on movement was motivated by what the authors encountered as a common problem in sensory survey work broadly,

and which has been tackled by Hamilton in her research (Hamilton, [Chapter 6](#), this volume). Whether in research modes or daily existence, we are accustomed to negating our presence in a space and instead focusing on the sounds, smells and sights that we do not introduce.²¹ This is especially true when we are asked to be still and take in our surroundings – the context of ‘stillness’ encourages us to consider the space without us in it. Yet sensory engagement is not based on static baselines outside of ourselves, but rather is determined by an individual in a space, who is carrying both the sensory input encountered from the previous room and the socio-cultural expectations constructed over a lifetime.²²

Even when still, our sensory organs are comparing the current situation to what has come before to assess its intensity and characteristics. The survey was designed to capture various understandings of this time-based dynamic by splitting participants into ‘stationary’ groups, those who chose a specific point from which to study, and ‘in-motion’ groups, those who focused on the experience along the paths they chose between points. Both categories arguably engaged movement through the space in the same way; the study merely drew participant attention to the still or in-motion moments. Analysis of the data could then investigate whether the difference enhanced participants’ awareness of themselves and their responses.

Overall, the survey was designed to be as responsive to individuals as possible while still gathering data that could be analysed collectively. All participants were able to choose their partners, choose where around the site they wanted to study, and how they moved. Basic questions were asked on standardized sheets for each study position or pathway, as described below, yet participants were encouraged to add their own notations and comments.

Structure of the investigation day

The day began with travel to the site. The group gathered in the engineering barn, adjacent to the fort, for an introduction to the day. After a short welcome, René Ros, a local Defence Line historian and regular volunteer at the fort, gave a short lecture on the site and its known history, followed by a tour of the fort and grounds. The group was led through the illuminated area of the interior to become familiar with the layout and different original functions, and Mr Ros related a few stories from the fort’s earliest uses, such as the account given by Theor Thijssen while stationed there in 1914 (see quote above). This introduction provided all participants

(a)



(b)



Figure 9.2 a) The entrance to the fort; b) Officers' quarters at the fort.
Source: W. R. G. Theelen.

with a basic familiarity with the physical site and its known history; it also enabled group members to choose the study paths they could follow during the survey within the allotted timeframe (Figure 9.2).

After the introduction, the group returned to the barn for an explanation of the research activities of the day, including the distribution of survey forms, going through their contents and use, and the choosing of research partners. A plan of the fort was included for participants to note their movements during the research. Questions were answered, and everyone teamed into pairs to conduct their research. The pairs were arranged as stationary groups and in-motion groups, with this distinction indicated on their survey sheets. Partners were asked to agree on the site positions for conducting their sensory gathering; choices were based on their earlier tour and on what they personally felt they wished to investigate. Using the barn for this preparation helped to delimit the fort as a research space and prevented possible blending of sensory engagements that might affect survey responses.

Once all participants felt equipped to carry out the investigation, they were invited to begin their work, starting from the entrance court of the fort building. Groups were given approximately 90 minutes and, on average, at least half of this time was spent determining the positions of study and the routes between them. After the surveys were completed, everyone reconvened in the barn. Following a group lunch, a semi-structured discussion was led by the study organizers, so participants could offer their impressions of the research. This discussion was recorded and transcribed, with participant permission.

The survey form

The provided survey form was developed according to standardized soundwalking practices for public survey (ISO, 2018). The survey pack given to each participant included a sheet for gathering anonymous demographic information, five individual question sheets for use at each study position or path (Figure 9.3), and a plan of the fort. An additional study-release form was collected before the study began, which asked for the participant's age, nationality, disciplinary fields and previous knowledge about the fort or the Defence Line.

The demographic information sheet established the knowledge base of participants from multiple backgrounds without attaching this information to specific survey responses; it was detached from the survey pack and handed in before the groups began their research. The survey pack began by asking participants to identify the weather conditions to

initiate their sensory engagement with the environment. A restatement of the instructions for completing the survey was also included, as follows:

At each position, please pay attention to your surrounding environment for 2 minutes – try to step away from other participants if possible. Only after this period of time passes, please look at your survey sheet and respond to the questions. This form is merely a guide; please include any other reactions or details that you would like to share. This study looks at how the human mind connects to a historic environment – if you find yourself distracted, happy, impatient, hungry, etc., please include this type of information in the free response as well. There is no useless information!

Including a map of the fort with the survey pack allowed a consistent visual means for participants to note their locations and paths chosen during the study. But it was also included in lieu of participants documenting their positions or impressions with a camera.²³ Requiring someone to engage with a diagrammatic plan (as opposed to using a camera) requires more attention, time and analysis on their part. It also ensures that participants assess visual cues with their own eyes and not the ‘eye’ of their phone (and the inherent remove, combined with cultural practices, that phone cameras influence).

All research questions for a single position or path were contained within one sheet, which included five questions of both quantitative responses (for later statistical assessment) and qualitative responses. Questions one and two focused on an individual’s experience of present conditions; questions three and four focused on (presumed) conditions of the historical past or the perceived connection to the past; and question 5 sought any pressing contextual information about the individual’s state of mind (Figure 9.3). Blank space was provided for answering each qualitative question, to give participants a sense of freedom in their writing process while encouraging short and straightforward answers.

The first two questions were intended to collect qualitative data:

- Question 1 prompted an analysis of how the person moves in the space and approaches the built environment.
- Question 2 directed attention to the senses separately. The terms for each sense were chosen to provide broad categories for individual sensory reflection without requiring interpretation. Being in a Western context that tends to centralize dependency on (and comfort

1

How did you position yourself at this location?
 In front of the shopping hole, standing in the corridor, facing towards outside
 I was stuck by the door and bumbling my cheek.

What did you experience?		What did you experience?
Feeling/ (and) Touch/ Pedestrian	a breeze of fresh air, for my cheek like standing in a slope → more pressure from dark into light, on one foot	ears outside, contrast with quiet inside.
Sight/Invisibility	green not tree outside	smell of wet concrete, fresh cold smell of outside air

More details		
How intense is each sense in the environment? (weak-strong)	Is this condition historically accurate?	I would expect the difference between the inside, the sign contrast to also have been there. The smell is influenced by decay, so I expect more change
Feeling/Touch	1...2...3...4...5	
Sight	1...2...3...4...5	
Hearing	1...2...3...4...5	
Smell/Taste	1...2...3...4...5	

What elements fit, what don't		More details
Historical longevity of your experience in the environment (new-historic)	I feel that my experience is so much more personal than historical	
Feeling/Touch		
Sight		
Hearing		
Smell/Taste		

What did you perceive that was specific to you?
 my feet are breaking, I have a slight pain in my belly

What is on your mind?
 what other points to choose? Difficult...
 The numbers of the place pushes me forward, difficult to just be in the present, with to explore

Figure 9.3 Sample of a filled-out survey sheet. Source: authors and respondent.

with) vision, senses were organized starting with feeling, a general term that aimed to include emotions as well as touch, perceived through sensory receptors in our skin and throughout the body. Sight and hearing were presented, together with their absence, invisibility and silence, to encourage participants to expand their sensory range beyond automatic assumptions that only a sound is heard, for instance. The descriptors smell and taste were left without elaboration, to allow participants to indicate how they interpreted these descriptors.

Questions 3 and 4 combined qualitative and quantitative data:

- Question 3 sought the intensity of each sense experience and its relationship to historical conditions. A five-point scale ('weak' to 'strong') was used to note each sense.²⁴ A closed (yes/no) question asked participants to judge the historical accuracy of the experiential intensity. The intent was to understand how current conditions were perceived as reflective of historical ones, for instance if the intensity of interior silence was expected to be the same during military use, but participants were allowed to interpret the meaning of 'historical accuracy' from their own perspective. An open text field was included, for reflection on the combined sensorial experience. In the case of the stationary group, participants could provide more details on their experience, while the in-motion group was asked to reflect on how experience changed along their path.
- Question 4 sought to understand whether and how the sensory experience reflected presumed historical conditions. The question asked about the 'historical longevity' of sensory experience using a five-point scale ('new' to 'historic'). As opposed to question 3, question 4 sought to understand how the overall sensory experience (not just the intensity) was perceived to be reflective of historical conditions. A free text field was again included for reflection on combined sensory experience, as in question 3.

Question 5 was a free form text field:

- Question 5 was designed to capture any dominating influence that could not otherwise be captured in the survey, for instance if someone was uncomfortable, hungry or distracted in a positive or negative way.

Follow-up conversation

The fort was not heated, and a communal lunch helped reinvigorate the group before the semi-structured conversation about the morning's research. Everyone was encouraged to share their impressions, highlights and criticisms of the survey, in the collective interest of improving future iterations of the study. The authors acted as conversation leaders, prompting the discussion through a series of questions but allowing the participants to fully explore ideas and introduce new topics. The discussion was recorded and later transcribed.

Overall, the conversation served as an important forum for exchange and clarification for both study designers and participants. For participants, the (re)articulation of their responses was evidently helpful, either to explain their responses in more detail than the form could allow, or to process their impressions through verbal analysis rather than in writing. The dearth of historical information about the fort presented a challenge, and the conversation revealed a clear strategy used by many participants when conducting analysis. Their tendency was to fill in knowledge gaps about the fort, through anecdotes and sensory analogies from other sites or familiar military narratives, whether or not they were appropriate to the period or historical practices at Fort bij Uithoorn:

There were some things that for me were the same, like footsteps on the concrete have to be the same for people that were living there ... The bit of fresh air that people wanted to get [by] going outside. And thinking about your families in Amsterdam, when you can get there, and if you can get there. (Group dialogue, 9 October 2021 (13:46)²⁵)

For the research leads, the conversation provided a layer of contextualization for the form-based data along with feedback on the study's design. Working in pairs proved helpful, as it gave a sense of security in unknown (and at times intimidating) surroundings and greater confidence to explore. The forms themselves proved challenging at times due to a lack of familiarity with such research methods or specific terms. Feedback also reiterated conceptual difficulties that the researchers were seeking to clarify, such as the meaningful difference between historical intensity and historical longevity, in questions 3 and 4. Excerpts below are all from the group discussion, recorded 9 October 2021:

[Working in pairs helped us] to validate I guess our feelings and our emotions by sharing ... (04:35).

... I had a really hard time ... finding vocabulary to describe [the experience] (06:05).

[The form] might point you to things that might not be there, or you would start searching for it. And on the other hand, it does make you think and ... wonder more (11:34).

[The experience] was a flow in my head. So I had a really hard time separating them in different boxes ... it became a bit restrictive ... repetitive ... (24:58).

A number of participants in this group sensory survey discussed the usefulness of the proposed method, in providing a new, different layer to their experience of the site:

... once you start focusing on using more senses to experience rather than just going on tour and listening to the history is a whole different experience ... (08:05).

I think that sort of recognizing or ... inviting the senses into your heritage experience makes it so much more ... memorable, evocative (12:34).

While the discussion was recorded and transcribed, it was anonymized so no connection could be made to specific survey sheets or demographic data. A brief thematic analysis was conducted on the conversation, for general context and themes. For future iterations of the research, a detailed thematic analysis would prove fruitful.

Data analysis procedures

With only a dozen participants, our analysis has focused on assessing the methodology rather than the results. The following discussion on research findings will therefore concentrate on the method of analysis. One point of enquiry was the efficacy of mixed qualitative and quantitative methods to explore the participants' experiences as phenomena; the discussion here will focus on questions 3 and 4 of the survey, which combine both types of data collection. [Figure 9.4](#) illustrates the analytical workflow for the two questions, depicting the interplay between qualitative and quantitative analyses and the way the research

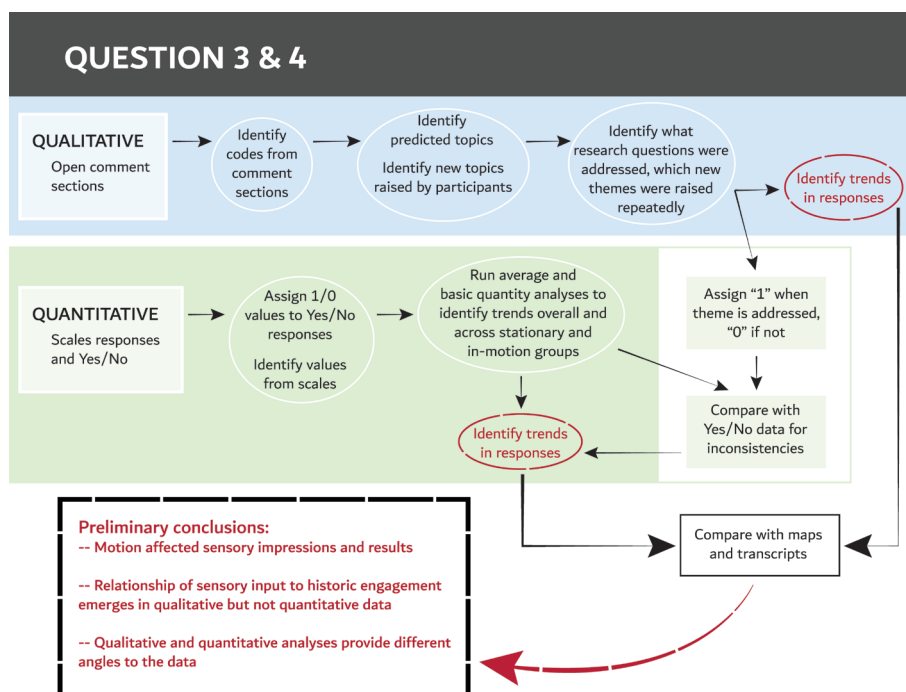


Figure 9.4 Diagram of data analysis procedure. *Source:* authors.

objectives of the study were embedded in their content and structure. The analysis objectives were to: identify possible relationships between sensory experience and historical value to participants; identify the effects of motion in sensory experience; gather sensory data in a historical setting.

Quantitative analysis was carried out on the scalar question fields as well as yes/no questions; the responses were given a value between 1–5 for scalar fields, or 1/0 for yes/no fields. The responses were then used to observe trends across all participants and according to stationary or in-motion groups. As the scalar field was used to determine the intensity of responses, responses of ‘4’ or ‘5’ were flagged for considered qualitative analysis. Trends between stationary and in-motion groups were observed, such as the frequency that stationary groups mentioned sight more than other sensory impressions, or difficulties in understanding the language of the form with respect to relating ‘intensity’ and ‘historical accuracy’, as will be described below.

Future iterations with more participants could look at other trends, such as the intensity of responses between study points 1 and 5, the

intensity of association between historical authenticity and movement, or the frequency that respondents chose not to answer a certain question. Such iterations could also incorporate statistical analysis on responses to determine the likelihood that certain responses or trends are related or even causal, given enough participants. Quantitative data gathering and analysis enabled responses to be standardized and compared according to the research objectives, which proved especially useful for discussing intensity and frequency assessments. The statistical analysis that could result from such data might be beneficial for larger studies, as well as comparing sites with similar typologies, such as the many forts in the Stelling van Amsterdam.

Qualitative data review was conducted through thematic analysis of open-ended responses attached to the qualitative response fields (Guest et al., 2012). This information was gathered to supplement the quantitative responses, adding depth to forced numeric responses. Recurring elements and ideas were identified, between respondents, that matched the research interests of the study, such as respondents identifying certain senses, referring to the distinction between tangible and intangible space and the effects of movement through the fort. Other unpredicted recurring ideas were also noted, such as the mention of abandonment or feelings of fear, as well as the process of associating ideas to explain the condition of the structures and/or their personal sensory experience. The following examples illustrate the rich content gathered on the day concerning smell, sound, light, present feeling and historical association, from two participants:

Very intense smell change at first but as we moved deeper it mellowed out. As we moved down the incline tunnel it became quieter, or we were invited by the space to be more careful/quiet, because of the dramatic shift from open-loud-light to dark, enclosed, quiet. (Question 3. Participant 4, in-motion group, Path between the entrance of the fort to Point 1.)

I imagine different smells and noises from people living here. (Question 3. Participant 3, stationary group, Point 3.)

Ideas noticed in such responses were identified as recurring ‘codes’ in the thematic analysis. To minimize bias during selection, each free response was carefully reviewed and the rationale behind the selection of codes was noted. Inter-rater comparisons and discussions between the authors further aided in this process of individuating additional,

unexpected aspects of the sensory experience. Out of these coded responses, a few cohesive and overarching themes were identified from the study that both aligned with research objectives and also revealed new common ideas. These consisted of: reflections on the historical accuracy and longevity of either the senses in general or the space specifically; movement and the creation of a narrative linked to the space; and, the human presence, both in the past and the present. Notes on single senses were seldom entered, with comments structured more commonly as follows:

I feel that my experience is so much more personal than historical.
(Question 4. Participant 4, stationary group, Point 1.)

Coming outside I felt more like the experience was authentic for an enlisted soldier. As I looked to the water I imagined how this might have affected him and his own experience of movement from the inside to the outside. (Question 4. Participant 4, in-motion group, between Point 1 and 2.)

The themes that emerged from the qualitative analysis were then compared with transcripts from the group discussion, which was integrated as a vital component of the study. As flagged by Sather-Wagstaff:

[Sharon] Macdonald notes that a key issue with the analysis of embodiment and materiality, particularly in getting at the effects of affect and feeling, is that in the current ‘affective turn’, the body becomes the privileged vehicle for creating ‘authentic’ knowledge and this ‘has the effect of separating “the felt” from the linguistically expressed’, thus dismissing discourse. (Sather-Wagstaff, 2017: 16)

The integration of multiple registers for data collection – spoken, written, drawn – sought to rectify the threat of separated feedback. While the participants could not be linked to their survey responses, the discussion alongside written responses enabled the direct integration of multiple forms of discourse coequal with felt experience. It often supplied context to the emergent themes identified in the survey forms, since they were mentioned by multiple groups as interesting impressions from their experience. The question of authenticity in the context of the fort will be returned to below.

A simple inter-rater analysis between qualitative and quantitative results was conducted by comparing the frequency that the historical relation themes were mentioned with the yes/no question on historical relationship to sensory experience. Since not all participants elaborated their yes/no questions qualitatively as well, the results of the two analyses did not exactly match, but this technique proved useful for identifying any significant discrepancies in responses that would require re-examining the qualitative data. One last cross-connection of data involved linking responses to the annotations on the handout maps, so that any trends at common study points could be compared. Though this did not occur consistently in the pilot study, this could prove a productive line of enquiry in iterations with larger survey groups.

An important observation resulting from data analysis pertained to the study's objective to understand whether introducing motion proved an effective sensory engagement strategy. Generally speaking, contrast was an important method of description for many participants. However, those within in-motion groups presented their sensory observations most often in contrasting terms and with greater intensity. Stationary groups, on the other hand, appear to have assessed conditions from a more consistent baseline of experience. The difference was consequential for data collection, but not enough participants were involved to adequately trace the specific influence of incorporating motion into the data gathering. Later participant reflection on the dynamic was mixed:

[Although] we were [a] stationary group, I was continuously comparing what I have experienced inside and outside and how [they were] so dramatically different from each other (26:49).

I think the contrast became more clear when you were in motion. But sometimes there were details you didn't have time to explore when you were in motion (65:50).

In general, the study highlights that introducing participant-directed motion increased participant sensory awareness and provided an opportunity for discussing differences in perception. Given the freedom to choose their direction of movement, participants seemed to concentrate on the indoor spaces within the fort environment. Whether such attentive data gathering is appropriate is a pattern to be determined by future iterations of the study with larger groups.

One unprompted topic that emerged during analysis was the possible restoration and reuse of the site and its buildings, highlighting the new considerations of participants concerning how to appropriately ‘... repurpose them in a way that’s still preserving ... the spirit of the place in which it was originally built’.²⁶ The resulting heritage-themed discussion reflected on what could and should be repurposed and the accuracy of the sensory experience. This discussion underscored the potential for conducting such a study at heritage sites under consideration for functional repurposing. It could be a powerful tool for all stakeholders to reappraise a site and their assumptions simultaneously.

Concluding remarks on the research methodology

It makes me at least think of how would it have been, even more consciously than just going there and listening to the stories of what happened – like how other people felt it would have been. But that also makes me think, ‘are there any experiments of trying to recreate it? ... How long would it [take] to get the same sort of experience?’ (08:05).

By sidestepping the authorized heritage discourse terms of ‘authenticity’ and ‘integrity’, the study redirected participants away from value assessments based solely on material judgements. Thinking through their senses, many nonetheless fell back to recreation as a means of verifying their impressions. Negotiating their impressions through the alternate terms introduced on the survey, ‘historical accuracy’ and ‘historical longevity’, proved disorienting for many. We wonder how much of this is an expression of participants translating their existing, material-based mode directly into sensory-based experience of place rather than adapting a new way of thinking – something of a ‘square peg in a round hole’ struggle.

Left unsaid during the study, this sensory research was still material focused, but it put human interaction with that material at the centre to understand this interaction’s relevance to historical evaluations. Participant responses showed, in various ways, that focusing on their experience with the material remains of the fort indeed enabled everyone, of all disciplinary backgrounds, to delve into various layers of sensory affordances that proved influential to them. These in turn were cited as providing a richer understanding of the fort’s current historical

and cultural significance. Whether they reflected original conditions, however, was debated.

The mixed methods approach to structuring the survey form allowed for a novel means of collecting both visual and nonvisual data about site experience. The data has proven meaningful and consistently rendered from all participants, indicating that the form generally facilitates the consideration and documentation of sensory experience for individuals and as a collection of viewpoints. During the follow-up discussion, participants expressed specific concerns about improving the form (mostly related to terminology) rather than scepticism about the study method per se.

A few overarching observations were gained from the study. First, including nonspecialists ensured that a diverse array of responses was gathered. The results underscored that specialists and nonspecialists alike could trace their sensory experience meaningfully using this survey method. Incorporating motion into the foundation of the survey shifted the perception of participants to be more acutely aware of their experience and comparative in their analysis. More study is needed to understand how this may influence generated data. It is evident that the mixture of qualitative- and quantitative-focused survey questions was helpful. When the questions were worded clearly for participants, they provided comparable data points from which to draw general conclusions, but also provided enough detail to contextualize the answers fully. Personalized experience remains individual, but trends may be identified in future iterations. Lastly, the differences between stationary and in-motion studies show promise for a future expansion of the work. While no trends could be identified with the small group size, the in-motion group used descriptive language about the changes along their pathways, particularly with vision and sound, that contrasted with that of the stationary groups. A future iteration should include both approaches, as the depth and breadth of observations in each group might prove indicative and relevant for studies carried out in other contexts.

As detailed by Leonard in [Chapter 7](#), this volume, historical military sites can be understood more fully when sensory cues of original conditions are maintained and integrated as part of interpretive efforts. Part of the reason for this is the utilitarian nature of military site construction and use; their striking difference from more familiar historical environments, such as domestic or civic surroundings, renders the sensory experience more stark in contrast. Gaining access to reflective sensory cues offers an avenue for visitors to imagine what was required of soldiers inhabiting these spaces, as participants at Fort bij Uithoorn

articulated during the study. Sensory cues evidently enhance the depth of interpretative experiences for visitors, potentially fostering a deeper appreciation for the historical significance of the site. Thus this study presents promising evidence of the role that sensory aspects may play in future conservation efforts. A sense-based approach to valuation has particular potency in settings where historical narrative is not the primary concern – due to confidentiality of living witnesses, when a site is ancient without witness records, or when the built form – its affects and effects – are the focus of interest.

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Notes

- 1 This is a description of the fort on its official website (originally in Dutch: 'Een authentiek fort, alsof er zo een soldaat om de hoek kan komen'). De Hollandse Waterlinies, 2021.
- 2 'Integrity applies to both natural and cultural properties, and is defined as a measure of the completeness or intactness of the attributes that convey Outstanding Universal Value', UNESCO 2019.
- 3 This defensive strategy had a long history in the Netherlands. See, for instance, de Kraker, 2015.
- 4 Much of the available information about the forts and individuals stationed there has been compiled by Rene Ros and non-governmental experts: Ros, 2024b. See also Fabriek, 2013.
- 5 Detailed historical information was related by local expert René Ros in conversation, October 2021. See also Ros, 2024b.
- 6 For a thorough introduction to collective memory in archaeology, see Van Dyke, 2019.
- 7 This stands in contrast to managed decline, where the natural deterioration of the building is supervised with minimal intervention. See Davis, 2021.
- 8 Much has been written about the intersection of heritage, ruin and military history that also forms the background to these observations. See for instance: Moshenska, 2015; Edensor, 2016.
- 9 Account by Theor Thijssen, soldier stationed at Fort bij Uithoorn in 1914–15, in a letter to his publisher C. A. J. van Dishoeck. See Dullaart, 2012.
- 10 Heritage work at military sites within a frame of accountability deserves a more thorough review than can be presented here. For just a few points of reference, see De Nardi, 2015; Weizman, 2017; Axelsson et al., 2018.
- 11 For deeper research on mapping practices, one might begin with Norberg-Schulz, 1979; Diaconu, 2011; Burchell, 2018.
- 12 For further reading on the matter, see Fleming, 2006; Barrett and Ko, 2009; Ljunge, 2013.
- 13 The benefits of similar approaches are highlighted in Hamilton and Whitehouse, 2020; Skeates and Day, 2019; Fahlander and Kjellström, 2010.
- 14 See, as examples, Martin et al., 2022; Svensson et al., 2021.
- 15 See, as examples, Masberg and Silverman, 1996; Sather-Wagstaff, 2017; Tolia-Kelly et al., 2017; Wetherell et al., 2018; Micieli-Voutsinas and Person, 2021.
- 16 Among others, see Howes, 2014; Madsen, 2017.
- 17 There is an abundance of literature on these and similar concepts. For a few texts considering multiple interpretations of these terms, see Jokilehto, 2006; Kono, 2014.
- 18 The investigation took place with the approval of the Faculty of Humanities' ethics committee of the University of Amsterdam. It was conducted with participants of the public workshop on sensory research in archaeology and heritage, held in the Fall of 2021, through the University of Amsterdam (see the Preface to this volume). Individuals signed up of their own volition. Students were given educational credit through their universities, but, other than a catered lunch, no compensation was offered. Every participant signed a participation agreement and release form as a study participant. The fort caretaker was offered a modest donation to compensate for her time and for making the facilities available.
- 19 Participants in the pilot study all identified as female.
- 20 In connection to the application of sensory walking, see for example, Madsen, 2017; Perkins and McLean, 2020.
- 21 Consider for instance the inherent – one could say affective – difference between a building that is registered as a background condition, versus one that receives careful, conscious attention. See Ballantyne, 2011.
- 22 The literature on this topic is extensive and evolving. For a sample, see Semal et al., 2008; Park and Hong, 2018; Gabrys, 2019; Bruce, 2023.
- 23 This stands in contrast to work that relied on the use of images and video documentation. See, again, Sumartojo, 2019.
- 24 Following soundscape study standards mentioned earlier, the authors determined that a 1–5 scale allows the clear identification of two opposite values (1 and 5) and a neutral one (3) compared to a 1–7 or 1–10 scale. In terms of visual perception of the form itself, a 1–5 scale made it less overwhelming for the user.

- 25 A full transcript of the group conversation is available from the authors, on request. Responses have been anonymized for publication. All excerpts quoted are from the same group discussion, recorded 9 October 2021. Times shown, in minutes and seconds, mark when a quote occurs, relative to the beginning of the recording (00:00).
- 26 Group dialogue, 9 October 2021 (17:04).

References

- Ashurst, J. (2007) *Conservation of Ruins*. London: Routledge.
- Axelsson, T., Gustafsson, A., Karlsson, H. and Persson, M. (2018) 'Command Centre Bjorn: The conflict heritage of a Swedish Cold War military installation', *Journal of Conflict Archaeology*, 13(1): 59–76.
- Ballantyne, A. (2011) 'Architecture, life, and habit', *Journal of Aesthetics and Art Criticism*, 69(1): 43–9. Accessed 23 May 2024. <https://www.jstor.org/stable/42635835>.
- Barrett, J. C. and Ko, I. (2009) 'A phenomenology of landscape', *Journal of Social Archaeology*, 9(3): 275–94. Accessed 13 January 2025. <https://doi.org/10.1177/1469605309338422>.
- Bruce, N. S. (2023) 'Extending soundwalking practice: Soundsitting as an inclusive and complementary method to soundwalking', *Acoustics*, 5(3): 788–97. Accessed 13 January 2025. <https://doi.org/10.3390/acoustics5030046>.
- Bull, M., Gilroy, P., Howes, D. and Kahn, D. (2006) 'Introducing sensory studies', *The Senses and Society*, 1(1): 5–7. Accessed 13 January 2025. <https://doi.org/10.2752/174589206778055655>.
- Burchell, M. (2018) *Decoding a Royal Marine Commando: The militarized body as artefact*. Abingdon: Routledge. <https://doi.org/10.4324/9781315607061>.
- Davis, S. (2021) 'War, ruins and wildness at Orford Ness'. In G. S. Jaramillo and J. Tomann (eds), *Transcending the Nostalgic: Landscapes of postindustrial Europe beyond representation*. New York: Berghahn Books, 21–42. <https://doi.org/10.3167/9781800732216>.
- De Kraker, A. M. J. (2015) 'Flooding in river mouths: Human caused or natural events? Five centuries of flooding events in the SW Netherlands, 1500–2000', *Hydrology and Earth System Sciences*, 19(6): 2673–84. <https://doi.org/10.5194/hess-19-2673-2015>.
- De Nardi, S. (2015) 'The enemy as confounding other: Interpersonal perception and displacement in Italian memories of the resistance and German occupation of 1943–1945', *History and Anthropology*, 26(2): 234–54.
- Denman, D. S. (2020) 'On fortification: Military architecture, geometric power, and defensive design', *Security Dialogue*, 51(2–3): 231–47. <https://doi.org/10.1177/0967010619889470>.
- DeSilvey, C. (2017) *Curated Decay: Heritage beyond saving*. Minneapolis: University of Minnesota Press.
- DeSilvey, C. and Edensor, T. (2013) 'Reckoning with ruins', *Progress in Human Geography*, 37(4): 465–85. <https://doi.org/10.1177/0309132512462271>.
- Diaconu, M. (2011) 'City walks and tactile experience', *Contemporary Aesthetics (Journal Archive)*, 9(1): 14.
- Dullaart, J. (2012) 'Fort bij Uithoorn: Oneindig Noord-Holland'. Accessed 24 April 2024. <https://onh.nl/verhaal/fort-bij-uithoorn-verveeld-soldatenleven-beschreven-door-theo-thijssen>.
- Edensor, T. (2016) 'Walking through ruins'. In T. Ingold and J. L. Vergunst (eds), *Ways of Walking: Ethnography and practice on foot*. London: Routledge, 153–68.
- Erlmann, V. (2004) 'But what of the ethnographic ear? Anthropology, sound, and the senses'. In V. Erlmann (ed.), *Hearing Cultures: Essays on sound, listening, and modernity*. Oxford: Berg, 1–20.
- Fabrick, J. (2013) *De Stelling van Amsterdam*. Utrecht: Uitgeverij Matrijs.
- Fahlander, F. and Kjellström, A. (2010) 'Beyond sight: Archaeologies of sensory perception'. In F. Fahlander and A. Kjellström (eds), *Making Senses of Things: Archaeologies of sensory perception*. Stockholm: TMG Sthlm AB, 1–13.
- Fleming, A. (2006) 'Post-processual landscape archaeology: A critique', *Cambridge Archaeological Journal*, 16(3): 267–80. <https://doi.org/10.1017/S0959774306000163>.
- Gabrys, J. (2019) 'Sensors and sensing practices: Reworking experience across entities, environments, and technologies', *Science, Technology, & Human Values*, 44(5): 723–36. Accessed 1 May 2024. <https://www.jstor.org/stable/26752995>.

- Guest, G., MacQueen, K. M. and Namey, E. E. (2012) *Applied Thematic Analysis*. Thousand Oaks, CA: Sage. <https://doi.org/10.4135/9781483384436>.
- Hamilakis, Y. (2013) *Archaeology and the Senses: Human experience, memory, and affect*. Cambridge: Cambridge University Press.
- Hamilton, S. and Whitehouse, R. (2020) *Neolithic Spaces*, volume 1. London: Accordia Research Institute.
- Henshaw, V. (2013) *Urban Smellscapes: Understanding and designing city smell environments*. London: Routledge.
- Hollandse Waterlinies (2021) 'Fort bij Uithoorn'. Accessed 24 April 2024. <https://www.hollandsewaterlinies.nl/nl/locaties/2483454842/fort-bij-uthoorn>.
- Howes, D. (2014) 'Introduction to sensory museology', *The Senses and Society*, 9(3): 259–67. <https://doi.org/10.2752/174589314X14023847039917>.
- Ingold, T. (2005) 'Comments on Christopher Tilley: The materiality of stone: Explorations in landscape phenomenology', *Norwegian Archaeological Review*, 38(2): 122–6.
- ISO (International Organization for Standardization) (2018) *ISO 12913-2:2018 – Acoustics – Soundscape Part 2: Data collection and reporting requirements*. <https://www.iso.org/obp/ui/#iso:std:iso:ts:12913-2:ed-1:v1:en>.
- ISO (International Organization for Standardization) (2019) *ISO 12913-3:2019 – Acoustics – Soundscape Part 3: Data analysis*. <https://www.iso.org/obp/ui/#iso:std:iso:ts:12913-3:ed-1:v1:en>.
- Jokilehto, J. (2006) 'Considerations on authenticity and integrity in World Heritage context', *City & Time*, 2(1): 1–16. https://blogs.ed.ac.uk/ear-journal/wp-content/uploads/sites/3710/2011/11/EAR_30_1.pdf.
- Kono, T. (2014) 'Authenticity: Principles and notions', *Change Over Time*, 4(2): 436–60. <https://doi.org/10.1353/cot.2014.0014>.
- Leonard, M. (2019) 'A sensorial No Man's Land: Corporeality and the Western Front during the First World War', *The Senses and Society*, 14(3): 257–70. <https://doi.org/10.1080/17458927.2019.1663661>.
- Leonard, M. and Breithoff, E. (2019) 'Warfare and the senses: Archaeologies of the senses and sensorial archaeologies of recent conflict'. In R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge, 281–92.
- Ljunge, M. (2013) 'Beyond "the phenomenological walk": Perspectives on the experience of images', *Norwegian Archaeological Review*, 46(2): 139–58. <https://doi.org/10.1080/00293652.2013.821160>.
- Madsen, T. A. (2017) 'Walking and sensing at Faaborg Museum: Atmosphere and walk-along interviews at the museum', *Nordisk Museologi*, 2: 124–41. <https://doi.org/10.5617/nm.6351>.
- Martin, J., Serrano, J., Nowakowski, J., Williamson, D. and Ingold, T. (2022) 'Heritage trails: Pathways to sustainable development goals'. In D. Svensson, K. Saltzman and S. Sörlin (eds), *Pathways: Exploring the routes of a movement heritage*. Winwick, Cambs.: White Horse Press, 240–63. Accessed 15 May 2024. <https://www.jstor.org/stable/j.ctv2p5zn1t.19>.
- Masberg, B. A. and Silverman, L. H. (1996) 'Visitor experiences at heritage sites: A phenomenological approach', *Journal of Travel Research*, 34(4): 20–5. <https://doi.org/10.1177/004728759603400403>.
- Micieli-Voutsinas, J. and Person, A. (2021) *Affective Architectures: More-than-representational geographies of heritage*. London: Routledge.
- Moshenska, G. (2015) 'Curated ruins and the endurance of conflict heritage', *Conservation and Management of Archaeological Sites*, 17(1): 77–90. <https://doi.org/10.1179/1350503315Z.00000000095>.
- Norberg-Schulz, C. (1979) *Genius Loci: Towards a phenomenology of architecture*. New York: Rizzoli.
- Park, I. and Hong, Y. (2018) 'Culture and sensory response to visual stimuli', *International Journal of Psychology*, 53(1): 77–81. <https://doi.org/10.1002/ijop.12272>.
- Pellini, J. R., Salerno, M. A. and Zarankin, A. (eds) (2015) *Coming to Senses: Topics in sensory archaeology*. Cambridge: Cambridge Scholars Publishing.
- Pellitero, A. M. (2011) 'The phenomenological experience of the visual landscape', *Research in Urbanism Series*, 2: 57–71.
- Perkins, C. and McLean, K. (2020) 'Smell walking and mapping'. In S. M. Hall and H. Holmes (eds), *Mundane Methods: Innovative ways to research the everyday*. Manchester: Manchester University Press, 156–73.

- Pétursdóttir, Þ. (2013) 'Concrete matters: Ruins of modernity and the things called heritage', *Journal of Social Archaeology*, 13(1): 31–53.
- Ros, R. G. A. (2024a) 'De Stelling van Amsterdam – Extra' [The defence line of Amsterdam – Extra]. Kenniscentrum Waterlinies. Accessed 13 March 2024. <https://www.stelling-amsterdam.nl/stelling/extra/fortmodel/index.php#BOMVRJJB>.
- Ros, R. G. A. (2024b) 'Sector Oudekerk' [Old Church sector], Kenniscentrum Waterlinies. Accessed 23 April 2024. <https://www.stelling-amsterdam.nl/forten/withoorn/>.
- Samuels, D. W., Meintjes, L., Ochoa, A. M. and Porcello, T. (2010) 'Soundscapes: Toward a sounded anthropology', *Annual Review of Anthropology*, 39(1): 329–45. <https://doi.org/10.1146/annurev-anthro-022510-132230>.
- Sather-Wagstaff, J. (2017) 'Making polysense of the world: Affect, memory, heritage'. In D. P. Tolia-Kelly, E. Waterton and S. Watson (eds), *Heritage, Affect and Emotion: Politics, practices and infrastructures*. London: Routledge, 1–29.
- Schafer, R. M. (1977) *The Tuning of the World: Toward a theory of soundscape design*. Philadelphia: University of Pennsylvania Press.
- Schafer, R. M. (1994) *The Soundscape: Our sonic environment and the tuning of the world* (2nd edition). Rochester, VT: Destiny Books.
- Schafer, R. M. (ed.) (2009) *Five Village Soundscapes* (2nd edition). Vancouver: A.R.C. Publications.
- Semal, C., Demany, L. and Semal, C. (2008) 'The role of memory in auditory perception'. In W. A. Yost, A. N. Popper and R. R. Fay (eds), *Auditory Perception of Sound Sources*. London: Springer Nature, 77–113. <https://doi.org/10.1007/978-0-387-71305-2>.
- Skeates, R. and Day, J. (2019) *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge. <https://doi.org/10.4324/9781315560175>.
- Smith, L. (2012) 'Discourses of heritage: Implications for archaeological community practice', *Nuevo Mundo Mundos Nuevos*. <https://doi.org/10.4000/nuevomundo.64148>.
- Southworth, M. (1969) 'The sonic environment of cities', *Environment and Behavior*, 1(1): 49–70.
- Sumartojo, S. (2019) 'Sensory impact: Memory, affect and sensory ethnography at official memory sites'. In D. Drozdowski and C. Birdsall (eds), *Doing Memory Research: New methods and approaches*. London: Palgrave Macmillan, 21–37.
- Svensson, D., Sörlin, S. and Saltzman, K. (2021) 'Pathways to the trail: Landscape, walking and heritage in a Scandinavian border region', *Norwegian Journal of Geography*, 75(5): 243–55. <https://doi.org/10.1080/00291951.2021.1998216>.
- Thomas, J. (1993) 'The politics of vision and archaeologies of landscape'. In B. Bender (ed.), *Landscape: Politics and perspectives*. Oxford: Oxford University Press, 19–48.
- Tilley, C. (1994) *A Phenomenology of Landscape: Places, paths and monuments*. Oxford: Berg.
- Tilley, C. (2004) *The Materiality of Stone: Explorations in landscape phenomenology*. Oxford: Berg.
- Tolia-Kelly, D. P., Waterton, E. and Watson, S. (eds) (2017) *Heritage, Affect and Emotion: Politics, practices and infrastructures*. London: Routledge.
- UNESCO World Heritage Centre (2019) 'OG operational guidelines for the implementation of the World Heritage Convention' (WHC.19/01), paragraph 88. Accessed 13 March 2024. <https://whc.unesco.org/en/compendium/111>.
- UNESCO World Heritage Centre (2021) 'Dutch Water Defence Lines', World Heritage List. Accessed 13 March 2024. <https://whc.unesco.org/en/list/759/>.
- Van Dyke, R. M. (2019) 'Archaeology and Social Memory', *Annual Review of Anthropology*, 48(1): 207–25. <https://doi.org/10.1146/annurev-anthro-102218-011051>.
- Virilio, P. (1994) *Bunker Archaeology*. Princeton: Princeton University Press.
- Weizman, E. (2017) *Forensic Architecture: Violence at the threshold of detectability*. Brooklyn, NY: Zone Books.
- Wetherell, M., Smith, L. and Campbell, G. (2018) 'Introduction: Affective heritage practices'. In L. Smith, M. Wetherell and G. Campbell (eds), *Emotion, Affective Practices, and the Past in the Present*. London: Routledge, 1–17.

Part III

Externalized sensing research

Sounds from the roots: Sabīl wa Kuttāb Ismaʿil al-Maghlawī's acoustics reconstruction and digital simulation, Historic Cairo, Egypt

Aliaa El-Dardiry, Ahmed Ali Elkhateeb and
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In 1657, Ismāʿīl al-Maghlawī founded his Sabīl wa-Kuttāb between al-Mashhad al-Ḥusaynī and al-Azhar mosque in Cairo, Egypt. The *sabīl* was a charity building for dispensing water to people. It was attached to a school for teaching children the Quran (*kuttāb*), shops (*ḥawānīt*), a tomb and a portico (*riwāq*). It also included an underground cistern (*ṣihrīj*) for storing fresh water, covered by four shallow domes. Providing water to people had its own behind-the-scenes stories, starting with the building of the *sabīl* and its connectivity with the cistern, then the process of bringing water from the Nile, by *saqqayīn* (water carriers), and the classification of water according to its source and use, all for the purpose of filling the cistern with water and dispensing it to people. *Saqqayīn* were responsible for bringing water from water sources to people, public buildings such as mosques and water dispensaries, or houses. To become a water carrier, a person had to be honest, well-behaved and clean (Raymond, 1979).

In 1930, the Ministry of Public Works proposed relocating Sabīl al-Maghlawī, in order to widen al-Azhar Street. Between 1935 and 1939, the Comité de Conservation des Monuments de l'Art Arabe relocated Sabīl al-Maghlawī to its current location in Ḥārit al-Badrī. However, relocating the building was laborious. The Comité's team disassembled the superstructure and abandoned the underground cistern (Warner, 2005). Today, the relocated and reassembled Sabīl al-Maghlawī is reduced to a simple rectangular building with two windows. Unlike other Cairene *sabīls*, this one's function, spatial configuration and main

features were significantly altered to the extent that an ‘authentic’ experience of its original architecture is no longer possible.

An interactive three-dimensional (3D) reconstruction of Sabīl al-Maghlawī, using gaming technology, can offer an alternative way to experience the building’s lost aura. Moreover, the medium can move beyond the typical heritage ocularcentrism to simulate the rich soundscape of Sabīl al-Maghlawī. Thus, this chapter explores using auralization (soundscape simulation) to provide a multisensorial approach integral to understanding past social practices in Sabīl al-Maghlawī, like the sound of water falling on marble surfaces and filling the cistern, the calls of the water carriers, and the sounds of their animals. The aim is to develop a richer multisensorial understanding of the tangible and intangible heritage of the relocated historic building.¹

For the tangible heritage, the reconstruction enables the user to understand the building’s previous context, the building itself, its exterior elevations and interior spaces, using a 3D model. For the intangible heritage, the chapter focuses on the building’s soundscape and acoustics, which is necessary to understand its function and how people inhabited it.

Using Sabīl al-Maghlawī’s reconstruction, this chapter offers an escape from the ocularcentrism that dominates historical reconstructions and a move towards an appreciation of non-Western understanding of the past. The actual *sabīl* and its context in Historic Cairo exemplify synaesthetic perception, where sight is only one of many senses that constitute the ways in which Cairenes perceive their city. The sounds of people and their animals, the ruckus of the street markets, and the Islamic Adhan (call to prayer) are integral to the city’s ‘image’, not to mention the smell of hookahs and incense.

The chapter builds on primary and secondary sources, such as the accounts of contemporaneous urban historians and travellers, endowment documents, the Comité bulletins, and recent literature on Cairene water systems and architecture. It starts with a brief background section on acoustics in virtual heritage reconstructions. Two sections follow, depicting Sabīl al-Maghlawī’s history and architecture, respectively. Then, in the two subsequent sections, we introduce our work on the soundscape and the 3D reconstruction of Sabīl al-Maghlawī. We end the chapter with a critical reflection on the implicit assumptions in our reconstruction and their potential implications in interpreting heritage.

Acoustics and heritage

Everything has a sound. While incorporeal and shapeless, sound makes everything present (Schafer, 1986). It is sound that ‘colours’ a space (Bachelard, 1994). From a heritage perspective, sound provides a holistic understanding of a building. ‘Active’ sound gives us insights into the inhabitants’ auditory traditions and the building’s functionality. Meanwhile, ‘passive’ sound reveals the building’s unique acoustical signature.

Acknowledging that focusing on significant senses – other than vision – enhances our understanding of heritage, acoustical heritage attempts to shed light on the impact of sound on our understanding of history. Meanwhile, auralization, the modelling and simulation of sound, offers a way to understand the acoustics of lost heritage. Conversely, simulation is a simplified model of reality that depends on collecting and validating data (Gilbert and Troitzsch, 1999). It is instrumental when a heritage building no longer exists, preventing experimental or empirical studies.

An example of such work is that of Maria Cristina Manzetti, in the Roman theatre at the Acropolis of Gortyna in Crete. Using auralization, she simulated the subjective qualities of the original spectators’ sound perception. The results allowed her to evaluate two different interpretative reconstructions of the temple and seek the one that made more sense acoustically (Manzetti, 2023). Similarly, Rupert Till studied acoustics in three UNESCO World Heritage Sites. He concluded that sound was critical in creating each space’s individualized ritual character (Till, 2019). Furthermore, Rafael Suárez et al. shed light on the archaeo-acoustics of Cordoba’s Aljama Mosque, Spain, which faced changes in its spatial configuration over time. They simulated the acoustics of different periods’ models, generating auralized audio (simulating audio sources). From analysing and evaluating the simulation, they deduced the impact of the mosque’s expansion on its acoustics, especially during the Islamic Adhan (call to prayer) (Suárez et al., 2018). Similarly, Jaume Segura-Garcia et al. (2019) produced an auralization of an extinct theatre in Valencia, Spain.

Correspondingly, in this chapter, we attempt to produce an auralization of the water in Sabīl al-Maghlawī. We are trying to tell the story of water, which is implicated with the story of the building itself and its inhabitants. The following sections provide a historical account of the building, its owner and employees.

The Sabīl of Ismāʿīl al-Maghlawī

The influence of water on Cairene architecture manifested itself historically in several architectural typologies, including the aqueduct, the Nilometer, and the *sabīl* (El Shakhs and Ezzat, 2018). There was a relationship between the Nile flooding cycle and the Egyptians' taste for its water. During the flood in August, the rushing water was full of silt that turned the river red, making its water undrinkable. The water became pure and drinkable when the Nile's flow slowed, especially in January and February. Starting in June, the Nile's level receded and its water became still, negatively impacting its quality. Hence, Egyptians boiled the water and added medicinal substances, like peach kernel and apricot, for purification (Ismail, 2017).

Consequently, drinkable water was transported from the Nile once a year. It was called *mā' ṭahir* or *mā' 'adhb* (pure water). Certified water carriers transported it to cisterns constructed below mosques, homes and water dispensaries. This water was good for both drinking and cooking. Egyptians did not develop a taste for water collected from rain or wells (Ismail, 2017). It was called *mā' ṭahūr* (purifying water), which must be colourless, odourless and tasteless, to be used for cleaning, washing, ablution and animal drinking basins. The availability and low cost of 'purifying' water and the scarcity and high cost of 'pure' water had formative effects on water network distribution and prompted the government and the wealthy to provide charitable water (Ali, 2006). The *sabīl*, the focus of this chapter, was a facility that fulfilled this role. It was a charity building complex that provided drinking water to people, among other functions. It flourished during the Mamluk (1250–1517) and then the Ottoman (1517–1867) periods, amounting to over 300 *sabīls* in Cairo alone (Raymond, 1979).

For the wealthy, constructing a *sabīl*, usually coupled with a Quran school for young children, was a conspicuous act of piousness and philanthropy. To that end, benefactors would buy or rent land to construct the *sabīl*, then establish an endowment to provide a sustainable fund for the facility's rent and overhead costs. Ismāʿīl Ibn al-Ḥaj Aḥmad, better known as Ismāʿīl al-Maghlawī, was no exception. He was a chief janissary officer from the Mustahfazan sect that constituted Cairo Citadel's garrison. In 1657 he rented land, in front of al-Mashhad al-Ḥussaynī shrine in Khān al-Khalīlī Street in Cairo, to build his *sabīl* and he made a generous endowment to cover its running expenses. He appointed his son to be the endowment custodian (*naẓir al-waqf*) after his death. The endowment's income paid for al-Shihabī Aḥmad, al-Maghlawī's emancipated slave, as

the facility manager and ʿĪsā al-Danusharī as the accountant (Elghezawi, 1996), among others.

The Ottoman-styled building included a cistern underground, a water dispensary room, a tomb for the *sabīl*'s patron, and several shops on the ground floor, in addition to a portico, restrooms and a Quranic school on the first floor (Elghezawi, 1996). According to Sabīl al-Maghlawī's endowment document, filling the cistern with water occurred once a year following the Nile's flooding. The water volume in the cistern was sufficient to supply water to people for around three to four hours in the afternoon every day (Elghezawi, 1996).

History was not kind to Sabīl al-Maghlawī. After securing a ninety-nine-year lease, in 1865, the Cairo Water Company, owned by the French engineer Jean-Antoine Cordier, partnered with the Ministry of Public Works to supply water to Cairo's residents. The company constructed water reservoirs to store and filter water. From there, it distributed water in cast-iron pipes extended under the city and sold it, from metered standpipes, to the public and water carriers. Having once been available free of charge, water became a commodity sold at a price higher than that in France (Ismail, 2017). Later, however, due to the cholera epidemic, the Egyptian local government and the British colonial regime negotiated an agreement to lower filtered water prices and to supply water freely from some of the company's metered standpipes. Still, by 1890, the company supplied only sixty *sabīls*, ten mosques and 2,600 houses with drinkable water (Ismail, 2017). By 1905, Sabīl al-Maghlawī was turned into a coffee shop and an inn (Herz et al., 1906).

Finally, in 1935, the building was relocated to the Ḥārīt al-Badrī neighbourhood (Figure 10.1) to make room for a tramway. The relocation was limited to the superstructure, partially damaging it. There is no documentation of the building reassembly process and the extent of damage inflicted on its superstructure during relocation. The cistern and its attached *shādhawān* (marble inclined panel on which water flows) and basins were left in place to be demolished (Warner, 2005). The current reassembled building (Figure 10.2) is missing the annexe room and one of its two attached shops. Its relatively complex floor plan, designed to align the building's exterior with Cairo's irregular streets while orienting some of its interior spaces towards the qiblah (direction of Mecca), was simplified to a regular square-shaped building with a consistent wall thickness and no internal reorientation. The relocated *sabīl* henceforth functioned as a primary school (Elghezawi, 1996) until its conservation and closing in 2000.



Figure 10.1 The relocated Sabīl al-Maghlawī, Cairo. *Source:* authors.

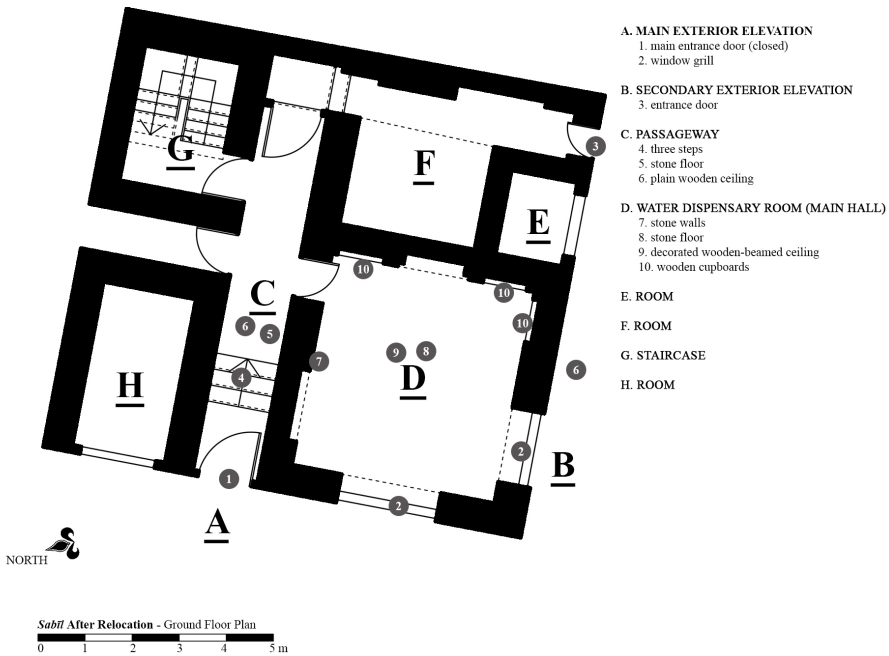


Figure 10.2 The ground floor plan of Sabīl al-Maghlawī after its relocation. *Source:* authors.

The *sabīl*'s architecture

The reconstruction of Sabīl al-Maghlawī's architecture, social aspects and functions depended on various sources. We visited the relocated *sabīl* for architectural documentation and analysis. We consulted the Ministry of Antiquities and the Ministry of Endowments archives. We also used many secondary sources. For the missing information, we relied heavily on Mahmoud El-Hosseiny's taxonomy of the Ottoman *sabīl* (El-Hosseiny, 1988). In this chapter, we focus exclusively on the *sabīl* side of the building, involving the water dispensary room, the annexe room (shown in Figure 10.3) and the underground cistern. Future work can address other parts of the building, such as the tomb, the shops and the Quran school.

Due to its location on a street corner, the original Sabīl al-Maghlawī had two elevations, all in ashlar-red stone. The public interacted with the building through the water dispensary room's two windows, one on each elevation. The north-western elevation was the main one, having the only entrance to the building. At this elevation, people had to climb three

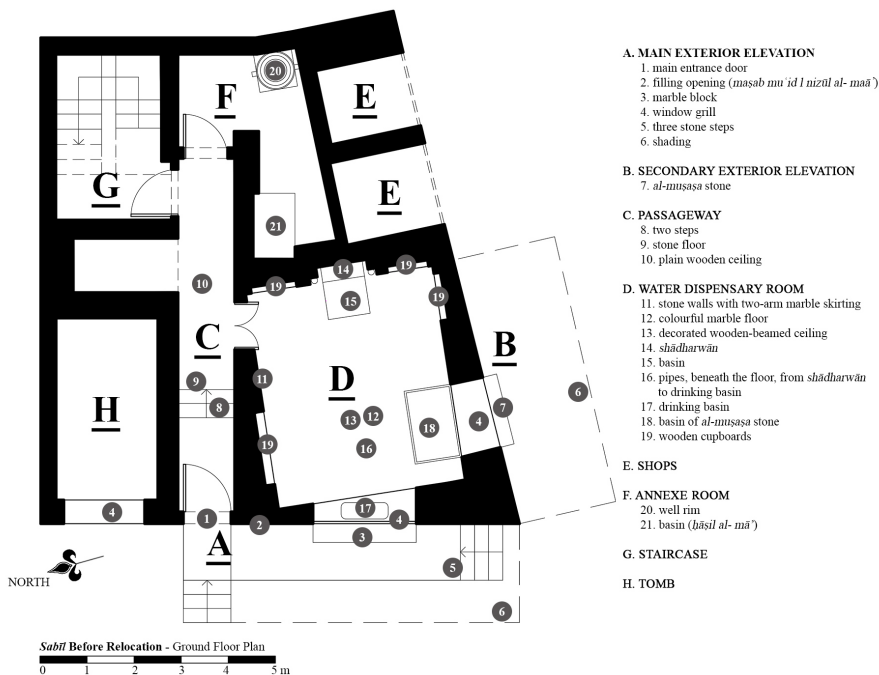


Figure 10.3 The ground floor plan of Sabīl al-Maghlawī before its relocation.
Source: authors.

steps to reach for a water cup and drink water on a red marble platform beneath the dispensary window grill. The secondary, south-western, elevation included another window grill, and, underneath it, used to exist a stone with two copper faucets (al-muṣaṣa stone) connected to another basin in the water dispensary room. This allowed people to fill a bucket with water (El-Hosseiny, 1988).

Meanwhile, Sabīl al-Maghlawī's staff interacted with the building differently. Water carriers arrived to fill the *sabīl* with water, carried on their camels, calling: 'Ya 'awaḍ Allah' – O! May God compensate me! (Lane and Thompson, 2014). They used an opening screened by a marble plate, next to the water dispensary window on the north-western elevation, to pour water from their waterskins into the underground cistern.

Other employees had access to the inside of the building through the entrance on the main elevation. The entrance led to a passageway with access to the tomb room² on the left and the water dispensary room to the right. Further down the passageway was a staircase to the first floor and the annexe room.

Sabīl al-Maghlawī's annexe room connected the underground with the superstructure. It included a marble well, from which *al-mizammilātī*, the person operating water in the *sabīl*, brought water from the cistern, using a bucket. He then poured the water into a basin, which moved through hidden lead pipes to the basin in the water dispensary room connected to the faucets of al-muṣaṣa stone in the exterior elevation, from which people could fill their cups with water. From the same well, *al-mizammilātī* and his janitors descended into the cistern once a year, to clean it and burn incense, before refilling it.

From the inside, the water dispensary room had a colourful marble floor, stone walls with marble skirting, wooden cabinetry, calligraphic friezes and a decorated ceiling. One of its walls had a blind niche with openings above an inclined marble plane, called *shādhawān*, on which the poured water moved towards a basin. Water moved from this basin to the main elevation's marble basin through hidden lead pipes beneath the marble floor.

The underground cistern, as described, now no longer exists. The endowment document is frustratingly brief regarding its description, revealing only that it was a square-shaped space covered with four shallow domes.

Soundscape

We argue that the soundscape dominated the sensory experience of Sabīl al-Maghlawī. The sound of the bucket hitting the water surface in the underground cistern, or the water being poured on textured marble surfaces, created an audio resonance unique to *sabīls*. The following section shows the process by which we tried to reconstruct such a soundscape. Building on Michael Fowler’s active and passive aural embellishment (Fowler, 2015) and Gwen Guo’s audio classification (Guo, 2020), we introduce a bipartite taxonomy for the simulation’s audio sources (Table 10.1). The first part is the active and passive aural embellishment. In the actual *sabīl*, the active audio sources are the water flow path and ambient soundscape, including the Adhan (call to prayer), the nearby marketplace, water carriers’ calls and sounds of animals and tools. In the reconstructed *sabīl*, we also added narrators and characters’ voices. Meanwhile, the passive audio sources are elements of the building that impact the sounds, like building materials and the cistern’s shallow domes.

The second part depends on audio sources: sample libraries, field recordings and voice casting (Guo, 2020). Due to the relocation of Sabīl al-Maghlawī and the loss of its cistern, water no longer runs in the building. Instead, we used online open-source audio files to recreate the sounds of water flow, animals and interactive objects. For water carriers’ calls and characters’ narration, we recorded narration scripts in a semi-anechoic room with the help of volunteers. Otherwise, we used field recordings for ambient sounds and an acoustics survey for the passive audio embellishment.

Table 10.1 The taxonomy of audio sources.

Audio embellishment		Source
Active	Characters	Voice casting
	Ambient sounds	Field recording
	Interactive objects	Sample libraries
	Water flow	Sample libraries
Passive	Architectural elements and features	Acoustics survey

Source: Michael Fowler’s active and passive aural embellishment (Fowler, 2015) and Gwen Guo’s audio classification (Guo, 2020)

Acoustic survey

An acoustic survey goes beyond understanding the acoustic space from its impulse response; it helps document and preserve the significance

of existing cultural heritage and reconstruct destroyed ones (Murphy et al., 2017). The room impulse response (RIR) is the room's acoustic signature, including all its parameters (Đorđević et al., 2020). Due to the changes Sabīl al-Maghlawī has undergone, the acoustic survey took place in two sites. For the superstructure, we collected and documented the RIR of the water dispensary room (currently called 'the main hall') of the current (relocated) *sabīl*. Meanwhile, because Sabīl al-Maghlawī's original cistern no longer exists, we searched for a similar surviving cistern, in which to measure RIR. Today, most cisterns of other *sabīls* of the same era are either destroyed or badly damaged. Therefore, we documented the impulse response of the relatively well-preserved cistern beneath Mosque wa-Sabīl wa-Kuttāb Sulaymān Aghā al-Siliḥdār, constructed in 1839. This *sabīl*'s cistern was built over a century after the one under study at Sabīl al-Maghlawī.

We collected RIRs using the integrated impulse response method, following the ISO 3382-1 standards (for an unoccupied room). We popped large balloons in space as a stimulus and used a digital sound recorder (TASCAM DR-100MKIII) and an omni microphone (Earthworks M30BX) to record responding audio signals (Elkhateeb and Eldakdoky, 2021). Due to the relocated water dispensary room's small area, we positioned two sound sources (balloons) at two of its corners and three sound receivers (recorder and microphone), one in the middle and two at the opposite two corners. Similarly, in al-Siliḥdār's cistern, we placed two sound sources and six receivers. This distribution considered the rooms' areas and a minimum distance of one metre from walls to reduce sound reflection and ensure its clarity.

Audio auralization

After the acoustic survey and RIR collection, we started virtually modelling and simulating the acoustic phenomenon (auralization) using Rhinoceros 3D (version 7) and Odeon Room Acoustics Software (version 13). We used the Genetic Materials Optimiser from within Odeon to automatically match the material's absorption coefficients of the generated model with those collected from the acoustics survey.

The simulation of Sabīl al-Maghlawī's water dispensary room, before its relocation, depends on the measured RIRs of the current relocated room. We validated the 'before' 3D model using the measured RIRs of the 'after', performed in Odeon, concluding that the differences between the 'before' and 'after' had a negligible impact on the simulation. Afterwards, we generated the auralized clips by convoluting the audio

sources to the new simulated RIRs, as calculated in the validated ‘before’ water dispensary room.

For the reconstruction of Sabīl al-Maghlawī’s cistern, first, we validated the model of al-Siliḥdār’s cistern using its measured RIR. Second, we utilized the absorption coefficients of the finishing materials from the validated al-Siliḥdār’s cistern in the reconstructed model of al-Maghlawī’s cistern. Then, we applied additional simulations in the reconstructed model. The aim was to investigate the effect of different water levels on the auralized clips, to enable hearing the pouring water in Sabīl al-Maghlawī’s cistern at different depths. The assumed water levels are (1) the cistern is empty of water, with a stone floor, (2) a very thin layer of water covers the stone floor, (3) the water level increases to one and a half metres, (4) water level is three metres, and (5) water level is four metres. Table 10.2 shows the impact of the water level increase, and hence the decrease in the cistern’s air space, on the reverberation time and consequently on the auralized clips. For instance, at frequency band 125 Hz the reverberation time with a very thin layer of water on the stone floor of the cistern is 7.12 seconds, while when the water level reaches four metres, the reverberation time is 3.56 seconds. The differences become insignificant at a higher frequency band (8000 Hz). T_{20} is the reverberation time taken for decaying sound pressure level to reach 20 decibels.

Finally, for the reconstruction of Sabīl al-Maghlawī’s annexe room, we developed its 3D model and imported it into Odeon with the validated finishing materials from those of the reconstructed water dispensary room. We aimed to investigate the relationship between this room and the cistern, through the well’s opening. Accordingly, we generated the auralized clips for two simulated water levels, at zero and four metres, by introducing a sound source in the cistern and assuming

Table 10.2 Reverberation time (in seconds) at different frequency levels, depending on the cistern’s water level at T_{20} .

Frequency band (Hz)	63	125	250	500	1000	2000	4000	8000
(1) T_{20} , stone floor (dry surface) = 0.0 m	5.51	6.67	4.93	3.12	2.76	2.33	1.79	1.43
(2) T_{20} , stone floor (wet surface) = 0.0 m	6.16	7.12	5.57	3.62	3.15	2.58	1.95	1.4
(3) T_{20} , water height = 1.5 m	5.47	6.05	5.05	3.36	2.86	2.35	1.85	1.38
(4) T_{20} , water height = 3.00 m	4.47	4.66	4.24	2.94	2.42	2	1.68	1.35
(5) T_{20} , water height = 4.00 m	3.57	3.56	3.48	2.5	2	1.66	1.49	1.31

Source: authors.

the listener to be in the annexed room. The differences between the two obtained auralized clips were recognizable.

In the Unity game engine (version 2020.3.42f1), we assigned the audio sources to the characters, interactive objects and water, by adding an Audio Source component, to each. This component changed the spatial blend to 3D, allowing users to hear the sound according to their orientation and distance from the object. Furthermore, we used the Steam Audio plugin for active audio embellishment to modify sound occlusion and directivity. We used the Steam Audio Geometry plugin for passive audio embellishment, to assign ambient audio sources as ambisonics. Last, we added a Steam Audio Listener to the first-person shooter's main camera, enabling players to hear the auralized audio source

The reconstruction

We digitally reconstructed the built environment by integrating the architectural 3D model and acoustics reconstruction of Sabīl al-Maghlawī in the Unity game engine (Figure 10.4). The aim was to provide users with an auditory spatial experience of Sabīl al-Maghlawī and interaction

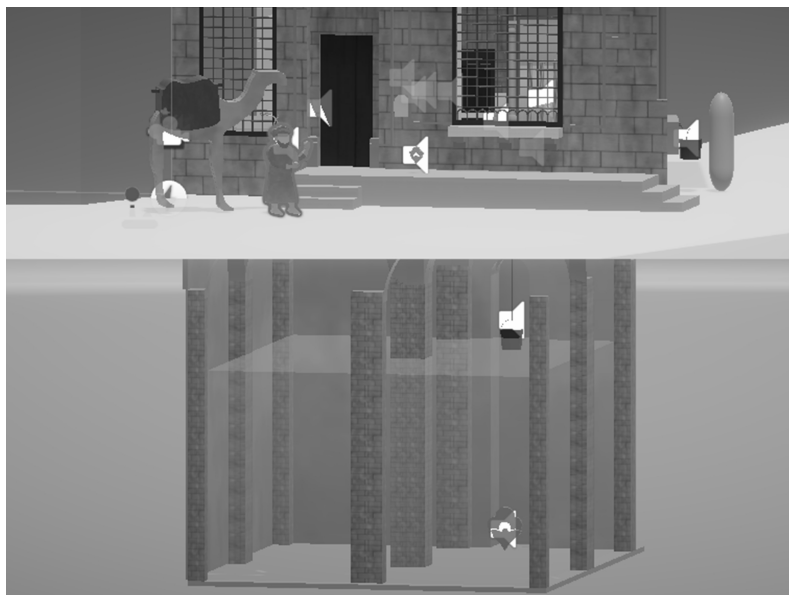


Figure 10.4 The digital reconstruction of Sabīl al-Maghlawī in the Unity game engine. *Source:* authors.

with its water. Additionally, the medium affords involvement with Sabīl al-Maghlawī's social aspects, by introducing the *sabīl*'s characters and everyday life.

The reconstruction allows users to freely navigate the virtual environment and listen to the ambient sounds. The user interface (UI) offers two interactive game objects, inspired by Sabīl al-Maghlawī's decorations. The first is the 'golden flower', which initiates a scenario when triggered. The second is the 'shiny gene', inspired by a decorative element that resembles today's typical depiction of DNA, which displays information about the attached character or object. The reconstruction offers different scenarios representing how different users of Sabīl al-Maghlawī would have experienced it. For example, the first scenario starts with the users assuming the role of *al-mizammilātī* (Figure 10.4). At the building's entrance, there is a golden flower. When users click on it, the water carrier arrives with his camel, making his distinctive call: 'Ya 'awaḍ Allah'. A shiny gene comes with the water carrier, which opens up a UI panel showing historical information on the extinct profession.

Alternatively, users – donning the character of *al-mizammilātī* – can enter Sabīl al-Maghlawī from the front door. They can hear the sizeable single-leaf door creaking under its weight as they open it. Beyond the door, they move into a passageway with two accessible doors. One is for the water dispensary room, and the other for the *sabīl*'s annexe room. The users can then access the water dispensary room, click on the golden flower and listen to *al-mizammilātī*'s story. Afterwards, the users find another golden flower. Upon clicking it, water starts to fall on the *shādhawān* and move through pipes towards the main elevation's basin. The users can hear the water and recognize its path acoustically.

After returning to the passageway, another golden flower awaits the users heading towards the annexe room's entrance. Once clicked, the users can drop the bucket into the cistern and listen to its sound, colliding with water at different depths. Once the users bring water up, they could move down toward the cistern through the well opening. They find another golden flower underground, allowing al-Shihabi Ahmad to tell his story. Then, the last golden flower appears, which starts the acoustic experience of filling the cistern with water.

Discussion

The *sabīl*, as a place, is a socially and historically situated phenomenon. The society in which the original users were born, and the specific

history that shaped them, constituted their perception in ways different to us, modern-day users. They experienced the building differently. Therefore, any reconstruction of Sabīl al-Maghlawī's experience must suffer from the fallacy of presentism, a historical representation in which present-day perspectives shape our interpretation of the past.

Moreover, as a medium, the video game can potentially increase the risk of presentism. A rich eidetic digital reconstruction of a place, especially when it involves a high degree of photorealism typically produced in a game engine, tends to elicit a rich eidetic interpretation of such a place (El Antably, 2010). When users are immersed in the reconstruction and are 'present' there, they tend to forgo the difference between their own subjectivity and their avatars. Furthermore, they become indifferent to the distinction between the original and represented *sabīl*.

Idiosyncratically, we do not try to avoid presentism; we embrace it. We agree with Jeff Malpas, that 'the very attempt at "recreation" marks off the "recreated" place from the original' (Malpas, 2008). Therefore, in our view, the meaning of Sabīl al-Maghlawī, as a place, is essentially presentist and contingent on the users' experience. It is not fixed in some permanent past.

From this standpoint, and informed by Walter Benjamin's *The Storyteller*, we deliberately added visual ambiguity to the reconstruction (Benjamin, 1969). We want the users to shift their focus from the visuals to the acoustics. We want them to become active participants and spark in them a multitude of different interpretations, based on their auditory senses. To that end, we designed the reconstruction to be experienced through a first-person shooter camera, enabling the users to navigate the virtual environment without an avatar's symbolic connotations or virtually embodied experience.

The first-person shooter camera helps users experience the *sabīl*'s architecture in ways not present in typical projective drawings. Architectural floor plans allow users to apprehend the building from above, in one glance. Except for vision, any sensory input vanishes. With a drawing, even vision is limited to an abstract view that erases spatial experience and everyday practices. A case in hand, no drawing (or text) can depict the sensation of the sound reverberating in the *sabīl*'s cistern. Therefore, we want the users to experience the building's acoustics as a spatial sequence in a 3D environment. We endeavoured to let the users appreciate the architect's play with volumes and materials to endow each space with its unique acoustic signature.

In addition, Sabīl al-Maghlawī's Ottoman architectural style inspired us to design the characters, their tools, animals and the UI,

based on Abd al-Aziz Abdu's illustrations in *Legends of the House of the Cretan Woman* (Kretli et al., 2001) and the visual convention of Ottoman miniature art (Özcan, 2005). The nature of this art type reduces the visual determinism of the story characters and their spatial settings.

Again, we explicitly argue that we are not creating an 'authentic' model of Sabīl al-Maghlawī. We took accurate acoustic measurements from the building's interior but speculated about the eighteenth-century street soundscape, which we assume to have been much richer than our current depiction. Many events could have contributed to the complexity of the acoustic environment outside Sabīl al-Maghlawī, including internal activities in the other parts of the *sabīl*'s building complex, away from the water, and external nearby gatherings. One example of interior activities is the Quran school located on the first floor of the building, where young children collectively recited Quranic verses with their Imam. A typical example of external events is the Friday prayer, when people could hear the Adhan (call to prayer) at noon, followed by the sermons and then the prayer itself, coming from the nearest mosques. Afterwards, the sounds of Friday markets would dominate the acoustic environment. We postulate that Friday shoppers would benefit from the presence of a *sabīl* and crowd at its windows for drinking water. However, the accurate depiction of Friday's soundscape depends on the location and size of mosques and markets, among many other factors that exceed the scope of this research. Therefore, we did not attempt to depict the impact of the street soundscape on Sabīl al-Maghlawī's interior.

We interpreted the endowment documents and survey data to create one possible interpretation of the *sabīl*, among many. We encourage the readers to download the game for themselves so they can listen to the sound of water in the *sabīl* and possibly have their own interpretation of the ways in which Sabīl al-Maghlawī might have impressed itself on the perception of a passer-by in the eighteenth century.

Looking beyond the *sabīl*'s architecture, our reconstruction invites users to rethink the relationship between water and society. The life and death of the *sabīl* express the history of the deep connection between the Cairene society and water. Changes in this relationship were detrimental to the *sabīl*, including the seasonality of the Nile River, the taste and multiple uses of its water, and, eventually, its colonization and commodification. The death of the *sabīl* announced the end of the whole water carriers' sector and its hygienic system, the loss of the ties between water, education and charity, and the loss of water sensation and atmosphere that accompanied the *sabīl*. Today, the *sabīl* may be extinct as a building type, yet the charitable practice survives. Cairenes still provide charitable

water to people by installing electric water-dispensing machines outside their houses and mosques.

Conclusion

In this chapter, we document an attempt to auralize the sound of water in Sabīl al-Maghlawī. We used the accounts of contemporaneous urban historians and travellers, endowment documents, the Comité de Conservation des Monuments bulletins, and different *sabīl* architecture and water infrastructure studies. We also conducted acoustic surveys in the superstructure of Sabīl al-Maghlawī. As a substitute for its extinct underground cistern, we surveyed the cistern under Mosque wa-Sabīl wa-Kuttāb Sulaymān Aghā al-Siliḥdār. Using the collected data, we developed a 3D model and an auralization of Sabīl al-Maghlawī, which we implemented in the Unity game engine.

The auralization of Sabīl al-Maghlawī represents its tangible and intangible aspects. It depicts the tangible architectural features that made the building's unique acoustic signature possible. These features include each space's volume and the building materials' acoustic properties. It also includes devices integral to the functionality of the *sabīl* and its soundscape, such as the shādhawān. These features housed and impacted the building's intangible heritage. In the case of Sabīl al-Maghlawī, chief among these aspects was the sound of the water moving through different parts of the building and the voices of the people associated with it.

We deliberately tried to use abstract visuals to escape ocularcentrism and shift the users' focus to the reconstruction's acoustics. In that vein, we argue that sound is imperative to understanding the spatial experience of Sabīl al-Maghlawī. Yet, we also acknowledge that any historical reconstruction is presentist. We do not claim an 'authentic' experience. Instead, we implore the readers to download our game explore the *sabīl*, and actively try to imagine how it felt to be inside the building in the eighteenth century.

Acknowledgements

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Notes

- 1 El-Dardiry developed the model as part of her Master's thesis, which can be accessed at <https://aliaa-el-dardiry.itch.io/soundsfromtheroots?secret=oLjE0wdFenB75zBOAuzVD17iZOQ>.
- 2 The *sabīl*'s deceased patron was buried in a small stone crypt directly under the tomb room, which contained his gravestone, as is the standard burial practice that continues in some parts of Cairo today. The tomb and its crypt were in the 'dry' side of the *sabīl* and away from the water path. On the other hand, the cistern was a much larger and deeper underground structure built with brick or stones and plastered with lime. It was connected to the 'wet' side of the building, where the *sabīl* is, by a well and an opening in the exterior elevation. The water level in the cistern was always lower than the crypt. Therefore, water contamination through the soil was not possible.

References

- Ali, M. (2006) 'al-Nāfurāt wa al-sawāqī fī manāzil wa masājīd al-Qāhirah mundh al-faṭḥ al-Islāmī ḥatā nihāyat al-'asr al-'Uthmānī'. Master's thesis, Cairo University.
- Bachelard, G. (1994 [1958]) *The Poetics of Space*, translated by Maria Jolas. Boston: Beacon Press.
- Benjamin, W. (1969) 'The storyteller'. In W. Benjamin and H. Arendt (eds), *Illuminations*. New York: Schocken Books, 83–110.
- Dorđević, Z., Dragišić, M., Manzetti, M. C. and Novković, D. (2020) 'Digitization of acoustic heritage in a service of protection, research and promotion of European cultural heritage'. In H. Kremers (ed.), *Digital Cultural Heritage*. Cham: Springer, 433–47.
- El Antably, A. (2010) 'The virtual (re)construction of history: Some epistemological questions'. Paper presented at the 'Spaces of History / Histories of Space: Emerging Approaches to the Study of the Built Environment' conference, UC Berkeley, 30 April–1 May. <https://escholarship.org/uc/item/225426rr>.
- Elghezawi, M. (1996) 'Kḥiṭaṭ al-Qāhirah shamāl sharq al-mashhad al-ḥusaynī'. Master's thesis, Cairo University.
- El-Hosseiny, M. (1988) *al-Asbilah al-'uthmānīyah bi-madīnat al-Qāhirah, 1517–1789*. Cairo: Maktabat Madbūli.
- Elkhateeb, A. and Eldakdoky, S. (2021) 'The acoustics of Mamluk masjids: A case study of Iwan-type masjids in Cairo', *Applied Acoustics*, 178: 107988. <https://doi.org/10.1016/j.apacoust.2021.107988>.
- El Shakhs, A. and Ezzat, D. (2018) 'Water in Islamic architecture: Study of the water dispensary (sabīl)', *Journal of Architecture, Arts and Humanistic Science*, 3(12): 1–16. <https://doi.org/10.12816/0047906>.
- Fowler, M. (2015) 'Sounds in space or space in sounds? Architecture as an auditory construct', *Architectural Research Quarterly*, 19(1): 61–72. <https://doi.org/10.1017/S1359135515000226>.
- Gilbert, G. N. and Troitzsch, K. G. (1999) *Simulation for the Social Scientist*. Maidenhead: Open University Press.
- Guo, G. (2020) 'Making sound decisions in game audio'. In R. Dillon (ed.), *The Digital Gaming Handbook*. Boca Raton, FL: CRC Press, 287–301.

- Herz, M., Boinet, A., Bahgat, A. and Barois, J. (1906) '13° Sebil d'Ismâïl Maghlâoui', *Comité de Conservation des Monuments de l'Art Arabe*, 22: 77. <https://doi.org/10.3406/cmaa.1906.11057>.
- Ismail, S. (2017) 'Engineering Metropolis: Contagion, capital, and the making of British colonial Cairo, 1882–1922'. PhD thesis, Columbia University.
- Kretli, S., Gayer-Anderson, R. G., Abdu, A. A. and Warner, N. (2001) *Legends of the House of the Cretan Woman*. Cairo: American University in Cairo Press.
- Lane, E. W. and Thompson, J. (2014) *An Account of the Manners and Customs of the Modern Egyptians: The definitive 1860 edition*. Cairo: American University in Cairo Press.
- Malpas, J. (2008) 'New media, cultural heritage and the sense of place: Mapping the conceptual ground', *International Journal of Heritage Studies*, 14(3): 197–209. <https://doi.org/10.1080/13527250801953652>.
- Manzetti, M. C. (2023) 'Combining 3D visibility analysis and virtual acoustics analysis for the architectural study of ancient theatres'. In G. Landeschi and E. Betts (eds), *Capturing the Senses: Digital methods for sensory archaeologies*. Cham: Springer, 105–25.
- Murphy, D., Shelley, S., Foteinou, A., Brereton, J. and Daffern, H. (2017) 'Acoustic heritage and audio creativity: The creative application of sound in the representation, understanding and experience of past environments', *Internet Archaeology*, 44: 1–23. <https://doi.org/10.11141/ia.44.12>.
- Özcan, O. (2005) 'Turkish-Ottoman miniature art within the context of electronic information design education', *International Journal of Technology and Design Education*, 15(3): 237–52. <https://doi.org/10.1007/s10798-004-5400-7>.
- Raymond, A. (1979) 'Les fontaines publiques (sabîl) du Caire à l'époque ottomane (1517–1798) (I)', *Annales Islamologiques*, 15: 235–92. <https://doi.org/10.3406/anisl.1979.984>.
- Schafer, R. M. (1986) 'Acoustic space'. In D. Seamon and R. Mugerauer (eds), *Dwelling, Place and Environment*. Dordrecht: Springer, 87–98.
- Segura-Garcia, J., Montagud-Climent, M., Mirasol-Menacho, S. and Oleza-Simó, J. (2019) 'Theatrical virtual acoustic rendering with head movement interaction', *AI EDAM*, 33(3): 359–68. <https://doi.org/10.1017/S0890060419000192>.
- Suárez, R., Alonso, A. and Sendra, J. J. (2018) 'Virtual acoustic environment reconstruction of the hypostyle mosque of Cordoba', *Applied Acoustics*, 140: 214–24. <https://doi.org/10.1016/j.apacoust.2018.06.006>.
- Till, R. (2019) 'Sound archaeology: A study of the acoustics of three world heritage sites, Spanish prehistoric painted caves, Stonehenge, and Paphos Theatre', *Acoustics*, 1(3): 661–92. <https://www.mdpi.com/2624-599X/1/3/39>.
- Warner, N. (2005) *The Monuments of Historic Cairo: A map and descriptive catalogue*. Cairo: American University in Cairo Press.

The archaeoacoustics of rock art sites: a methodological review

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The archaeoacoustic analysis of rock art sites and landscapes has attracted a number of researchers since the 1960s. Similar to other fields of research, the significant technological advancements witnessed in recent decades, coupled with the growing prevalence of interdisciplinarity, have driven the evolution of the field of archaeoacoustics towards the adoption of more rigorous methodologies (Djordevic et al., 2019; Kolar et al., 2018; Richards-Rissetto et al., 2023). In this context, the acoustic characterization of rock art sites as performance spaces has gone from an early period, in which what could be described as an intuitive assessment was in place, to the current situation, in which the principles and techniques of acoustics have been embraced, incorporating an experimental approach centred on the analysis of a collection of impulse responses (IRs).¹ Latest advancements in archaeoacoustic research were recently discussed by Navas-Reascos and colleagues, including a succinct reference to the recent studies conducted at rock art sites (Navas-Reascos et al., 2023). Nevertheless, a thorough examination of the great variety of methodologies and approaches, used in the archaeoacoustic study of rock art sites since the 1950s, was still pending.

In this chapter, our aim is to present a comprehensive review of the evolution of the methods applied in the archaeoacoustics of rock art sites, from the pioneering studies by Glory and Reznikoff, to the advanced methods based on ambisonics techniques and GIS (geographic information system) technology, used nowadays by the ERC Artsoundscapes project. We will also introduce the frontier research, but still preliminary work, undertaken in the fields of psychoacoustics and neuroacoustics, both incorporated into the project in an attempt to explore listeners' subjective experiences and physiological responses to the acoustics of the rock

art sites. The strengths and weaknesses of the different approaches are discussed, providing an insight into their potential applications.

Our intention is for this text to stand as a valuable resource for current and future generations interested in working in the field, as well as a positive contribution to the debate on the necessity of standardizing an experimental method for conducting acoustic research in rock art sites for more consistent, repeatable and comparable results.

The first 50 years of the archaeoacoustics of rock art sites, up to 2018

The pioneers: Glory and Reznikoff

In the 1950s and 1960s, a series of articles described the existence of rock gongs, occasionally with presence of rock art in them, in America (Heizer, 1953: 34–6), Africa (Fagg, 1956), Asia (Condominas, 1952) and Europe (Fagg, 1957; and see below). Yet, an attempt to study the phenomenon with a certain degree of methodology was only introduced by French prehistorian André Glory in the mid-1960s (Glory, 1964; 1965). From today's point of view, his methodological comments can be defined as naive: it was assumed – rather than demonstrated – that the chippings observed in natural lithophones,² found in caves such as at Nerja (Spain), were the result of having been repeatedly beaten in the past in order to produce deep percussive sounds. In this site, as well as in the French caves of Roucadour, Cougnac and Pech Merle, these lithophones were associated to painted motifs, dated in the Upper Palaeolithic (Glory, 1964: clxviii–clxix; 1965: 114–15; see also Dams, 1984).

Two decades later, Iégor Reznikoff used his voice as a sound source, paying attention to the intensity and duration of resonant sounds, depending on the pitch used (Reznikoff and Dauvois, 1988: 239). He described his method in this way:

One walks through the cave, in the middle or next to the wall, testing different sounds at different pitches; eventually, at a certain pitch, the cave will respond. One must then ascertain (1) the exact pitch that produces resonance, (2) whether there are other sounds (the fifth for example) which respond, (3) the situation and orientation for the best resonance (in terms of intensity and duration), and (4) finally the point from which the resonance originates. One then continues along the path ... Once the map of resonance has been established it is superimposed on the map of

the cave drawings. The question of possible correlations between sounds and pictures arises, and, through sound, between the pictures themselves. (Reznikoff, 1995: 545)

Reznikoff mentioned that in order to ascertain the coincidence between, for example, human-made sounds and resonance, in areas with paintings, the results had to be statistically significant. This was the case in the French caves of Le Portel, Niaux and Arcy-sur-Cure (correlation of 80, 90 and 80 per cent respectively). Although he acknowledged that these figures depended on the definition of what was meant by a 'well-resonating' or 'good-sounding' location, no precise data to define this were provided in the article. He just indicated that red dots were predominantly located in places of 'good' resonance (Reznikoff, 2006: 79). In the case of the open air, post-palaeolithic rock art sites of Finland, he followed a similar procedure, using his voice as a sound source, in this case to measure echoes. Yet, beyond assuring that he had been placed 'at some distance from the bank' (Reznikoff, 1995: 553), information about the location of the sound source in relation to the rock art panels was not registered.

Although viewed in the context of today's standards, Glory's and Reznikoff's methodologies, which rely on their embodied experience and self-reflexivity (see Hamilton, Chapter 1, this volume), exhibit limitations when assessing the acoustic characteristics of the rock art sites, their work was genuinely pioneering for their time, and marked a pivotal moment in the recognition of sound as a significant sensory aspect worthy of exploration within these sites.

From human-made sounds to impulsive sounds: early archaeoacoustic research

In contrast to Reznikoff's interpretative analysis, more precise acoustic analyses were soon undertaken by archaeologist Michel Dauvois and music acoustician Xavier Boutillon. They were the first ones to introduce methods from the field of room acoustics, in the acoustic tests performed in rock art sites. Their approach consisted of recording, every two metres, the impulse responses (IRs) produced by the sound of a clapper located next to the wall. As recording devices, they used an AKG D24 dynamic microphone and a Nagra IV-S tape recorder. The receiver was placed 2.7 m away from the clapper, a distance that was adapted depending on the circumstances of the cave (Dauvois and Boutillon, 1990: 176). The results did not seem to replicate Reznikoff's findings. As they said:

The numerical results show an increase in reverberation time, in all frequency bands, with increasing distance from the drawings. Similarly, the ratio between early and late reflection energy gradually decreases. According to the latest data from C. Lavandier's work ... the corresponding sound impression is drier, closer, clearer and more neutral when closer to the drawings, in natural agreement with the tight configuration of the venue.

It emerges that a better acoustic clarity characterises the close environment of the drawings. The acoustic response changes regularly from that of an 'intimate' space – the area around the opening and the drawings has restricted dimensions – to that of an almost open space ... At the Réseau Clastres, we can rule out the hypothesis of a precise correspondence between the figures in the Salle des Peintures and the acoustic properties of the site. (Dauvois and Boutillon, 1990: 178, 186, our translation)

One of the most prolific early researchers in the field of archaeoacoustics, Steve Waller, also employed a clapper as a source of sound in his acoustic tests. He utilized a spring-loaded device that produced a short burst of sound lasting less than 0.1 seconds, of an average emission level of 53 dB with a standard deviation of 9 dB (Waller, 2000: 92). To ensure the reliability of the experiment, Waller repeated the sound burst three times at each studied position. An omnidirectional microphone was positioned at a distance of 1 metre from the sound source. As he expounded:

Each experiment at each location was conducted in replicate to assess reproducibility of the impulse, intensity of the reflected sound, and echo delay time. Ambient sounds before, during and after each impulse were recorded on Type II tape with a Realistic Stereo-Mate SCP-29 Model 14-1068A portable cassette analog recorder using an (uncalibrated) omnidirectional Realistic stereo Electret microphone model 33-1065 placed one metre from the impulse generating device. (Waller, 2002: 14)

He further explained that:

These recordings were then digitised at a sampling rate of 22 kHz and quantitatively analysed for sound intensity as a function of time and frequency using SoundEdit Pro® v1.0 on a Macintosh Quadra Power PC®. The data was exported into Microsoft Excel® v4.0 for mathematical analysis. The average dB for each

6 millisecond-interval was calculated over 0.5 to 7.5 kHz, then corrected for background ambient noise. (Waller, 2002: 14) (see also Waller, 2003: 33–4)

With this methodology, Steve Waller indicated that he found a relationship in the location of wall drawings of hoofed animals and echoes in several Upper Palaeolithic caves in the Dordogne, Lot and Vienne (France) (Waller, 1993). A few years later he also investigated echoes in rock art sites in Arizona (here using a starter pistol as a sound source) (Waller et al., 1999), Utah (Waller, 2000) and Canada (Waller and Arsenault, 2008).

In Northern Europe, around the same period as Waller's aforementioned earlier studies, Joakim Goldhahn was applying a distinctly different approach in the rock art regions of Nämforsen, Norrfors and Laxforsen in Sweden. His 2002 study of ambient sounds looked at the sound pressure level (SPL), demonstrating that rock art had been carved in close proximity to thunderous rapids and waterfalls. He argued that this selection was not solely based on the availability of a suitable surface for engraving, but rather a deliberate choice to opt for locations with powerful soundscapes. According to Goldhahn's research, the resounding noise of the water, reaching levels of up to 110 dB, played a crucial role in what he interpreted as the shaman's quest to enter and emerge from an altered state of consciousness (Goldhahn, 2002).

Also in Northern Europe, the archaeologist-musicologist Riitta Rainio and her team analysed the Värrikallio rock art site in Finland. They used a starter revolver (6 mm), as well as handclap and a wooden percussion plate, as a sound source. As receiver they chose a spaced pair of Neumann KM 183 condenser microphones, together with a Zoom H4n portable recorder (48 kHz, 16 bit). They were able to record echoes and flutter echoes and demonstrate that the massive smooth painted rock was an efficient sound reflector (Rainio et al., 2014). Additionally, they registered the A-weighted sound pressure level of ambient sounds with an Amprobe SM-20 sound level meter, in order to assess how the ambient sound – mainly the brawl of fast-flowing water nearby – interfered with the acoustics of the space.

Moving to Southern Europe, in 2011, one of the authors of this article, Margarita Díaz-Andreu, became involved in the field of archaeo-acoustics. Despite lacking funding, she, along with fellow researcher Carlos García Benito, devised a simple, but cost-effective method, based on investigators' embodied experience, of recording the acoustic properties of rock art sites and landscapes in Spain. The acoustic tests relied on human-generated sounds such as voices (male and female) (a

method already used by Reznikoff, see above), whistles and handclapping (as seen in Rainio, above) to evaluate the presence of reverberation and echoes. The emitted sounds were captured in a series of rock art shelters and gorge locations, using a portable M-Audio MicroTrak II digital recorder. Initial observations and impressions were recorded on a field form specifically designed for the purpose. Several types of locations were selected for the acoustic tests, adhering to various criteria. Firstly, tests were conducted both in the rock art shelters and at the bottom of the valleys or gorges where these shelters were situated. Secondly, the sound source was directed towards the paintings, and then it was oriented 180 degrees from the paintings. Thirdly, tests were carried out in two types of location: the first of them directly linked to rock art sites, in contrast to the other type of location that were in nearby areas without rock art. This allowed for comparative analyses across different settings. The methodology was applied to different rock art landscapes with Levantine paintings – the Valltorta and Mortero gorges, as well as the Godall mountains (also known as the rock art sites of Ermita de la Pietat, in Ulldecona) – and others with schematic rock art sites in Southern Andalusia (Díaz-Andreu and García Benito, 2012; 2013; 2015; Díaz-Andreu et al., 2014).

Later, between 2014 and 2016, the collaboration between Margarita Díaz-Andreu and Tommaso Mattioli in the SONART project resulted in a significant improvement in the methodology used for acoustic testing. Following advice from acoustic engineer, Angelo Farina (University of Parma), the ambisonics technique was adopted for acoustic testing with the goal of improving precision. In order to achieve this, another portable impulsive sound source, consisting of air balloons with a diameter of 40 cm, was used. To capture the IRs, a Brahma first-order ambisonic tetrahedral microphone was employed (Manthravadi, 2022: 73–7). The use of the ambisonics technique enabled the mapping of the sound intensity arriving from all directions. This equipment was used to conduct research in the schematic rock art landscapes of La Baume Brune (Vaucluse, France), Valle d'Ividoro (Puglia, Italy) and Arroyo de San Serván (Extremadura, Spain), specifically focusing on investigating reverberation, echoes and enhanced audibility (Díaz-Andreu et al., 2019; Mattioli and Díaz-Andreu, 2017; Mattioli et al., 2017). In 2018, the same methodology was used for the rock art of the Gran Mural tradition in Baja California. Several acoustical parameters listed in ISO3382-1 (ISO 3382-1, 2009) were calculated this time, including sound strength (G), reverberation time (T_{20}), speech and musical clarity (C_{50} , C_{80}), late lateral sound level (L_j) and early lateral energy fraction (J_{LF}) (Díaz-Andreu et al., 2021).

In the field of room acoustics, impulse responses (IRs) were traditionally recorded using impulsive sound sources such as blank pistols, wooden clappers or balloons, until the 1980s (Bradley, 1986), when more sophisticated methods emerged, based on the use of loudspeakers as sound sources, to address the primary limitations of these techniques. Such limitations include difficulties in guaranteeing repeatability, poor source directivity, and uneven energy distribution across the frequency spectrum (Lamothe and Bradley, 1985; Pätynen et al., 2011; San Martín et al., 2013). Nonetheless, the use of impulsive sounds as sound source continues to be explicitly mentioned in standards (ISO 3382-1, 2009; ISO 3382-2, 2008) as a viable alternative, since they are particularly suitable for registering echoes, and also for situations when simplicity in implementing the measurement system is required, or when faced with constraints in portability, either due to the impracticality of transporting heavy equipment or the inaccessibility of the sites to be tested. All of these factors are indeed quite common to rock art sites.

Capturing more reliable IRs: using loudspeakers as the sound source

The use of a loudspeaker as sound source represented a step forward in the archaeoacoustical study of rock art sites. Its late introduction was possibly due to the requirement of an electric power source for its operation and accessibility limitations to such natural sites.

The first mention of the use of a loudspeaker came from José Miguel Gaona and his team during their acoustic experiments conducted at the El Castillo cave system, located in northern Spain. The focus of attention of their analysis was sound pressure level (SPL). A range of audio tones consisting of 31 different frequencies ranging from 80 Hz to 1 kHz was used. Additionally, they employed pink noise and a sine sweep, generated through an omnidirectional speaker or dodecahedron (Gaona et al., 2014). The audio data was recorded using a condenser microphone and then converted into digital files, with a sampling rate of 48 kHz and 16 bit resolution. The study demonstrated that, as the emitted tone's frequency shifted towards the 100 Hz range, a distinct increase in sound level was noted, reaching its highest peak at 108 and 110 Hz (−1 dB). This discovery aligned remarkably well with other investigations in the field of archaeoacoustics concerning megalithic structures (Devereux et al., 2007; Manaud and Barrandon, 2014).

A dodecahedron was also used in a second measurement season taken at Värrikallio by Riitta Rainio's team (see above) together with the

rock art site of Julma-Ölkky and the more recent *sieidi* (Sámi sacred site) of Taatsinkirkko, all of them in Finland. A custom-built omnidirectional dodecahedron loudspeaker, powered by a battery-operated amplifier, was used for the acoustic tests. The sound signal was generated by a Zoom H4n and the recording procedure consisted of a specialized microphone stand, holding an array of four KM 183 microphones arranged in a tetrahedron shape, with a 40-cm distance between each microphone. A Zoom H6 multi-channel recorder was used, offering a sampling rate of 96 kHz and a 24-bit depth. The tetrahedron microphone array enabled the assessment of echo arrival angles. However, the new system demanded a stable surface and greater effort for transportation and setup, which led to the number of recording points being reduced to only a few. The microphone stand was positioned at a distance of 5–10 metres from the loudspeaker, typically between the loudspeaker and the cliff being studied. The primary excitation signal was a logarithmic sine sweep. Additionally, other excitation signals such as sine tones, noise bursts, recorded female voice, calls, laughter and drum beats were employed, with the latter serving for demonstration purposes (Rainio et al., 2018: 459).

A dodecahedron was also used in the fieldwork by the British-Spanish team in their acoustic investigation of five Upper Palaeolithic painted caves in northern Spain (Fazenda et al., 2017). One of the main aims of the research was to test Reznikoff's claims. His assertion that there was an association between drawn motifs, and in particular lines and dots, with higher reverberation, was found to be tenable, although statistically weak. Measurement positions were chosen by placing a microphone approximately 1 metre away from the motifs where they were present. The primary measurement system consisted of a laptop and a professional soundcard (Focusrite Saffire Pro 26 i/o). The sound source was a battery-powered Bang & Olufsen Beolit 12 loudspeaker, which was connected to the soundcard via a cable. For the microphone setup, omnidirectional DPA 4006 microphones with B&K diaphragms were used. The microphone signal was captured and processed using EASERA,³ a room-acoustic measurement software tool. Several acoustical parameters were calculated from the impulse responses. These included metrics for reverberation (T_{30} , EDT⁴) and speech intelligibility (STI⁵), along with commonly used measures for characterizing the acoustics of enclosed spaces and concert halls, such as definition (D_{50}) and clarity (C_{80}). In the case of small rooms, several metrics were also evaluated to measure the quality of low frequency response, addressing both the variation in reverberation time and

the sound pressure level at low frequencies (LFRT60diffs, LFRT60thr, Lfdevflat and Lfdevsmooth).

Gathering 3D sound information: a methodological evolution towards high quality auralizations

This section describes the methodological advancements achieved by the ERC Artsoundscapes project since its inception in 2018. These developments were primarily motivated by the project's intention to leverage the latest innovations in the field of room acoustics to acquire more comprehensive data on the acoustic characteristics of the sites, thereby enabling a deeper exploration of the hearing aspects associated with rock art sites. Furthermore, the project aimed to push beyond previous research boundaries by incorporating two relatively unexplored fields in the study of the past, psychoacoustics and neuropsychology.

To achieve these objectives, it became imperative to establish a methodology based on high order ambisonics (HOA) techniques⁶ to capture spatial IRs, going beyond what had been achieved before. Therefore, we incorporated 3rd-order ambisonics⁷ technology, with the idea of not only enabling a more in-depth study of the sites' acoustic properties, including a detailed analysis of the spatial distribution of reflections, but also a more detailed sonic recreation of the sites through HOA-based auralizations. Auralizations are akin to visualizations, but represent the sound field at specific positions within a given space (Vorländer, 2008). Thus, they can be regarded as a tool for implementing a sensory-based approach to reinterpreting tangible remains, previously examined in the studied sites, now considering their sonic component, while also providing individuals with novel ways to interact with these heritage sites. It can be said that the gathered IRs enable the restoration of the auditory dimension to these rock art sites, which had been, up to this moment, kept in silence.

The measurement procedure and equipment used

The methodology we employed to capture impulse responses is based on the exponential sine-sweep technique (ESS), as outlined in ISO 3382-1, to ensure the highest signal quality (ISO 3382-1, 2009). This technique relies on the utilization of an exponential sine-sweep as the testing signal, emitted through a loudspeaker used as a controlled sound source.⁸ It is important to note that, although the ISO 3382-1 standard

serves as a reference when characterizing rock art sites, its applicability is not straightforward, especially in open-air rock art sites where the diffuse field conditions assumed by the standard are not met (Alvarez-Morales et al., 2023a; Astolfi et al., 2020). Hence, given the morphological, geographical and topographic particularities of each site, it is necessary to adapt certain aspects of the methodological procedure in each case study (Till, 2020).

During the fieldwork carried out as part of the Artsoundscapes project, we employed an exponential sine-sweep with a minimum duration of 12 seconds, spanning from at least 50 Hz to 20 kHz. The emission level of the test signal is individually adjusted for each site to guarantee an adequate impulse-to-noise ratio (being greater than 45 dB) at the frequency bands of interest (Hak et al., 2012).

Regarding the sound source, throughout the project our methodology has developed from MIMO to SIMO. In the first years of the project the measurement methodology was developed using the MIMO (multiple input, multiple output) approach, which was originally proposed by Professor Angelo Farina along with Lorenzo Chiesi (Farina and Chiesi, 2016). In practical terms, the MIMO approach entails the use of a spherical array of transducers for both the sound source (input) and the receiver (output). As a senior member of the Artsoundscapes project, Professor Farina proposed a groundbreaking MIMO loudspeaker array with adjustable directivity that had to be specifically constructed. This custom-built MIMO loudspeaker system is essentially composed of a spherical configuration housing 12 individual loudspeakers and a dedicated power amplifier, emitting sound sequentially, so that the individual IRs captured can subsequently be combined to render the acoustic response of the site to a specific directivity emission pattern. Using this equipment, MIMO measurements were successfully carried out in the rock art landscapes of Altai (Siberia, Russia) in 2019 (Díaz-Andreu et al., 2023) and Catalonia (Spain) in 2020 (Farina et al., 2020) (Figure 11.1a).

Following these two campaigns, the practical challenges associated with the weight and size of the MIMO loudspeaker led to a modification of the measurement protocol for conducting SIMO (single input, multiple output) acoustical measurements, in 2021. In this revised approach, an ultralight omnidirectional sound source, the IAG DD4 mini dodecahedral loudspeaker, in combination with a pre-equalized IAG AP4GB power amplifier, was employed (Figure 11.1b). While this change meant sacrificing the flexibility offered by MIMO measurements, in terms of source directivity variability, opting for a smaller (nearly half the size

(a)



(b)



Figure 11.1 (a) Equipment used in the Artsoundscapes fieldwork in 2019 and 2020 at the site of Urkosh XV (Altai, Russia). (b) Equipment used in the Artsoundscapes fieldwork in 2021 at the site of Game Pass Shelter in front of the Rosetta Stone Panel (Drakensberg, South Africa). *Sources:* Margarita Díaz-Andreu © Artsoundscapes project (a); Neemias Santos da Rosa © Artsoundscapes project (b).

and weight of its predecessor) dodecahedron improved portability⁹ and enhanced high-frequency performance in terms of omnidirectionality. Furthermore, the incorporation of external electronics rendered the new system more robust and enabled better thermal dispersion. SIMO measurements were conducted in various locations, including Valencia and Cadiz, in eastern and southern Spain respectively (Alvarez-Morales et al., 2023a; Alvarez-Morales et al., 2023b; Alvarez-Morales et al., 2023c; Santos da Rosa et al., 2023), as well as in the Drakensberg Mountains in South Africa (Santos da Rosa et al., 2025).

Regardless of the type of sound source employed, two distinct sets of impulse responses (IRs) are obtained at each examined site. Monaural IRs are recorded following the guidelines outlined in the ISO 3382-1 standard, as mentioned above. This involves using an omnidirectional microphone (micW n201) in conjunction with a high-quality multi-track audio recorder (Zoom F4). At each source-receiver pair, monaural IRs are measured synchronously, using the EASERA 1.2 software tool. One advantage of employing this commercial solution is the ability to monitor IRs onsite and reduce post-processing tasks. Additionally, high-resolution spatial IRs are collected. For this purpose, the test signal is captured with the 19-capsule ZYLIA ZM-1 microphone array, which includes an integrated preamplifier. By default, this array's centre of coordinates is oriented towards the emission point and the test signal is recorded with the audio software Bidule (0.9762) by Plogue. Subsequently, signal processing techniques are applied to extract the 1st and 3rd order ambisonics IRs from the 19-channel recordings. The post-processing is performed in MATLAB, using either the MIMO¹⁰ (Farina et al., 2020) or SIMO (Benítez Aragón et al., 2023) scripts, depending on the type of sound source used in each case. Moreover, the binaural rendering from the ambisonics IRs is done via the Binaural Decoder plugin for Reaper, by IEM,¹¹ in order to facilitate the playback of the audio signals through headphones.

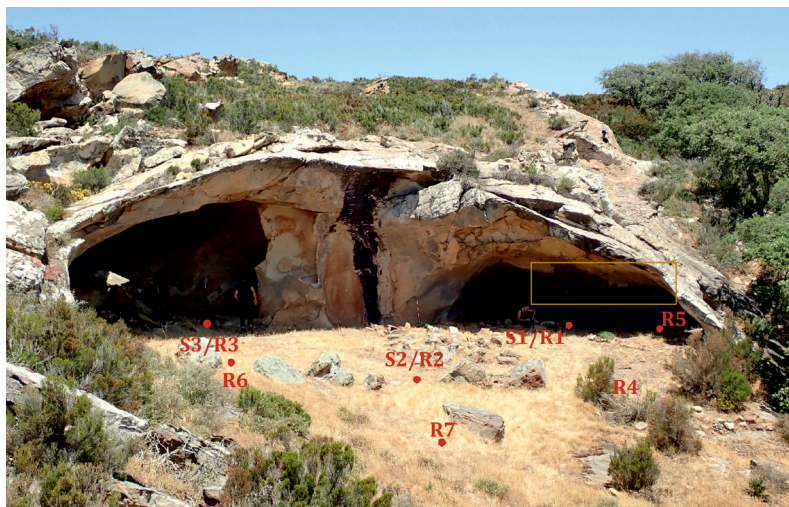
Along with the equipment used for the acoustic measurements, an anemometer and the ARTA SPL Meter software tool are employed to monitor environmental conditions during each session, paying special attention to the ambient temperature, the wind velocity and the environmental noise levels, variables that are necessary to consider when analysing and interpreting the results. Actually, during the South Africa campaign, we observed that the sound of water in different forms dominated the ambient sound, causing high levels of background noise for the acoustic measurements, so we decided to test a complementary methodology designed to explore the sites in terms of soundscapes,

which includes the proposal of a level-calibration procedure of the HOA recordings in order to calculate psychoacoustic parameters (Moreno Iglesias et al., 2022).

In addition to using the appropriate equipment, to achieve a thorough acoustic characterization, it is crucial to carefully select a sufficient and representative set of source-receiver combinations at each site. This involves taking into account the unique features of each studied rock art site when designing the measurement plan. This consideration should encompass not only hypotheses regarding the historical uses of the site by past societies, but also its physical shape and spatial arrangement. Unfortunately, the number of positions that can be characterized is limited, primarily because the time available for measurements is constrained by environmental conditions or access limitations to the sites. Therefore, whenever possible, a preparatory visit to the field is conducted, prior to the fieldwork campaign, to optimize the available time. It is important to note that, despite the test signal lasting only about 20 seconds, the uneven terrain commonly found in natural sites requires special attention when positioning both the loudspeakers and the microphones, to ensure they are level and correctly oriented during the measurements, which is particularly time-consuming. Additionally, although measurements are always conducted in unoccupied conditions, repetitions are often necessary due to the presence of unwanted noises or air currents, which are common in outdoor sites.

In an effort to ensure consistent and comparable results across the various rock art sites investigated in the Artsoundscapes project, an initial criterion was established for the placement of the sound source. According to this criterion, the primary source position (S1) is determined based on its alignment with the primary rock art panel of the site, or at the centre of the space in cases where paintings are dispersed. Additionally, a secondary source position (S2) is typically established in front of other significant panels, or directly in front of S1, if the site being measured is small in size. Extra source locations (S3 and beyond) are introduced as needed, taking into consideration the site's morphology or to explore different usage hypotheses. Receivers are strategically placed across the available area within each shelter to ensure complete coverage of the influence area¹² of each source position (an example is shown in Figure 11.2). The height of the transducers is usually set at approximately 1.5 metres or 0.9 metres, depending on the working hypothesis, which considers either a 'standing' or 'sitting/kneeling' performer/audience posture. These distances from the ground are chosen to closely match the average height of a person's mouth or ears when standing or sitting/

(a)



(b)



Figure 11.2 (a) General view of the cave Mujeres I, located in Medina-Sidonia, Cadiz, Spain. The approximate source (S) and receiver (R) locations are labelled in red. The golden square indicates the area which concentrates the largest number of figures. (b) Detail picture taken with both the loudspeaker and the microphone positioned in the cavity pictured on the right of the cave (S1–R5). The loudspeaker is set in position S1, in front of one of the main panels, the remains of a scene with five women (marked with a black square). *Source:* Lidia Álvarez-Morales © Artsoundscapes project.

kneeling, respectively, since, following an analogy of embodiment, the loudspeaker serves as the talking person and the microphones act as the ears of the listener.

Performing a comprehensive analysis of the acoustic features of rock art sites

To comprehensively analyse the acoustic characteristics of rock art sites, various aspects of the auditory experience of listeners are explored. This involves a detailed examination of the impulse responses measured on site.

To achieve this, it is crucial to delve into the structure of the impulse responses and the patterns of sound reflection, particularly considering the open-air conditions frequently encountered in rock art sites. The initial part of the omnidirectional IRs holds valuable information for assessing the subjective sense of intimacy within the shelter. This assessment can be made based on the initial time-delay gap (ITDG), which is defined as the time interval between the arrival of the direct sound at a specific listener location and the occurrence of the first significant reflection. Additionally, examining the later portion of the response allows for the identification of significant late reflections that could lead to echoes and other acoustic phenomena. Furthermore, by analysing the spatial IRs, it becomes possible to determine the direction of arrival (DOA) of the primary reflections. This information helps in evaluating whether there is any relevant focusing of sound and whether specific elements within the shelter or the rock boulder where the motifs have been painted, or even the surrounding landscape, are responsible for generating such reflections. When analysing the results, consideration is given to site alterations in relation to the period when the rock art was produced and experienced, including the impact of prolonged exposure to weathering agents, as well as human-induced alterations.

Furthermore, the assessment of rock art sites as performance spaces can be conducted by analysing various acoustic parameters derived from the IRs in accordance with ISO 3382-1 standards. The specific acoustic parameters to be assessed depend on the physical characteristics of the site being studied and the research objectives established for each unique research assignment. Typically, the analysis includes acoustic metrics designed to evaluate aspects such as reverberation conditions (reverberation time, T_{20}), sound clarity (definition, D ; musical clarity, C_{80} ; and centre time, T_S), and perceived loudness (sound strength, G) within the space, all of which are derived from the omnidirectional

responses. In addition to these metrics, the spatial impression at rock art sites is assessed by examining the early lateral energy fraction (J_{LF}) and the interaural cross-correlation coefficients ($IACC_x$), which are calculated from the rendered 1st-order ambisonics and the binaural IRs, respectively.

Examining the spectral characteristics of the chosen acoustic parameters for each source-receiver (S-R) combination helps identify any frequency-specific sound enhancements or detriments. Averaged values within the mid-frequency range are particularly valuable for assessing the various audience zones linked to each source position. This approach allows us to investigate how the acoustic properties vary across different areas within the space. Moreover, spatially averaged values offer insights into the overall behaviour of the entire space, simplifying the process of comparing different rock art sites. These averaged values provide a means to make direct comparisons between the acoustics of several sites and evaluate their collective acoustic attributes.

Approaching past sounds from the field of psychology

Two additional angles from which the Artsoundscapes project has approached the acoustics of past rock art sites are psychoacoustics and neuroacoustics. Psychoacoustics is an area little trodden in archaeology (Kolar, 2013; 2017; Jordan, 2020; 2023). The Artsoundscapes project establishes an interdisciplinary approach to delve into the acoustics of the sites in terms of psychoacoustic perception, relying on close collaboration between archaeologists, acoustic engineers and psychologists. The first article produced by the project in this field aimed to synthesize what was known about the influence of acoustics on human mental processes, related to sound perception and cognition and how this could be employed to the study of the past (Valenzuela et al., 2020). The term psychoarchaeoacoustics was proposed to mean the study of the type of emotions elicited by the perception of sound in past monuments and landscapes. This has been implemented by experimentally reproducing the acoustic conditions from archaeological sites in the laboratory, using auralizations based on the acoustic measurements undertaken by the project in several rock art areas (see above). While listening tests can only be conducted with present-day listeners, the fundamental assumption is that the communities that produced and engaged with the rock art shared neurological similarities with modern populations (something that was already mentioned by David Lewis-Williams in 1991). Thus, it is presumed that there are no significant differences in

how past and contemporary individuals are affected by sound. However, it is important to bear in mind that the sonic perceptions and subjective preferences of individuals who experienced archaeological sites in the past were heavily influenced by their cultural context. Nonetheless, in this regard, psychoacoustics is no different from any other field in archaeology, as post-processual archaeology, and then relational archaeology, denounced regarding the way in which processual archaeologists had analysed the past (for rock art see, for example, Ouzman, 1998; and Jones, 2017).

The experiments conducted as part of the Artsoundscapes project have used binaural and HOA auralizations in order to explore listeners' subjective experiences and physiological responses to the acoustics of three different rock art areas: Altai (Russia) (López-Mochales et al., 2023a), southern Spain (López-Mochales et al., 2023b) and the Levantine site of Cuevas de la Araña in Valencia (Spain) (López-Mochales et al., 2023c). The listening tests have been carried out in both the Aalto Acoustics Lab at Aalto University in Finland and the Immersive Psychoacoustics Laboratory (immpaLAB) at the Faculty of Psychology of the University of Barcelona (Spain) (López-Mochales et al., 2020) (Figure 11.3a). For some of these tests, excerpts from the Artsoundscapes project's own repository of anechoic sounds have been used (López-Mochales et al. 2024), including recordings of various wind and percussion instruments, singing and speech (López-Mochales and Jiménez Pasalodos, 2021; López-Mochales et al., 2023b: table 1) (Figure 11.3b).

In addition to psychoarchaeoacoustics, the Artsoundscapes project has fostered research in neuroacoustics, a field in which prior research highlights the pressing need for establishing minimum standards (Cook et al., 2008; Devereux and Jahn, 1996; Gaona et al., 2014). In an initial study, a review from the perspective of neuropsychology related to the presence of music in ritual contexts, reveals the role of music and sound in modulating emotions during ritual event and/or in inducing alterations in participants' mental states (Aparicio-Terrés and Escera, 2024). Additionally, research has been focused on explaining why exposure to repetitive sounds, specifically rhythmicity, can trigger altered states of consciousness (ASCs), with particular emphasis on the concept of entrainment (Aparicio-Terrés et al., 2024; Vaitl et al., 2005). In the latter study, using electroencephalography, it has been possible to demonstrate that entrainment to the beat of electronic music is related to some aspects of the phenomenology that characterizes ASCs. In particular, it has been shown that the magnitude of entrainment to the

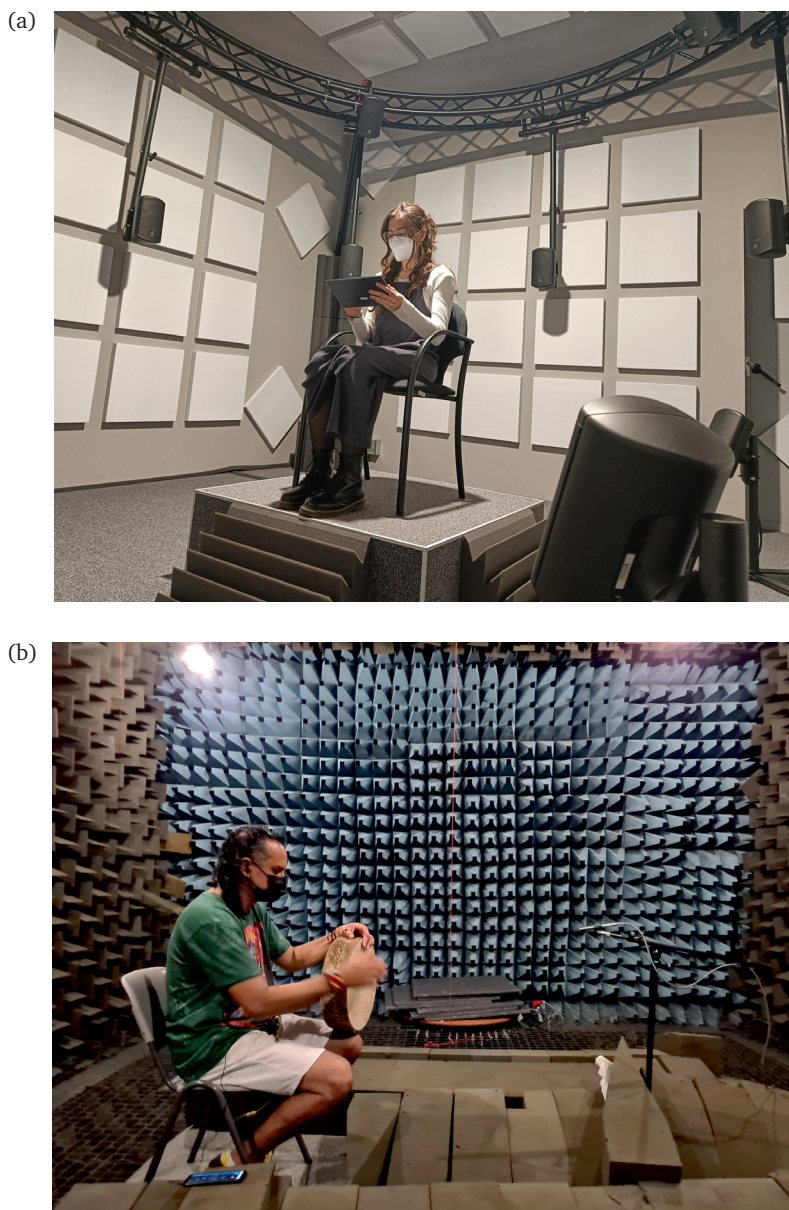


Figure 11.3 (a) Volunteer conducting psychoacoustic tests in the listening room of the Immersive Psychoacoustics Laboratory (ImpplaLAB), funded by the Artsoundscapes project at the Faculty of Psychology, University of Barcelona. (b) Musician playing a replica of a Sámi drum in the anechoic chamber at the La Salle Acoustics Laboratory (Ramon Llull University, Barcelona). *Sources:* Samantha López-Mochales. © Artsoundscapes project (a); Raquel Aparicio-Terrés. © Artsoundscapes project (b).

beat of music, lasting one minute, can be modulated by the tempo of the music. When taking into account its complex temporal dynamics, the results show that entrainment is higher for stimulation rates at 2.25 Hz compared to faster and lower rates of stimulation (1.65 Hz and 2.85 Hz, respectively) for most part of the duration of the music. This is a novel way of suggesting how drum beating can lead to ASCs, something repeatedly mentioned in anthropological studies and assumed to have happened in the past (see, for example, Vitebsky, 2001).

GIS applied to archaeoacoustic and perceptual research

Geographic information systems (GIS) have been widely used in archaeology since the 1980s, and due to their potential to store, reference, analyse and visualize spatial information, they are now considered an essential methodological tool (Menéndez-Marsh et al., 2023: 41). Over the last four decades, GIS has been mainly used to investigate the relationship between archaeological sites and the characteristics of the landscapes in which they are located (for example, Garate et al., 2020; Santos da Rosa et al., 2018), to address issues related to the dispersal of anthropogenic remains at an intra-site level (also, Gabucio et al., 2023; Mendez-Quintas et al., 2019; Richards-Rissetto et al., 2023) and even as a tool to unveil lost archaeological landscapes by means of augmented reality applications (LoPiano, Chapter 13, this volume). Nevertheless, the value of GIS extends beyond the physical aspects of the archaeological record. It enables us to delve into perceptual facets, including visibility and audibility, which are pivotal for a comprehensive investigation of the environments inhabited by prehistoric societies (see, for example, Fábrega-Álvarez and Parcerro-Oubiña, 2019; Primeau, 2022).

Using GIS, visibility patterns from rock art sites can be modelled by creating data layers that result from the relationship between a specific point in the landscape and a digital elevation model. This process generates an image that depicts all the potential visible areas within the landscape from that specific vantage point (Maschner, 1996: 249). On the other hand, audibility analysis, which focuses on how the landscape affects the transmission of sounds perceptible to the human ear, can be conducted by calculating sound attenuation, based on factors like topography, predominant land cover and the distance from the sound source (García Atiénzar et al., 2022: 92). In rock art research, numerous visibility studies have been conducted to investigate how

images produced in caves, shelters and open-air sites could be perceived by an audience gathered in these places (for example, Bourdier et al., 2017; Fairén Jiménez, 2007; Señorán Martín et al., 2014; Intxaurbe et al., 2022). However, in recent years, researchers have also employed audibility analyses to explore the acoustics of areas featuring prehistoric paintings and engravings (for example, Díaz-Andreu et al., 2017; Mattioli et al., 2019; García Atiénzar et al., 2022; González Vázquez et al., 2025).

In the realm of these audibility studies, our initial work on painted sites located in the Alicante Mountains (Spain) correspond to the first attempt to investigate audibility within a rock art landscape using GIS (Díaz-Andreu et al., 2017). In this archaeoacoustic research, the authors used the human voice (male, female and both together) and handclapping as a sound source, emitting the 'a' sound (as in mad) and applauding for approximately 5 seconds. Also, they used two whistles of different musical notes together (obtaining a fifth interval) and individually. These sounds were registered on an M-Audio Microtrack II portable digital recorder and, subsequently, the audio files were processed in Sonic Visualiser software. The data generated by these acoustic tests served as a reference to compare, through GIS, the audibility of sounds emitted in sites with macroschematic, Levantine and schematic rock art paintings, in order to determine at what level the propagation of sound across the landscape would have been relevant to the artists of these three rock art traditions. The findings indicated that schematic and Levantine painters exhibited a substantial interest in audibility within the broader landscape. Sounds emitted from these sites could be heard over an area ranging from 33 to 44 hectares for schematic sites and 20 to 39 hectares for Levantine shelters. In contrast, according to the data from this initial study, macroschematic artists did not seem particularly concerned with audibility, as the sounds generated in their sites were audible within a smaller area, spanning from 12 to 39 hectares (Díaz-Andreu et al., 2017: 199–202).

Recently, within the scope of the ERC Artsoundscapes project, the research in the Alicante Mountains was complemented with new visibility and audibility analyses on major sites (considered by local archaeologists as 'main sanctuaries') and secondary sites with macroschematic rock art (García Atiénzar et al., 2022). In the first place, a novel classification of macroschematic motifs, derived from an iconographic analysis, was undertaken, resulting in four primary motif types: anthropomorphic, zoomorphic, curvilinear geometric and minor motifs. Secondly, we analysed the spatial positioning of each rock art shelter, emphasizing the quantity and diversity of motifs within each shelter.

As a result, distinct distributions of specific motifs in particular areas were identified. In addition, distinct variations in the concentration of motifs, both in terms of the number of motifs and types in each rock art site, particularly in shelters that have been identified as so-called ‘sanctuaries’ by local archaeologists, were unveiled. Finally, a series of GIS analytical tools were employed to model both the visual and auditory perception experienced in and emanating from the macroschematic rock art shelters. To circumvent distortions noted in previous reconstructions conducted in similar contexts, a preliminary assessment of cartographic requirements was conducted. Addressing the visibility aspect, the GIS analysis methodology underwent refinement by incorporating additional factors such as visual field and range. The modelling used the Individual Distance Viewshed tool, as developed by Fábrega-Álvarez and Parceró-Oubiña (2019) for Esri ArcGIS 10.5. In the examination of sonority, variables associated with musicality were considered, drawing from archaeological and anthropological records. Additionally, technical aspects related to sound propagation in outdoor spaces were investigated. The GIS sound propagation study employed Sound Mapping Tools v.4.4 for Esri ArcGIS 10.5, developed by Reed, Boggs and Mann (Reed et al., 2012). This analytical approach facilitated the mapping of sensory-related aspects for each site, enabling a comprehensive cross-site comparative analysis. Consequently, this process led to the identification of intriguing patterns and distinctions.

The data obtained in this last study led the authors to nuance and rediscuss some aspects of their previous work (Díaz-Andreu et al., 2017). The new results showed that the main shelters exhibit a panoramic visibility at immediate and medium distances, and that the sounds produced in these sites propagate in a panoramic way through the immediate surroundings, while the visibility and the sound propagation from the secondary sites are more heterogeneous. Based on these results and the morphological features of the decorated shelters, García Atiénzar and his colleagues proposed that the main ‘sanctuaries’ were selected due to their ability to congregate a significant number of individuals, who could clearly see and hear any ritual activity carried out in these places (García Atiénzar et al., 2022: 94; see Figure 11.4). Such results highlight the potential of GIS not only as a tool to obtain quantitative data on perceptual aspects of the archaeological record, but also as a methodological resource that allows us to better understand the way in which prehistoric communities experienced the landscape in which they lived.

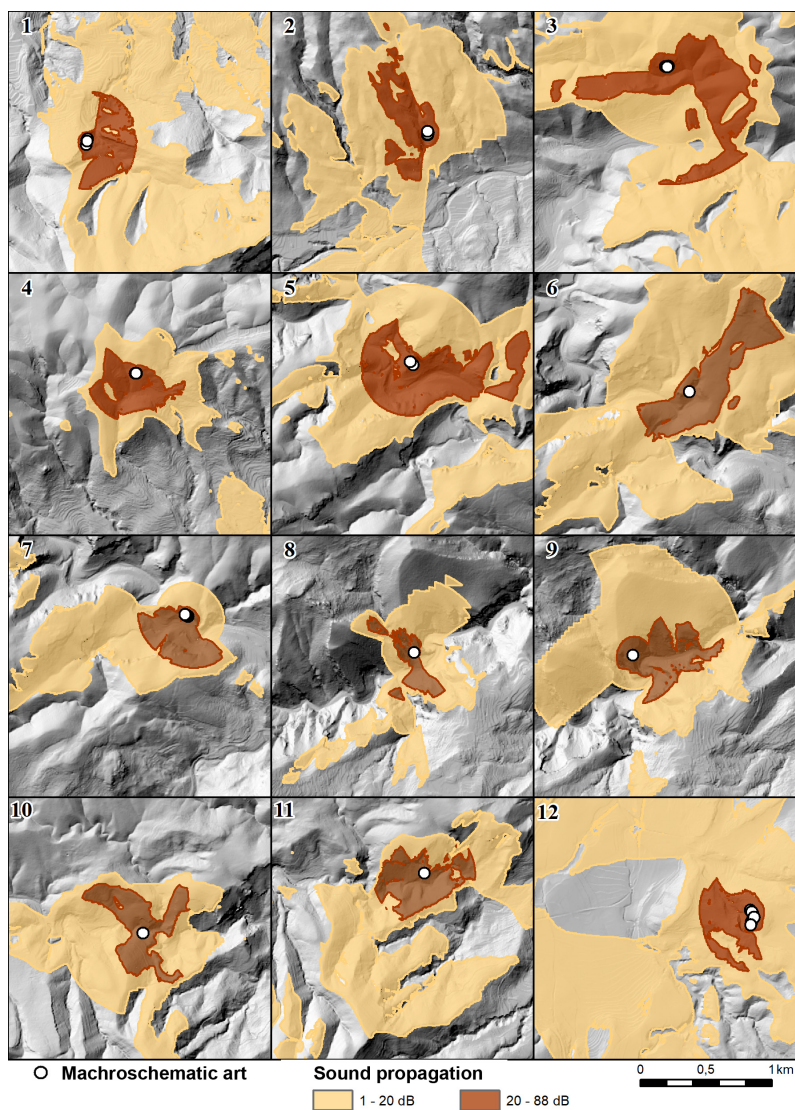


Figure 11.4 GIS model of sound propagation from sites with macroschematic rock art (numbering corresponds to sites in García Atiénzar et al., 2022: table 1). Source: García-Atiénzar et al., 2022 (figure 6).

Conclusion

This chapter has provided an overview of the experimental methodologies and approaches employed to investigate the acoustics of rock art sites and landscapes. The development of methods to measure the acoustic features at rock art sites has necessitated a retrospective examination of many projects since the 1960s. In summary, in the first fifty years of archaeoacoustic research on rock art sites, the field has evolved along several lines. Initially dominated exclusively by archaeologists (both professional and avocational) and individuals from related disciplines, there has been a continuous enhancement in the sophistication of methodologies. This evolution has resulted in the emergence, first in the 1990s but mainly from the 2010s, of interdisciplinarity, particularly through collaborative efforts between archaeologists and acoustical engineers. The field has evolved from a focus solely on searching for reverberation and echoes to, in the 2000s, incorporating measurements of sound pressure level and increased audibility. Since the 2020s, there has been a shift towards refining the search for specific parameters, applying the guidelines of room acoustics and utilising commonly available room acoustic measurement software tools. It is to be noted that in this period most of the research has taken place in Europe and North America.

After this general overview, the chapter has centred on the developments in the archaeoacoustics of rock art sites resulting from the Artsoundscapes project, mainly in the area of physical acoustics but also in the field of psychoacoustics and neuropsychology. Regarding the methodology used to register acoustic properties in the field at the University of Barcelona, over the last decade, the improvement of financial resources allowed that, from one project to the next, the technological advancements in the field of room acoustics were leveraged. In particular, the inclusion of psychoacoustics in the Artsoundscapes project made it imperative that, for the type of analyses that had been devised, looking at listeners' perception, further improvements were made. These related to the way spatial impulse responses were recorded in a manner that facilitated the use of auralizations for listening tests (Díaz-Andreu, 2019). Fieldwork in Baja California, Altai (Russia), South Africa and Spain has been alluded to, but we have not delved into how the data are interpreted from an archaeological point of view. It is worth mentioning briefly that our approach involves drawing insights from a range of related disciplines, including ethnohistory, ethnology, anthropology and musicology. Our published works include discussions

on what these sources reveal about the ritual practices in specific rock art areas (Díaz-Andreu et al., 2021), the likely interplay of rock art, music and storytelling (Díaz-Andreu et al., 2023), insights into how specific ethnic groups perceive and understand sound (Alarcón-Jiménez et al., 2021), and an exploration into why anthropologists at the turn of the twentieth century tended to overlook the study of music in anthropological publications (Alarcón-Jiménez et al., 2023). We have also provided an overview of musical practices in prehistoric Eurasia (Jiménez Pasalodos et al., 2021). Additionally, the project has expanded to incorporate techniques such as GIS for sound propagation analysis. This approach is currently under development and is expected to be among our main focuses in the near future.

In spite of the significant advancements achieved in the field of archaeoacoustics, there are still challenges to overcome. Every archaeoacoustic study of rock art sites must confront the inherent uncertainties in characterizing the acoustic properties of natural sites, which were not originally intended for such purposes. Moreover, the scarcity of evidence, regarding both the details of sonic-related activities held in them and the acoustic preferences of past societies, will always be a hurdle. The highlighted limitations underscore the importance of integrating multidisciplinary approaches and a wide range of methodologies. These will enable us to develop the most plausible hypotheses for exploration and will also inform the decision-making process that inevitably shapes the results to be obtained.

The novel data obtained by the Artsoundscapes project in different rock art landscapes around the world, in conjunction with the insights obtained from disciplines specialising in the study of human societies, has revealed the importance of taking into account sound as a fundamental element in archaeology's pursuit of a fresh ontological perspective when examining the past. The incorporation of sound and acoustics into archaeological research should become a standard practice, as it sheds light on essential cultural aspects previously considered beyond the reach of traditional archaeological methods.

Further than objectives focused on research questions, the recovered high-order ambisonics impulse responses (HOA IRs) open the possibility to create high-quality auralizations. The recovery of these audio materials enables a different kind of engagement with the sites, thereby bringing to life part of their – up to this moment, lost – intangible heritage. With this consideration in mind, the Artsoundscapes project makes the gathered acoustic data widely accessible through the repository of the University of Barcelona.¹³ Additionally, we have created

a multisensory map, for users to explore a selection of rock art sites not just visually but also sonically (Benítez and Alvarez-Morales, 2024).

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Notes

- 1 In general terms, an impulse response (IR) is a signal that describes how a linear time-invariant (LTI) system reacts to an impulse function. Considering our case study, an IR describes how the physical characteristics of a rock art site shape a sound emitted by a source placed at a particular position within that space, until it reaches a listener located at another specific position.
- 2 A lithophone is a percussion instrument made of stone and whose sound is produced by striking. In caves, a natural lithophone can be a speleothem, including stalagmites, stalactites and the geological formations of draperies or curtains.
- 3 EASERA: Electronic and Acoustic System Evaluation and Response Analysis. <https://www.afmg.eu/en/afmg-easera>.
- 4 Early decay time.
- 5 Speech transmission index.
- 6 Ambisonics is a surround sound recording technique based on spherical harmonics to encode and decode three-dimensional sound. HOA is an extension of ambisonics that increases the number of spherical harmonic orders, offering higher spatial resolution.
- 7 1st order ambisonics (already used in the SONART project) and 3rd order ambisonics differ, the latter having a higher degree of detail in the representation of the sound field.
- 8 A sine sweep is a sine function that gradually changes frequency over time. Typically, a sine sweep used for acoustic measurements spans the full audible frequency spectrum (from 20 Hz to 20 kHz). The duration and emission level of the test signal are tailored according to various factors: the anticipated reverberation conditions of the site being studied, environmental conditions during data collection, and the technical specifications of the equipment in use.
- 9 While it may appear trivial, portability in these cases is paramount, given that many of the sites are difficult to access, including those that require walking for hours through dense undergrowth and/or across steep terrain.
- 10 The MIMO script by Adriano Farina is publicly available in the GitHub platform, https://github.com/xorgol/MIMO_Matlab.
- 11 <https://plugins.iem.at/>. Accessed on 15 June 2023.
- 12 The spatial region on a site where listeners could have been located, considering each usage hypothesis linked to each sound-source position and the morphology of the space, such as slopes, terrain irregularities and so on.
- 13 <https://dataverse.csuc.cat/dataverse/artscoundscapes>.

References

- Alarcón-Jiménez, A. M., Jiménez Pasalodos, R. and Díaz-Andreu, M. (2021) 'Mapping with/in: Hearing power in Yokuts landscapes at the beginning of the twentieth century', *Ethnomusicology Forum*, 30(3): 379–96. <https://doi.org/10.1080/17411912.2021.1953392>.
- Alarcón-Jiménez, A. M., Jiménez Pasalodos, R. and Díaz-Andreu, M. (2023) 'A glimpse behind closed doors: Alfred L. Kroeber and the representation of Native Californian music', *History and Anthropology*, 34(3): 521–39. <https://doi.org/10.1080/02757206.2021.1983561>.
- Alvarez-Morales, L., Santos da Rosa, N., Benítez-Aragón, D., Fernández Macías, L., Lazarich, M. and Díaz-Andreu, M. (2023a) 'The Bacinete main shelter: A prehistoric theatre?', *Acoustics*, 5(1): 299–319. <https://doi.org/10.3390/acoustics5010018>.
- Alvarez-Morales, L., Santos da Rosa, N., Benítez-Aragón, D., Lazarich, M. and Díaz-Andreu, M. (2023b) 'Recovering the intangible acoustic heritage of rock art sites: El Tajo de las Figuras as a case study'. In *Immersive and 3D Audio: From architecture to automotive*. Bologna: University of Bologna, 1–7. <https://doi.org/10.1109/I3DA57090.2023.10289188>.
- Alvarez-Morales, L., Santos da Rosa, N., Benítez-Aragón, D., Lazarich, M. and Díaz-Andreu, M. (2023c) 'Acústica de recintos prehistóricos: Estudio arqueoacústico de Palomas I', *Tecniciástica. Cuenca 2023*. https://documentacion.sea-acustica.es/publicaciones/Cuenca23/Abs_95.pdf.
- Aparicio-Terrés, R. and Escera, C. (2024) 'Methodological approaches to understand the cognitive effects of music in ritualistic contexts: Implications for studying ancient ritual activities'. In M. Díaz-Andreu and N. Santos da Rosa (eds), *Exploring Ancient Sounds and Places: Theoretical and methodological approaches to archaeoacoustics*. Oxford: Oxbow, 99–122.
- Aparicio-Terrés, R., López-Mochales, S., Díaz-Andreu, M. and Escera, C. (2024) 'Assessing the relationship between neural entrainment and altered states of consciousness induced by electronic music'. bioRxiv. <https://doi.org/10.1101/2024.01.16.575849>.
- Astolfi, A., Bo, E., Aletta, F. and Shtrepi, L. (2020) 'Measurements of acoustical parameters in the ancient open-air theatre of Tyndaris (Sicily, Italy)', *Applied Sciences*, 10(16): 5680. <https://doi.org/10.3390/app10165680>.
- Benítez, D. and Alvarez Morales, L. (2024) 'Welcome to our multisensory map: A portal to the captivating world of Artsoundscapes!', *Artsoundscapes blog*, 26 (4 June). Accessed 29 January 2025. <https://www.ub.edu/artsoundscapes/multisensory-map/>.
- Benítez Aragón, D., Farina, A., Alvarez Morales, L. and Díaz-Andreu, M. (2023) 'ERC Artsoundscapes project: SIMO (single input multiple output) impulse responses processing'. In *CORA: Repositori de Dades de Recerca*, V1. <https://doi.org/10.34810/data629>.
- Bourdier, C., Fuentes, O. and Pinçon, G. (2017) 'Methodological contribution to the integrated study of European Palaeolithic rock art: The issue of the audience and the perceptibility of Roc-aux-Sorciers rock art (Angles-sur-l'Anglin, France)', *Quaternary International*, 430: 114–29.
- Bradley, J. S. (1986) 'Auditorium acoustics measures from pistol shots', *Journal of the Acoustical Society of America*, 80: 199–205.
- Condominas, G. (1952) 'Le lithophone préhistorique de Ndut Liang Krak', *Bulletin de l'École Française d'Extrême-Orient*, 45(2): 359–92.
- Cook, I. A., Pajot, S. and Leuchter, A. F. (2008) 'Ancient architectural acoustic resonance patterns and regional brain activity', *Time and Mind*, 1(1): 95–104.
- Dams, L. (1984) 'Preliminary findings at the "organ" sanctuary in the cave of Nerja, Málaga, Spain', *Oxford Journal of Archaeology*, 3(1): 1–14.
- Dauvois, M. and Boutillon, X. (1990) 'Etudes acoustiques au Réseau Clastres: Salle des peintures et lithophones naturels. Préhistoire, art et sociétés', *Bulletin de la Société Préhistorique de l'Ariège-Pyrénées*, 45: 175–86.
- Devereux, P. and Jahn, R. G. (1996) 'Preliminary investigations and cognitive considerations of the acoustical resonances of selected archaeological sites', *Antiquity*, 70: 665–6.
- Devereux, P., Krippner, S., Tartz, R. and Fish, A. (2007) 'A preliminary study on English and Welsh "sacred sites" and home dream reports', *Anthropology of Consciousness*, 18(2): 2–28.
- Díaz-Andreu, M. (2019) '10 months of Artsoundscapes: The who, the what and the when', *Artsoundscapes blog*, 1 (8 October). Accessed 4 October 2024. <https://www.ub.edu/artsoundscapes/10-months-of-artsoundscapes-the-who-the-what-and-the-when/>.
- Díaz-Andreu, M., García Atiénzar, G., García Benito, C. and Mattioli, T. (2017) 'Do you hear what I see? Analysing visibility and audibility through alternative methods in the rock art landscape of the Alicante mountains', *Journal of Anthropological Research*, 73(2): 181–213.

- Díaz-Andreu, M. and García Benito, C. (2012) 'Acoustics and Levantine rock art: Auditory perceptions in La Valltorta Gorge (Spain)', *Journal of Archaeological Science*, 39: 3591–9.
- Díaz-Andreu, M. and García Benito, C. (2013) 'Sound and ritual in Levantine art: A preliminary study'. In R. Jiménez Pasalodos, R. Till and M. Howell (eds), *Music and Ritual: Bridging Material and Living Cultures*. Berlin: Ekho Verlag, 227–56.
- Díaz-Andreu, M. and García Benito, C. (2015) 'Acoustic rock art landscapes: A comparison between the acoustics of three Levantine rock art areas in Mediterranean Spain', *Rock Art Research*, 32(1): 46–62.
- Díaz-Andreu, M., García Benito, C. and Lazarich, M. (2014) 'The sound of rock art: The acoustics of the rock art of southern Andalusia (Spain)', *Oxford Journal of Archaeology*, 33(1): 1–18. <https://doi.org/10.1111/ojoa.12024>.
- Díaz-Andreu, M., Gutiérrez Martínez, M. L., Mattioli, T., Picas, M., Villalobos, C. and Zubietta, L. F. (2021) 'The soundscapes of Baja California Sur: Preliminary results from the Cañón de Santa Teresa rock art landscape', *Quaternary International*, 572: 166–77. <https://doi.org/10.1016/j.quaint.2020.02.026>.
- Díaz-Andreu, M., Hameau, P. and Mattioli, T. (2019) 'Des sites à voir et à entendre: Les abris a motifs schématiques de la falaise de Baume Brune (Vaucluse)', *L'Anthropologie*, 123(1): 66–99. <https://doi.org/10.1016/j.anthro.2019.02.004>.
- Díaz-Andreu, M., Jiménez Pasalodos, R., Rozwadowski, A., Álvarez Morales, L., Miklashevich, E. and Santos da Rosa, N. (2023) 'The soundscapes of the Lower Chuya River area, Russian Altai: Ethnographic sources, indigenous ontologies and the archaeoacoustics of rock art sites', *Journal of Archaeological Method and Theory*, 30: 335–62. <https://doi.org/10.1007/s10816-022-09562-w>.
- Djordjevic, Z., Dragišić, M., Manzetti, M. C. and Novković, D. (2019) 'Digitization of acoustic heritage in a service of protection, research and promotion of European cultural heritage'. In H. Kremers (ed.), *Digital Cultural Heritage*. Cham: Springer, 433–47.
- Fábrega-Álvarez, P. and Parcerou-Oubiña, C. (2019) 'Now you see me: An assessment of the visual recognition and control of individuals in archaeological landscapes', *Journal of Archaeological Science*, 104: 56–74.
- Fagg, B. (1956) 'The discovery of multiple rock gongs in Nigeria', *Man*, 56: 17–18.
- Fagg, B. (1957) 'Rock gongs and rock slides', *Man*, 57: 30–2.
- Fairén Jiménez, S. (2007) 'British Neolithic rock art in its landscape', *Journal of Field Archaeology*, 32(3): 283–95.
- Farina, A. and Chiesi, L. (2016) 'Measuring spatial MIMO impulse responses in rooms employing spherical transducer arrays'. Paper presented at the UK Audio Engineering Society's Conference on Sound Field Control 2016, 18–20 July, Guildford, UK. <https://aes2.org/publications/elibrary-page/?id=18311>.
- Farina, A., Farina, A. and Armelloni, E. (2020) 'How we take acoustical measurements in the Artsoundscapes project, and how we got there', *Artsoundscapes blog*, 9 (12 June). Accessed 4 October 2024. <https://www.ub.edu/artscoundscapes/how-we-take-acoustical-measurements-in-the-artscoundscapes-project/>.
- Fazenda, B., Scarre, C., Till, R., Jiménez Pasalodos, R., Rojo Guerra, M., Tejedor, C., Ontañón Peredo, R., Watson, A., Wyatt, S., García Benito, C., Drinkall, H. and Foulds, F. (2017) 'Cave acoustics in prehistory: Exploring the association of Palaeolithic visual motifs and acoustic response', *Journal of the Acoustical Society of America*, 142: 1332–49. <https://doi.org/10.1121/1.4998721>.
- Gabucio, M. J., Bargalló, A., Saladié, P., Romagnoli, F., Chacón, M. G., Vallverdú, J. and Vaquero, M. (2023) 'Using GIS and geostatistical techniques to identify Neanderthal campsites at archaeolevel Ob at Abric Romaní', *Archaeological and Anthropological Sciences*, 15(3): 24. <https://doi.org/10.1007/s12520-023-01715-6>.
- Gaona, J. M., Rouleau, N., Caswell, J. M., Tessaro, L. W. E., Burke, R. C. and Schumacher, D. S. (2014) 'Archaeoacoustic investigation of a prehistoric cave site: Frequency-dependent sound amplification and potential relevance for neurotheology', *NeuroQuantology*, 12(4): 455–63.
- Garate, D., Intxaurbe, I. and Moreno-García, J. (2020) 'Establishing a predictive model for rock art surveying: The case of Palaeolithic caves in Northern Spain', *Journal of Anthropological Archaeology*, 60: 101231. <https://doi.org/10.1016/j.jaa.2020.101231>.

- García Atiénzar, G., Barciela González, V., Santos da Rosa, N. and Díaz-Andreu, M. (2022) 'La modelización del paisaje: Iconografía y percepciones visual y sonora en el arte rupestre macroesquemático', *Virtual Archaeology Review*, 13(27): 81–99. <https://doi.org/10.4995/var.2022.16998>.
- Glory, A. (1964) 'La Grotte du Roucadour (Lot)', *Bulletin de la Société Préhistorique Française. Comptes rendus des séances mensuelles*, 61(7): 166–9.
- Glory, A. (1965) 'Nouvelles découvertes de dessins rupestres sur le causse de Gramat', *Bulletin de la Société Préhistorique Française*, 62(3): 528–36.
- Goldhahn, J. (2002) 'Roaring rocks: An audio-visual perspective on hunter-gatherer engravings in Northern Sweden and Scandinavia', *Norwegian Archaeological Review*, 35(1): 29–61.
- González Vázquez, N., García Atiénzar, G., Santos da Rosa, N., Villalobos Acosta, C., Gutiérrez Martínez, M. de la L., and Díaz-Andreu, M. (2025) 'GIS, sight and sound: Exploring the rock art landscapes of the Santa Teresa Canyon (Baja California Sur, Mexico) as a case study'. *Digital Applications in Archaeology and Cultural Heritage*, 36: 1–17. <https://doi.org/10.1016/j.daach.2025.e00402>.
- Hak, C., Wenmaekers, R. and Luxemburg, L. C. J. v. (2012) 'Measuring room impulse responses: Impact of the decay range on derived room acoustic parameters', *Acta Acustica United with Acustica*, 98: 907–15.
- Heizer, R. F. (1953) 'Sacred rain rocks of Northern California', *University of California Archaeological Survey Reports*, 22: 33–58.
- Intxaurbe, I., Garate, D., Arriolabengoa, M. and Medina-Alcaide, M. Á. (2022) 'Application of line of sight and potential audience analysis to unravel the spatial organization of Palaeolithic cave art', *Journal of Archaeological Method and Theory*, 29: 1158–89.
- ISO 3382-1 (2009) *Acoustics: Measurement of room acoustic parameters. Part 1: Performance spaces*. Geneva: International Organization for Standardization.
- ISO 3382-2 (2008) *Acoustics: Measurement of room acoustic parameters. Part 2: Reverberation time in ordinary rooms*. Geneva: International Organization for Standardization.
- Jiménez Pasalodos, R., Alarcón Jiménez, A. M., Santos da Rosa, N. and Díaz-Andreu, M. (2021) 'Los sonidos de la prehistoria: Reflexiones en torno a las evidencias de prácticas musicales del paleolítico y el neolítico en Eurasia', *Vínculos de Historia*, 10: 17–37. <https://doi.org/10.18239/vdh.2021.10.01>.
- Jones, A. M. (2017) 'Rock art and ontology', *Annual Review of Anthropology*, 46: 167–81.
- Jordan, P. (2020) 'Sound experience in archaeology and field investigations: An approach to mapping past activities through sound at Mount Lykaion's Sanctuary of Zeus', *KLEOS: Amsterdam Bulletin of Ancient Studies and Archaeology*, 3: 9–30.
- Jordan, P. (2023) 'Employing psychoacoustics in sensory archaeology: Developments at the Ancient Sanctuary of Zeus on Mount Lykaion', *Open Archaeology*, 9(1): 20220329. <https://doi.org/10.1515/opar-2022-0329>.
- Kolar, M. (2013) 'Tuned to the senses: An archaeoacoustic perspective on Ancient Chavín', *The Appendix*, 1(3). Accessed 15 October 2024. <https://theappendix.net/issues/2013/7/tuned-to-the-senses-an-archaeoacoustic-perspective-on-ancient-chavin>.
- Kolar, M. A. (2017) 'Sensing sonically at Andean Formative Chavín de Huántar, Perú', *Time and Mind*, 10(1): 39–59.
- Kolar, M. A., Covey, R. A. and Cruzado Coronel, J. L. (2018) 'The Huánuco Pampa acoustical field survey: An efficient, comparative archaeoacoustical method for studying sonic communication dynamics', *Heritage Science*, 6: 39.
- Lamothe, M. J. R. and Bradley, J. S. (1985) 'Acoustical characteristics of guns as impulse sources', *Canacoustisc*, 13(2): 16–24.
- Lewis-Williams, J. D. (1991) 'Wrestling with analogy: A methodological dilemma in Upper Palaeolithic art research', *Proceedings of the Prehistoric Society*, 57: 149–62.
- López-Mochales, S., Alvarez-Morales, L., Santos da Rosa, N., Díaz-Andreu, M. and Escera, C. (2023b) 'Psychoacoustics of rock art sites: The case study of the shelters Diosa I and Horadada (Cádiz, Spain)'. In *2023 Immersive and 3D Audio: From architecture to automotive (I3DA)*. Bologna: IEEE, 1–8. <https://doi.org/10.1109/I3DA57090.2023.10289519>.
- López-Mochales, S., Aparicio-Terrés, R., Díaz-Andreu, M. and Escera, C. (2023a) 'Acoustic perception and emotion evocation by rock art soundscapes of Altai (Russia)', *Frontiers in Psychology*, 14: 1188567. <https://doi.org/10.3389/fpsyg.2023.1188567>.

- López-Mochales, S., Aparicio, R., Valenzuela, J. and Escera, C. (2020) 'ImmpaLAB: Immersive psychoacoustic laboratory', *Artsoundscapes blog*, 13. Accessed 29 January 2025. <https://www.ub.edu/artsoundscapes/immpalab-immersive-psychoacoustic-laboratory/>.
- López-Mochales, S. and Jiménez Pasalodos, R. (2021) 'The Artsoundscapes research lines in psychoacoustics, neuropsychology and ethnomusicology working together', *Artsoundscapes blog*, 18 (15 December). Accessed 4 October 2024. <https://www.ub.edu/artsoundscapes/the-artsoundscapes-research-lines-in-psychoacoustics-neuropsychology-ethnomusicology-working-together/>.
- López-Mochales, S., Jiménez Pasalodos, R., Alvarez-Morales, L. and Díaz-Andreu, M. (2024) 'Artsoundscapes Project: Repository of anechoic sounds'. <https://doi.org/10.5281/zenodo.11046468>.
- López-Mochales, S., Lokki, T., Díaz-Andreu, M. and Escera, C. (2023c) 'Psychoacoustic study of the rock art sites of Cuevas de la Araña (Bicorp, Spain)', *Conference on Sound Perception, 1–3 September: Book of abstracts*. Poznań: Adam Mickiewicz University, 248–50.
- Manaud, O. and Barrandon, C. (2014) "'Echo-graphie" intérieure du cairn de Gavrinis: Etude exploratoire des caractéristiques acoustiques et lecture symbolique'. Overblog. <https://lespierresquichantent.over-blog.com/2014/10/echo-graphie-du-cairn-de-gavrinis.html>.
- Manthravadi, U. (2022) 'On how I become an acoustic archaeologist'. In U. Manthravadi (ed.), *An Archaeology of Listening: A slightly curving place*. Berlin: Archive Books, 25–94.
- Maschner, H. (1996) 'Geographical information system'. In B. Fagan (ed.), *The Oxford Companion to Archaeology*. Oxford: Oxford University Press, 248–50.
- Mattioli, T. and Díaz-Andreu, M. (2017) 'Hearing rock art landscapes: A survey of the acoustical perception in the Sierra de San Serván area in Extremadura (Spain)', *Time and Mind*, 10(1): 81–96. <https://doi.org/10.1080/1751696X.2016.1267919>.
- Mattioli, T., Farina, A., Armelloni, E., Hameau, P. and Díaz-Andreu, M. (2017) 'Echoing landscapes: Echolocation and the placement of rock art in the Central Mediterranean', *Journal of Archaeological Science*, 83: 12–25. <https://doi.org/10.1016/j.jas.2017.04.008>.
- Mattioli, T., García Atiénzar, G., Barciela González, V. and Díaz-Andreu García, M. (2019) 'Escuchar con los ojos: La aplicación del GIS al estudio del campo visual y sonoro en los paisajes de arte rupestre de la montaña alicantina'. In G. García Atiénzar and V. Barciela González (eds), *Sociedades prehistóricas y manifestaciones artísticas: Imágenes, nuevas propuestas e interpretaciones*. Alicante: Instituto Universitario de Investigación en Arqueología y Patrimonio Histórico de la Universidad de Alicante (INAPH), 285–302.
- Mendez-Quintas, E., Panera, J., Altamura, F., Di Bianco, L., Melis, R. T., Piarulli, F., Ruta, G. and Mussi, M. (2019) 'Gombore II (Melka Kunture, Ethiopia): A new approach to formation processes and spatial patterns of an Early Pleistocene Acheulean site', *Journal of Archaeological Science*, 108: 104975.
- Menéndez-Marsh, F., Al-Rawi, M., Fonte, J., Dias, R., Gonçalves, L. J., Seco, L. G., Hipólito, J., Machado, J. P., Medina, J., Moreira, J., Do Pereiro, T., Vázquez, M. and Neves, A. (2023) 'Geographic information systems in archaeology: A systematic review', *Journal of Computer Applications in Archaeology*, 6(1): 40–50. <https://doi.org/10.5334/jcaa.104>.
- Moreno Iglesias, D., Álvarez-Morales, L., Santos da Rosa, N. and Díaz-Andreu, M. (2022) 'Arte Rupestre: Una perspectiva desde los paisajes sonoros'. In *TecnAcústica Elche 2022: 53rd Congreso Español de Acústica y XII Congreso Ibérico de Acústica*. Madrid: Sociedad Española de Acústica, 263–72. Article: <https://www.sea-acustica.es/wp-content/uploads/2020/08/2022-Tecn-Elche-Publicacion-Congreso.pdf>. Dataset: <https://doi.org/10.34810/data863>. Accessed 29 January 2025.
- Navas-Reascos, G., Alonso-Valerdi, L. M. and Ibarra-Zarate, D. I. (2023) 'Archaeoacoustics around the world: A literature review', *Applied Sciences*, 13(4): 2361.
- Ouzman, S. (1998) 'Towards a mindscape of landscape: Rock-art as expression of world-understanding'. In C. Chippindale and P. S. C. Taçon (eds), *The Archaeology of Rock-Art*. Cambridge: Cambridge University Press, 30–41.
- Pätynen, J., Katz, B. F. G. and Lokki, T. (2011) 'Investigations on the balloon as an impulse source', *Journal of the Acoustical Society of America*, 129(1): EL27–33.
- Primeau, K. (2022) 'A GIS Approach to Landscape Scale Archaeoacoustics'. PhD thesis, State University of New York, Albany.
- Rainio, R., Lahelma, A., Äikäs, T., Lassfolk, K. and Okkonen, J. (2014) 'Acoustic measurements at the rock painting of Värkallio, Northern Finland'. In L. C. Eneix (ed.), *Archaeoacoustics: The*

- archaeology of sound. *Publication of proceedings from the 2014 conference in Malta*. Myakka City, FL: OTS Foundation, 141–52.
- Rainio, R., Lahelma, A., Äikäs, T., Lassfolk, K. and Okkonen, J. (2018) 'Acoustic measurements and digital image processing suggest a link between sound rituals and sacred sites in northern Finland', *Journal of Archaeological Method and Theory*, 25: 453–74.
- Reed, S. E., Boggs, J. L. and Mann, J. P. (2012) 'A GIS tool for modeling anthropogenic noise propagation in natural ecosystems', *Environmental Modelling & Software*, 37: 1–5.
- Reznikoff, I. (1995) 'On the sound dimension of prehistoric painted caves and rocks'. In E. Taratsi (ed.), *Musical Signification*. Berlin: Mouton de Gruyter, 541–57.
- Reznikoff, I. (2006) 'The evidence of the use of sound resonance from Palaeolithic to Medieval times'. In C. Scarre and G. Lawson (eds), *Archaeoacoustics*. Cambridge: McDonald Institute for Archaeological Research, 7–84.
- Reznikoff, I. and Dauvois, M. (1988) 'La dimension sonore des grottes ornées', *Bulletin de la Société Préhistorique Française*, 85: 238–46.
- Richards-Rissetto, H., Primeau, K. E., Witt, D. E. and Graham, G. (2023) 'Multisensory experiences in archaeological landscapes: Sound, vision, and movement in GIS and virtual reality'. In G. Landeschi and E. Betts (eds), *Capturing the Senses: Digital methods for sensory archaeologies*. Cham: Springer, 179–210.
- San Martín, R., Arana, M., Machín, J. and Arregui, A. (2013) 'Impulse source versus dodecahedral loudspeaker for measuring parameters derived from the impulse response in room acoustics', *Journal of the Acoustical Society of America*, 134(1): 275–84.
- Santos da Rosa, N., Alvarez Morales, L., Martorell Briz, X., Fernández Macías, L. and Díaz-Andreu García, M. (2023) 'The acoustics of aggregation sites: Listening to the rock art landscape of Cuevas de la Araña (Spain)', *Journal of Field Archaeology*, 48(2): 130–43. <https://doi.org/10.1080/00934690.2022.2134964>.
- Santos da Rosa, N., Alvarez-Morales, L., Moreno Iglesias, D., Laue, G. and Díaz-Andreu, M. (2025) 'On the relationship between sound, acoustics, and San rock art: An archaeoacoustic study at twenty-seven sites in the Maloti-Drakensberg mountains (South Africa)', *Journal of Archaeological Science: Reports*, 61: 104900. <https://doi.org/10.1016/j.jasrep.2024.104900>.
- Santos da Rosa, N., Ramos, J., Campos, J. B. and Zocche, J. J. (2018) 'Entre satélites e pedras lascadas: A utilização do geoprocessamento na identificação de áreas de potencial arqueológico'. In N. I. Ladwig and H. Schwalm (eds), *Planejamento e Gestão Territorial: A sustentabilidade dos ecossistemas urbanos*. Criciúma: EdUnesc, 381–402.
- Señorán Martín, J. M., De la Presa, P., Ruiz-Gálvez Priego, M. and De Torres Rodríguez, J. (2014) 'Connecting data: GIS and the human history of the Oukaïmeden Valley', *Complutum*, 25(2): 211–25.
- Till, R. (2020) 'Sound archaeology: A study of the acoustics of three World Heritage sites, Spanish prehistoric painted caves, Stonehenge, and Paphos Theatre', *Acoustics*, 1(3): 661–9.
- Vaitl, D., Birbaumer, N., Gruzelier, J., Graham, A. J., Kotchoubey, B., Kübler, A., Lehmann, D., Miltner, W. H. R., Ott, U., Pütz, P., Sammer, G., Strauch, I., Strehl, U., Wackermann, J. and Weiss, T. (2005) 'Psychobiology of altered states of consciousness', *Psychological Bulletin*, 131(1): 98–127. <https://doi.org/10.1037/0033-2909.131.1.98>.
- Valenzuela, J., Díaz-Andreu, M. and Escera, C. (2020) 'Psychology meets archaeology: Psychoarchaeoacoustics for understanding ancient minds and their relationship to the sacred', *Frontiers in Psychology*, 11: 550794. <https://doi.org/10.3389/fpsyg.2020.550794>.
- Vitebsky, P. (2001) *Shamanism*. Norman: University of Oklahoma Press.
- Vorländer, M. (2008) *Auralization*. Cham: Springer.
- Waller, S. J. (1993) 'Sound reflection as an explanation for the content and context of rock art', *Rock Art Research*, 10: 91–101.
- Waller, S. J. (2000) 'Spatial correlation of acoustics and rock art in Horseshoe Canyon', *American Indian Rock Art*, 24: 85–94.
- Waller, S. J. (2002) 'Rock art acoustics in the past, present and future', *1999 IRAC Proceedings*, 2: 11–20.
- Waller, S. J. (2003) 'Conservation of rock art acoustics: "Unexpected" echoes at Petroglyph National Monument'. In *Rock Art Papers 16*. San Diego Museum of Man, 31–8.
- Waller, S. J. and Arsenault, D. (2008) 'Echo spirits who paint rocks: Memegwashio dwell within echoing rock art site EIGf-2', *American Indian Rock Art*, 34: 191–201.
- Waller, S. J., Lubman, D. and Kiser, B. (1999) 'Digital acoustic recording techniques applied to rock art sites', *American Indian Rock Art*, 25: 179–90.

More than one can see: aural and visual experience inside the Etruscan painted tomb space at the Necropoli dei Monterozzi, Tarquinia, Italy

Jacqueline Ortoleva

Pre-Roman Etruria played a dynamic socio-political role in the ancient Mediterranean during the first millennium BCE. Etruria was also a profoundly sonic society, with its reverence for auditory experiences ranging from divination practices based on bird song, to thunder and music (Cicero, 1923, *De Divinatione* 2.38.80; Sarti, 2010). There is a variety of figurative and archaeological representations of such aural experiences in the Etruscan record. Fragments from instruments, such as double pipes, as well as intact rattles, *litui* (trumpets), bells and an intact cornu have been discovered in various Etruscan contexts (Sarti, 2010). This sonic focus is perhaps best illustrated inside Etruscan painted tombs, where figurative paintings of musicians, dancers and other figures visually represent different auditory experiences (Figure 12.1). In fact, musical themes account for the second most common figurative narrative in Etruscan tomb paintings, with only banqueting scenes more commonly depicted (Steingraber, 1986). Steingraber has suggested that the depiction of dancers and musicians metaphorically symbolizes Etruscan banquets. I argue that banqueting scenes may instead symbolize the importance of musical experience in funerary contexts and the role music may have served in contributing to ancestral cult during the interment process.

Traditionally, visual interpretations of Etruscan painted tombs have been theorized with remarkably little consideration of sound. Only recently have scholars begun to consider the importance of aural experience when assessing Etruscan painted tombs (Maras, 2016; Ortoleva, 2021). One must note here that human audition does not occur



Figure 12.1 The Tomba dei Demoni Azzurri, showing a procession scene with double pipes and cylinder kithara musicians. *Source:* Ortoleva, 2023a, figure 12.

in a bubble. Instead, auditory experience is perceived together with other sensory percepts, involving vision, touch, olfaction and so forth (Sugiyama et al., 2018). Vision has often been postulated, in neuroscience, as greatly influencing other sensory experiences (Guttman et al., 2005; Van Rullen et al., 2014). This leads us to a series of questions regarding depictions of musical performance inside painted tombs. Firstly, springing from recent studies which have demonstrated that some Etruscan painted tombs exhibit lengthy reverberation times and echoes (Ortoleva, 2021; 2022; 2023a), are tomb paintings which depict musical sound demonstrative of, or perhaps even connected to, the tomb's acoustic nature? Did the tomb's acoustics influence where certain figurative depictions of music and dance are painted? No painted tomb in Etruria has ever been discovered intact. Indeed, even intact unpainted tombs are extremely rare across central Italy. Consequently, our understanding of the funerary process inside the painted tomb is extremely limited. Therefore, can a study that considers the acoustic qualities of tomb spaces with paintings depicting musical performance assist in further elucidating bodily movement inside the Etruscan tomb? In terms of sensory perception, if a larger portion of the brain is allocated to vision, as is typically postulated in modern neuroscience, does this mean that tomb paintings of music and dance affected how the painted tomb was auditorily perceived (Repp and Penel, 2002; Guttman et al., 2005)?

Or did auditory experiences inside the tomb have the ability to shape how paintings of dancers and musicians were visually perceived?

This chapter addresses these questions by exploring the depiction of music, inside the Etruscan painted tomb space, from the perspective of sound, bodily movement and auditory experience. Data from acoustic fieldwork involving 11 painted tombs in Tarquinia, Italy, are presented (Figure 12.2). Sound propagation, stimulated inside the painted tomb via digitized and live musical performance of commonly depicted instruments in Etruscan iconography, is of focus. Ultimately, the visual representation and significance of musical performance inside the painted tomb is uniquely juxtaposed with the acoustic qualities of illustrated instruments and thematic scenes. Clues emerge, related to the commonality and potential religious importance of musical performance inside the Etruscan painted tomb space, as does information related to the extended tradition of constructing painted tombs in Tarquinia, Italy, while more limited in other areas of Etruria, even those colonized much later than Tarquinia.

The study contributes to studies involving wall paintings in other Mediterranean and non-Mediterranean contexts, while inviting debate regarding the unique role that figurative iconography may have served, as a representation of aural and visual experience involving musical performance. The first step in connecting the extraordinary paintings inside Etruscan painted tombs with auditory experience begins with an exploration regarding the importance of sound across regions and contexts.

History and scholarship involving the Etruscan painted tomb in Tarquinia, Italy

Etruscan painted tombs provide the most extensive record of figurative paintings in the ancient Mediterranean. Depictions of musicians, dancers, banqueters and other images are painted on the walls and ceilings of a subset of burial chambers in central Italy (Figure 12.1). Initially developing during the early seventh century BCE in the Etruscan regions of Veii and Cerveteri, tomb paintings subsequently developed across other Etruscan regions of central Italy with the bulk culminating in Tarquinia.¹ Wall paintings in Tarquinia were largely included inside subterranean tripartite tombs with one or more burial chambers, a single entrance and a long entrance corridor (dromos) leading to a subterranean burial chamber (see Figure 12.3). Many painted chambered tombs in

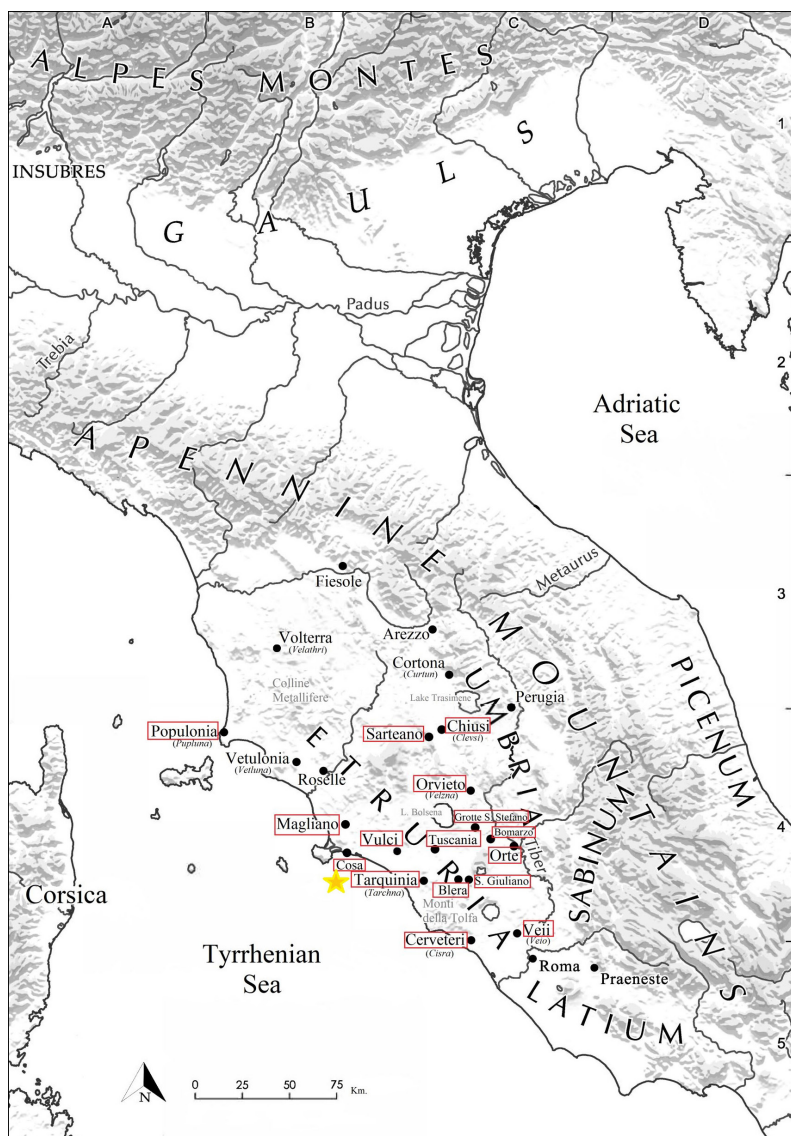


Figure 12.2 Map identifying the sites of all known painted tombs in Central Italy, marked in red, with Tarquinia, the area of focus for this chapter, marked with a star. Map: C. S. Ortoleva. *Source:* Ortoleva, 2023a, figure 1.

Tarquinia were also originally capped by large tumuli.² All painted tombs in Etruria and indeed, the majority of unpainted Etruscan tombs, were either extensively looted and/or subjected to early inferior excavations. Moreover, no Etruscan texts (nor secondary textual sources) survive

describing an Etruscan funeral. The lack of intact funerary contexts and textual sources, as well as the oversaturation of funerary objects (most without context), have led scholars to focus on funerary iconography or epigraphic and typographic analyses, to better understand tomb activities.

Although the exact number of mourners inside each chamber during the interment is unknown, scenes depicting the prothesis, or laying out of the dead (presumably not conducted inside the tomb itself), depict an average of three to five funerary practitioners (Taylor, 2011). The underlying function of tomb structures are crucial to consider because they can shed light on spatial movement during the internment, as tied to postmortem ritual. The internal structure of chambered tombs changed towards the end of the sixth century BCE. Previously uncommon multi-chambered tombs became almost nonexistent, to be replaced by large single chambers with benches lining the walls (Steingraber, 1986). The size of the tomb was not the only adaptation among chambered tombs. They now included loculi, large niches carved from the burial chamber (and less commonly, entrance corridor walls), presumably to house the cloth-wrapped corpse (Weber-Lehmann, 2007). Fosse (trench) burials also emerged during the fifth century BCE inside the Tomba Bettini, c. 450 BCE. Here, the deep trenches that dominate the rear-left walls of the chamber recall earlier fosse burials, as well as stone sarcophagi, which also emerged in Etruria during the fifth century BCE. Although the structural nature of Etruscan painted tombs remains largely intact, the corpus of figurative paintings has led much of the scholarship involving the tombs.

The rarity and preservation status of painted tombs led to a variety of surveys documenting tomb paintings throughout the twentieth century (Pallottino, 1937; 1955; Romanelli, 1948).³ The most common thematic approach to tomb paintings involves social organization, with scholars presenting the paintings as symbolic of gender, status and the general identity of the deceased (Weber-Lehmann, 1985; 1986; Cristofani, 1975; 1987; Colonna and Colonna di Paolo, 1997; Maggiani, 2005; Bonfante, 1981). Torelli (1983), Serra Ridgway (2004) and others have focused on the overall meaning of specific motifs, such as illustrated doors, as related to the spatial layout of the tomb space. Others have approached the paintings from a more anthropological perspective, although one might argue that such studies have sometimes resulted from an overreliance on Greek and Roman textual sources (for example, see Brandt, 2015; 2020). As early as the late twentieth century, scholars progressively began to move beyond traditional boundaries in

Etruscan scholarship, to consider more bodily and sensory approaches to the Etruscan record (Torelli, 1983; 1999; Izzet, 2007; Warden, 2009; 2011; 2018; Stoddart, 2009; Taylor, 2011; 2014; 2020; Brandt, 2020; Pernigotti, 2021; Ortoleva, 2023b; Giorgi et al., 2023; LoPiano, Chapter 13, this volume). Such analyses have begun to contemplate the sonic implication of burial objects and spaces. For example, Maras (2016) recently noted, with respect to fragments of tortoise shells discovered inside the burial chamber of the Tomb of the Blue Demon, that the fragments could attest to the presence of one or more *chelys lyres* (a lyre made with a tortoise shell serving as the instrument's sound box), hence its Greek name (Maras, 2016: 171). Maras' suggestion is crucial because it emphasizes the auditory potential of material remains, particularly inside the underground tomb space. This study contributes to this trajectory with the goal of investigating visual depictions of musical performance inside the painted tomb space, from an acoustic and bodily perspective. Such an aim is guided by the importance of sound throughout ancient Etruria.

Significance of sound and music in Etruria

Etruscan iconography and Greek, Roman and Early Christian texts attest to the observance of multiple different sounds throughout Etruscan regions (Cicero, 1923, *De Divinatione* 2.38.80; Seneca, 1971, *Naturales Quaestiones* 2.32.2). Perhaps one of the most discussed aspects of the Etruscan religion relates to the observation of natural phenomena such as bird calls and thunder. Latin texts describe such rituals in detail (Cicero, 1923, *De Divinatione* 1.41.92; 2.38.80; Ovid, 1931, *Fasti* 4.812–18; Livy, 1924, 1.34.3–10) and Etruscan imagery often seems to portray these traditions in figurative narratives (Maras, 2016). Among funerary media in Etruria, including tomb paintings, bronze mirrors, cinerary urns and cippi, the illustration of music and dance perhaps most clearly represents sound (Jannot, 1979; Iozzo, 2009; Huntsman, 2014). Dancers, often shown with accompanying musicians, are routine figures in late sixth–fourth century BCE tomb paintings (first emerging during the sixth century BCE), particularly in Tarquinia (Martinelli, 2007).

Oft illustrated instruments include different incarnations of the lyre, hence the *chelys lyre*, another lyre made with a wooden sound box, the cylinder *kithara*, and although rare, the concert *kithara*. Aerophone instruments include the most commonly depicted instrument in the Etruscan funerary record, the double pipes, comparable to the

Greek aulos and Roman tibia. Another aerophone, a long trumpet-like instrument, known as a lituus, is depicted as part of procession scenes in tomb paintings. Other instruments, such as castanets and rattles are also depicted (Jannot, 1974; 1979; Carrese, 2010; Li Castro and Scardina, 2011; Li Castro, 2017).

Instruments made from wood have never been found in burial contexts due to the fragility of such materials. Moreover, the inferior nature of early 'excavations' calls into question whether such material was indeed present, and simply thrown away (Lawrence, 1992). This is supported in the fact that plectra, which were made from bone and used to play chordophone instruments, have indeed been found in seventh-century burial contexts, in areas such as Cerveteri and Tarquinia (Petrizzi, 1986; Cataldi Dini, 1986; 1993; Rizzo, 1987). Other components of Etruscan musical instruments involve animal remains.

As noted, fragments of tortoise carapaces, used to create the sound box of chelys lyres, were discovered in the Tomba dei Demoni Azzurri (Adinolfi et al., 2005, 435; Ortoleva, 2023a). Tortoise fragments have also been discovered in multiple sanctuary settings in Etruria, where music would have been present, including Tarquinia, Veii and Pyrgi. Unlike the painted tombs, the sanctuaries have been more recently (hence, scientifically) excavated (Sorrentino, 2013: 217). Although rarely depicted in Etruscan art, metal aerophone instruments, such as the lituus and cornu, have also been found, *in situ*, in funerary and votive deposits in Tarquinia, Tuscania, Cortona and Populonia (Bonghi Jovino, 1987; 2001; Bonghi Jovino and Chiaramonte Treré, 1997). This further suggests that musical instruments were used in burial events and likely performed inside, and outside, of Tarquinian painted tombs.

It must be emphasized here that ancestral cult performed at funerary sites was a common practice throughout Etruria (Damgaard Anderson, 1997). So much so that scholars have suggested that some tombs may have been considered sacred and thus akin to a temple setting (Rouveret, 1974; Warden, 2008; Camporeale, 2009). Altars were erected inside some tombs and some tombs were climbed, to enact ritual on top (Bruni, 2009). In Tarquinia, altars were constructed inside some painted tombs and there is also evidence of climbing the tomb to enact ritual, and music would have been a part of such practices (Linington, 1980; Prayon, 2010). Musical performance, whether depicted in figurative portrayals or represented in material remains, is not only visually significant because of its commonality and potential religious significance, but also because of its auditory potential, particularly inside the underground tomb space. Recent studies of various Etruscan painted tombs, by this

author, have resulted in an extensive amount of acoustic data attesting to the ability of some tombs in Tarquinia to greatly amplify and adapt certain sounds (Ortoleva, 2021; 2022; 2023a). Yet, these results have never been connected with figurative depictions of musical performance inside the tomb space. The present discussion draws on acoustic data, collected as part of fieldwork conducted in central Italy in 2019, to thus consider such visual images through the lens of auditory perception.

A sensory approach to the Etruscan painted tomb

Modern neuroscientists postulate that approximately two-thirds of the brain performs either a primary or associative role in the processing of visual data (Hodgson, 2003; Malafouris, 2007). However, acknowledging the cerebral structures that allow one to visually perceive the world does not necessarily negate the importance of considering the material record from nonvisual perspectives. In fact, I argue that it supports a line of enquiry that considers sensory integration. Sensory perception does not occur without cross-percept interactions. Instead, sensory perception is very similar to an orchestral performance, where different instruments work together to enhance (or at times, negate) different musical tones.

Recent studies in cognitive science, neuroscience and experimental psychology have convincingly demonstrated that the interplay between vision and audition is much more nuanced than traditionally believed. One such study by Guttman et al. (2005) found that some ‘cross-coding’ seems to occur with visual and auditory sensory constructs. In the series of experiments conducted by Guttman, not only was auditory data found to be influential in terms of temporal perception, but the visual system actually seemed to *rely* on auditory temporal data to ‘see’ temporal changes. This phenomenon suggests that the allocation of brain structures to process visual data does not necessarily mean that vision influences audition. In fact, both senses seem to provide primary information that ultimately results in a sensorily perceived reality. If applying these results to the Etruscan painted tomb, vision may be seen as guiding the tomb experience, when funerary participants solely observed the burial chamber or another participant moving inside the tomb. Yet, when funerary observers moved, auditory stimuli would have become more influential than visual cues. A study that considers how sound worked together with tomb paintings explores this in more detail. The collection of data inside the assessed tombs began with an

acoustic survey conducted at 11 tombs in the necropolis of Monterozzi in Tarquinia, Italy.

Acoustic survey

The acoustic fieldwork conducted for the present study was performed in Tarquinia and data involving 11 tombs are discussed in this chapter (Table 12.1). The preservation status of painted tombs in Tarquinia varies drastically, depending on the age and history of the tomb space. For example, as mentioned, looting is well documented across central Italy and unfortunately this and early ‘excavations’, which were conducted with very little scientific rigour, further contributed to the decline of tomb paintings. Today, a multitude of issues continue to affect the preservation status of tomb paintings, particularly humidity levels inside the tombs (Steingraber, 1986; 2006; 2014; Naso, 1996; Marzullo, 2017; 2018; Ortoleva, 2021; 2023a). The fragile nature of the paintings limited the amount of time the present researchers were allowed inside the assessed burial chambers, where all tomb paintings are located. As such, each chamber had to be acoustically *and* photographically documented for subsequent photogrammetric models within a 15–20-minute time period. One must further note here that many of the assessed tombs are not accessible to the general public. Therefore, upon entering the tombs, there was a lack of natural light, many insects, and slippery steps leading down, anything from four to fourteen metres underground, to each burial chamber.

Acoustic methodology

The acoustic survey assessed the acoustics of the interior tomb space, using live music and digital recordings. In terms of the digitalization protocol, as part of preparation for the fieldwork, a digital audio track was created, to be played inside each tomb, to document how each tomb acoustically responded to sound. A review of the types of instruments that are shown in tomb paintings led to the inclusion of short musical clips, recorded in exterior settings, of a *lituus* (a bronze aerophone instrument), *kithara* (a chordophone instrument; Figure 12.1), another double aerophone instrument typically made from wood or bone (double pipes; Figure 12.1), and lastly, a female singing a cappella. A live musician was also used, as part of a second acoustic

survey, in which another chordophone instrument, the lyre, commonly depicted in Etruscan tomb paintings, was played inside the tombs. The acoustic response of the tombs to a series of four human handclaps were also documented, to assess reverberation inside the tomb space. The use of four claps enhanced the underlying reliability of the resulting acoustic measurements.

The digital audio track was projected from two to five locations (sound sources identified as SS1, SS2 and so forth; see [Figure 12.3](#)) inside each burial chamber and corresponding dromos. Notably, some dromoi varied in length, measuring between 3.9 and 14.3 metres. The sound-source positions were identified in areas of the tomb where funerary participants would have gathered. Hence, two places inside each dromos were identified as ‘Sound Source One’ (SS1) and ‘Sound Source Two’ (SS2). Sound source one was placed at the top of the dromos ([Figure 12.3](#)). The second sound source (SS2) was placed inside each dromos in the small vestibule-like area separating each dromos from the burial chamber’s entrance. The consistency of sound source placements allowed for comparison across different tombs.

A BOSE loudspeaker (model IPX7) was chosen for its acoustic clarity, particularly considering its cost effectiveness and portable nature, which was necessary because of the brevity of the acoustic survey. The BOSE device reproduces a frequency range of 24–24.800 Hz and has



Figure 12.3 Tomba dei Demoni Azzurri ground plan showing, in blue, sound-source placements 1–5. Each placement designated where the loudspeaker was situated for each acoustic protocol. Ground plan created in Metashape and Meshmixer by J. K. Ortoleva. *Source:* Ortoleva, 2023a, figure 6.

Table 12.1 Painted tombs in Tarquinia with measurements and dates.

Tomb Name	Date (BCE)	Burial chamber measurements (metres)
Tomba 5591 (Moretti)	510–490	L: 4.12 × W: 3.03 × H: 2.18
Tomba 3713 (Pallottino)	500–450	L: 4.31 × W: 3.24 × H: 2.15
Tomba Francesca Giustiniani	500–450	L: 4.58 × W: 3.68 × H: 2.35
Tomba della Querciola I	480–440	L: 5.37 × W: 5.14 × H: 3.52
Tomba del Gallo	450–440	L: 3.31 × W: 2.50 × H: 2.20
Tomba 5513 (Bettini)	450	L: 3.44 × W: 3.41 × H: 2.18
Tomba dei Demoni Azzurri	450–420	L: 6.04 × W: 5.83 × H: 2.20
Tomba della Pulcella	430–420	L: 3.24 × W: 3.17 × H: 2.43
Tomba dell’Orco I	350	L: 4.45 × W: 5.54 × H: 2.22–2.29
Tomba dell’Orco II	330–325	L: 5.88 × W: 6.10 × H: 2.65–3.25
Tomba dell’Orco III	330–325	L: 10.22 × W: 3.02–3.66 × H: 2.16–2.36

Source: dating based on Marzullo, 2017.

been found to deliver accurate frequencies below 1000 Hz, which is not always a feature of more cost-effective speakers (Papadakis and Stavroulakis, 2018; Ortoleva, 2021). The speaker was placed on a tripod measuring 1.375 m in height. Analyses of osteological remains of Etruscan male and female elites in Tarquinia suggest that on average, males measured 1.69–1.7 m with women measuring 1.59–1.6 m (Becker, 1990; 1993; Kron, 2013). If considering the upper estimate of height for males and females, the mean is 1.65m. The placement of an instrument at the level of the shoulder, as seen in tomb paintings, allowed for the deduction of 27.5 centimetres.

Inside each burial chamber a recording apparatus (digital recorder Sony PCM-10, with a three-way microphone, set at a 48 kHz sample rate and 16-bit depth) was placed, in different areas of the space, on a tripod set at 1.54 metres (calculated as 1.65 m minus 11 cm, which is estimated to be the distance from the top of the head to the ear of a human individual measuring 1.65 m tall (Robinette and Whitestone, 1992)). Prior to the tomb visits, a recording filter (Sony noise cut filter) was applied, for voice parameters, to alleviate distortion (Mattioli and Diaz-Andreu, 2018: 88). Most tombs allowed for three different areas of each burial chamber to be designated sound receiver sites (SR1, SR2 and SR3; Ortoleva, 2023a). Each sound receiver was placed near wall art depicting dancing figures, daemons, and a control placement, where other types of figures and narratives are illustrated (such as banqueting scenes, elite figures or servants). If musicians were illustrated separately from dancers (for example, on a different wall or part of the tomb) an additional sound receiver was placed there. If time permitted, the identification of further

sound receiver points was also identified and measured (for example, if there was a burial trench or wall niche). Following each acoustic protocol, the chamber was photographed and measurements taken to scale each model.

In addition to the sound receiver (SR) placements inside each chamber, three additional sound receiver and sound source sites were chosen, one at a halfway point inside the dromos. Two additional sites inside the chamber were chosen, one in the centre of the chamber and another near structures indicating funerary ritual, such as a trench (*fossa*), altar or base marks (large square or rectangular hollows carved into the burial chamber's floor). The utilization of a live performer as part of the October 2019 fieldwork provided the opportunity to acoustically measure additional areas of the tomb.

The lyre used inside the tombs was obtained from the United States from a music speciality store that specializes in hand-made instruments. The prototype of the lyre was modelled on an Iberian lyre dating from 900 BCE and measuring 63.5 centimetres in length. It has a walnut wood body, spruce soundboard, and ten nylon strings that require manual tuning. The live performer, who is skilled with string instruments, rehearsed with the lyre for six weeks prior to entering the tombs in Tarquinia. He was provided musical clips from the European Music Archaeology Project, of Celtic, Greek and Roman music, and was instructed to write a musical piece based on no specific type of music (EMAP, 2015). The reasons for studying live music inside the tomb are varied.

While the digital sound source was placed at a stationary site inside each dromos and/or burial chamber for each measurement, the use of a live performer provided flexibility to record the acoustic data while the performer walked up the dromos playing the lyre, with his back facing the burial chamber (and conversely, walking down each dromos facing each chamber, see Mattioli and Díaz-Andreu, 2018). The performer was placed at SS1 and SS2 in each dromos, SS3 and SS4, walking down the dromos and up the dromos, SS5 inside the burial chamber and the recording device was inserted inside each burial chamber (or dromos) at the previously identified sound receiver points (SR1–5; [Figure 12.3](#)). As such, the human actor was principally reintegrated into the tomb space. The resulting data from the acoustic surveys were assessed using several acoustic-analysis software programs.

Assessment of acoustic data

While some archaeoacoustic studies have relied on single software programs to evaluate data, these programs can sometimes give variable results. Rodiño et al. (2015) studied acoustic platforms and found them to vary, particularly in the assessment of reverberation. The use of three software programs was intended to reduce such margins of error. The first, Audacity, is an open-source platform and was utilized to edit and organize the studies' fieldwork data, according to the sounds used in the digital and live protocols. Another software program, EASERA (electronic and acoustic system evaluation and response analysis), which is a professional acoustic platform, was utilized to analyse the resulting data. With respect to this stage of analysis, a specialist in acoustic science – Andrew Barnard, director of the graduate programme of Acoustics at Pennsylvania State University – was consulted during the analysis of the resulting acoustic data. Not only did Barnard provide reverberation times for a series of the tombs (using MATLAB, a high level programming platform used in acoustic science for numerical computing, data analysis and algorithm development) to validate the data results, but he also assisted with isolating the acoustic absorption rates of each tomb space (Ortoleva and Barnard, 2021).

Existing scholarship in archaeoacoustics involves the analysis of multiple acoustic criteria, designated by the International Organization for Standardization (ISO), of which the most frequently assessed are reverberation, echoes, and audibility from a distance (ISO 3382).⁴ The aforementioned assessment by a specialist in acoustic science further assisted in confirming that the data from the study was accurately documented, even with the accelerated acoustic survey times necessary, inside each tomb setting.

This chapter details two acoustic measurements: reverberation and flutter echoes. Reverberation, which is commonly assessed in archaeoacoustic studies, involves the accumulation of sound within a confined space and occurs as a result of sound waves reflecting from each of the structure's surfaces (Ortoleva, 2021). Reverberation (RT60) is measured according to the overall time a sound takes to decay by 60 dB (after the sound source has stopped). EDT (early decay time) is evaluated from the slope (based on a 60 dB decay) of the integrated impulse response (IR) curve, which itself is determined from the slope of the best-fit linear regression line of the initial 10 dB (between 0 dB and 10 dB) of the decay (ISO 3382-1, 15). EDT is of primary focus for the present chapter because it generally provides a clearer picture of how reverberation is

perceived within an interior or semi-enclosed space. Because it considers the first 10 dB of sound decay, EDT (rather than RT20, for instance, which measures the first 20 dB of decay) breaks down an interior space according to specific positions, thus providing a sort of acoustic 'blueprint' for the acoustically documented space.

The present study assessed reverberation via the acoustic excitation of each tomb. The sound pressure level of a sound source must be strong enough to provide a dynamic frequency range to thus perform a more precise reverberation measurement (Jambrosic et al., 2008). This can be achieved with an impulsive sound source with a strong amplitude, such as a bursting balloon, handclaps, or a starter pistol, all of which generate omnidirectional sound without the harmonic overtones typically generated by musical instruments. In general, sounds generated from musical instruments as illustrated on Etruscan tomb walls are too harmonically complex to assess reverberation. There are, however, a variety of other acoustic measures that are accessible using musical sounds. For example, although echoes typically require at least 17 m between a sound source and the observer, another type of echo, known as a flutter echo, emerges particularly with high frequency sounds in small spaces with parallel walls (Cox, 2014). An assessment of flutter echoes therefore provided an interesting way to assess different types of instruments in terms of their ability to stimulate echoes across various sized tombs.

Sonic nature of sixth-third century BCE tomb paintings

Among the acoustically documented tombs, those with the longest reverberation times include the Tomba dei Demoni Azzurri, the Tomba dell'Orco I and Tomba dell'Orco II. The Tomba dei Demoni Azzurri is especially striking because it was reverberant across a multitude of frequency bands and some areas of the burial chamber exhibited reverberation times that were extraordinarily long, at over 7 s (Ortoleva, 2023a). In terms of 'ideal' reverberation times (levels that enhance rather than distort aural experience), these vary across different contexts. Optimal reverberation times inside modern spaces are not fully comparable to the Etruscan tomb and yet they are helpful when considering how reverberation can shape auditory perception. A modern orchestral hall with a reverberation time between 1.5 and 2.4 s is considered ideal (Rogers et al., 2006). When falling below 1.5 s, such a space may be perceived as sounding dead during a musical concert. Conversely, times above 2.4 s

can muddy sound in the space, impairing the observer's ability to sound localize (Rogers et al., 2006). Generally, reverberation times of 0.9–1.4 s are recommended for large auditoria to amplify vocals, and a reverberation time between 0.4–0.8 s is recommended for more intimate conference room or classroom settings (Till, 2019: 671–2).

The fact that the Tomba dei Demoni Azzurri exhibited reverberation times much longer than those suggested for modern auditoria indicates that the burial chamber would not have easily allowed speech perception if music and chanting were a part of funerary ritual inside the burial chamber. In fact, sounds, particularly those ranging between 200–800 Hz, originating from outside the tomb's entrance were found to travel through the dromos and amplify once inside the burial chamber (Ortoleva, *forthcoming*). Another notable tomb with respect to its acoustics is the Tomba Bettini, 450 BCE, which exhibited reverberation times well over two seconds up to frequencies of 2500 Hz. The Tomba Querciola I, 450–400 BCE, also produced longer reverberation times at 1000 Hz and above, likely as a result of the chamber's tall ceilings (Lewers and Anderson, 1984; see Table 12.1 for measurements of the Tomba Querciola I).

When further analysing these results together with tomb paintings, several thematic devices involving musical performance correlate with longer reverberation times, particularly between 125–500 Hz (Figure 12.4). It is important to note here that claps are often not suitable to assess low frequency bands, below 500 Hz. However, the low frequency threshold is also determined by the space in which you use handclaps. For the present data, a thorough exploration of the statistically usable (and non-usable) frequency bands was conducted by the aforementioned acoustic specialist, Andrew Barnard. It is also of note that the majority of acoustically documented tomb spaces discussed in this chapter were small and highly reflective, and because of this one does not need a large amount of low frequency energy to obtain sufficient IR measurements across low frequency bands (A. Barnard, personal communication).

As demonstrated in Figure 12.4a, *short* reverberation times were documented where musicians are painted sans additional figures. Yet, where musicians and dancers were depicted together, these were often coinciding with longer reverberation times. At the locations of painted banqueting scenes, those *with* musicians were found to have comparatively longer reverberation times than banqueting scenes *without* musicians (Figure 12.4a). The resulting acoustic data involving flutter echoes offers further clarity.

Flutter echoes were considered across two criteria, hence, the type of musical instrument and second, the location of each sound source in

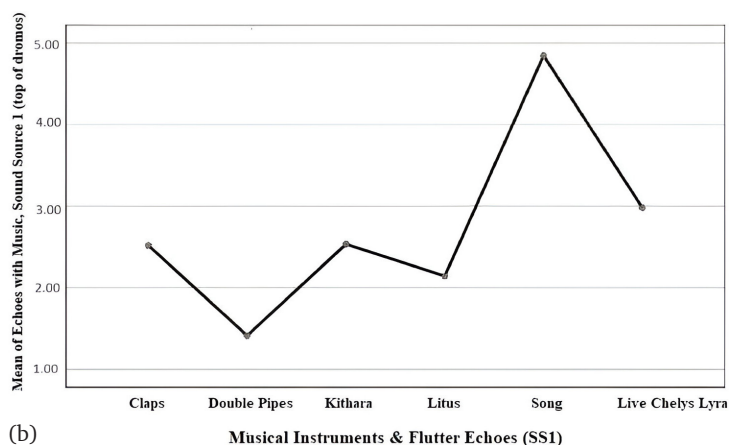
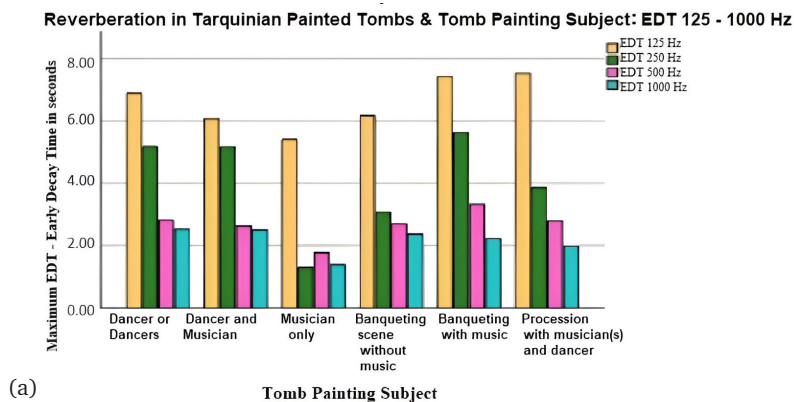


Figure 12.4 (a): shows reverberation mean in Tarquinian painted tombs and tomb paintings (125–1,000 Hz). (b): shows the flutter echoes mean (across the entire tomb set) of sound source 1 (placed at the top of dromos) according to different musical instruments as well as claps. *Source:* J. K. Ortoleva, using EASERA (Electronic and Acoustic System Evaluation and Response Analysis).

relation to tomb paintings (SS 1–5; see [Figure 12.3](#)). Some instruments performed so strongly inside the tombs that their placement during the acoustic survey did not seem to matter. For example, solo female singing a cappella triggered long flutter echoes no matter where each sound source was placed. Interestingly, the most commonly depicted instrument painted on tomb walls in Tarquinia, the double pipes, was found to generate the least number of echoes ([Figure 12.4b](#)).

According to Pliny the Elder, the Etruscans used boxwood to construct double-pipe instruments to be used solely in ritual settings,

such as the tomb space. Donkey bone, silver, or lotus wood was used to make double pipes played in entertainment contexts (Pliny, 1938, *Naturalis Historia* 16.172). Whether this is true or not, Greek auloi made from wood are estimated to optimally perform at harmonic frequencies ranging between 183–490 Hz (Hagel, 2013). If the Etruscan double pipes (made from similar material) projected similar harmonic frequencies, this likely contributed to the lack of echoes connected with the instrument in our study. This becomes clearer when considering two instruments that triggered lengthy flutter echoes inside multiple tomb spaces.

When the sound source was situated inside the dromos, only female voice and the lyre (documented as part of a second acoustic protocol with a live performer) produced strong echoes. Experimental studies have demonstrated that the chelys lyre, which was made with a tortoise shell sound box, is estimated to have had higher amplitudes at frequencies compatible with female vocals, thus, between 400–800 Hz (Bakarezos et al., 2012). When documenting sound inside each dromos and placing the musician within the burial chamber, more echoes were stimulated than by any other instrument including female vocals. However, this was not the case with the placement of the lyre at the bottom of the dromos. This itself may have been influenced by the musician's own body.

During the acoustic survey, the musician's body was found to often block the majority of sounds emerging from the instrument. This was noted not only with the musician walking up the dromos towards the tomb's exterior entrance, but also when the musician faced the burial chamber's rear wall. These findings, whether tied to specific tomb paintings or musical instruments, can be interpreted across several frames of reference.

Discussion

When considering the entire series of Etruscan tombs documented as part of this study, the four most reverberant tombs include banqueting scenes. However, banquets are the single most common scene in Etruscan painted tombs. Therefore, the commonality of banqueting paintings in the most reverberant tombs is probably coincidental. However, when independently considering musicians versus dancers, these results emerge as more purposeful in nature. Steingraber (2006) has suggested that the illustration of dancers and musicians inside the tomb, even when lacking an explicit banqueting scene, may in fact symbolize a banquet.

When further assessing the acoustics of the studied tombs in areas where dancers and musicians are depicted, Steingraber's argument is not entirely supported.

Burial chambers depicting musicians *without* additional figures (such as dancers or banqueteers) were the least reverberant of all the assessed locations with figures and scenes. However, when dancers were added to scenes with musicians, these areas of the tomb were found to be more reverberant. Walls solely depicting dancers moving across the tomb wall were also more reverberant than their musician-only counterparts. The exception to this general pattern again involves banqueting narratives. When musicians were included in banqueting scenes, such areas of the burial chamber were more reverberant than those with banqueting scenes lacking musicians. This was found across the majority of frequency bands between 125–8000 Hz. As such, it seems that the inclusion of more painted bodies, whether in dance or banqueting, indicates a more reverberant burial chamber. However, the illustration of musical instruments themselves did not correlate with the specific acoustics of any depicted instrument; in fact, the opposite seems to be true.

The study found that, across all known painted tombs, the most commonly illustrated musical instrument, the double pipes, did not trigger strong acoustic responses inside the tomb space. Although paintings including double pipes often display depictions of animated dancers seemingly lost in a flurry of emotions as they presumably respond to the double pipes, such areas of the tomb barely generated any detectable echoes. Conversely, the lyre, which is less commonly painted on tomb walls, triggered extensive echoes inside the studied tombs. Although female vocalists are not illustrated inside any known Tarquinian painted tombs, the female voice also triggered a similar number of echoes. These findings can be interpreted in several ways.

Firstly, the acoustic qualities of an instrument, as experienced inside the tomb, may not have played a role in deciding upon the specific musical instruments to be depicted on tomb walls. Instead, the choice to include certain instruments over others may have been entirely guided by the cultural belief that one particular instrument was more appropriate for the funerary setting. Nevertheless, the fact that music from the double pipes did not trigger echoes in any of the studied tombs, while other instruments did, is significant because of the double pipes commonality in tomb paintings. Yet, perhaps this itself is precisely why double pipes musicians are so frequently depicted. In other words, perhaps it was the *inability* of the double pipes to trigger

echoes that led to their commonality in tomb paintings. This leads us back to the particular manner in which the lyre is represented in Etruscan tomb paintings, with the instrument often raised above the body rather than parallel to the musician's arms, as is commonly shown in Greek iconography and indeed as the kithara is shown in Etruscan tomb paintings (Lawergren, 2007; Figure 12.1).

The live acoustic survey described here found that when holding the lyre at a lower position in front of the body, as typically depicted in Greek images, the musician's body almost completely blocked sound emerging from the instrument and it was only when raising the lyre well above the body that the instrument triggered strong acoustic responses inside the burial chamber. Interestingly, the lyre is usually not depicted being played in tomb imagery whereas the double pipes is always shown. Scholars have suggested this may signify class (Lawergren, 2007). The double pipes are shown as played by musicians and therefore a lower social order while elite male Etruscans more commonly hold lyres. Such illustrative differences may also be tied to the acoustic nature of the instruments when played inside the tomb. Here we have the lyre, the most echo-inducing instrument after the solo female voice, held above the body and not played, whereas the least echo-inducing instrument, the double pipes is always being played in tomb imagery. Rather than entirely signifying status, the manner in which these instruments are illustrated could represent an attempt to somehow restrict or control the acoustic qualities of the tomb. Such an inclination is not at all outside the bounds of typical ritualized efforts in Etruria. Indeed, according to the Romans, the Etruscans were more devoted to religious practices than anyone else, and excelled in performing them (Livy, 1924, 5.1). Religious ritual permeated all aspects of Etruscan life and many rituals involved sound. This would have almost surely expanded into the funerary space. Separate from the depiction of specific musical instruments, the present study nevertheless demonstrates that the acoustic behaviour of the painted tomb was not easily controlled.

Recent acoustic studies involving Etruscan painted tombs suggest that structural adaptations such as fosse (trenches), wall niches, altars and base marks are placed in areas of the tomb where acoustics are more pronounced. One such example involves the placement of a trapezoidal base, suggested to have served as an altar inside the Tomba dell'Orco II (Torelli, 1983). Here, reverberation times were much longer in the exact area where the large 'altar' was placed (Ortoleva, 2021). Although we do not have surviving textual sources detailing when Etruscan tombs were painted, we do know that some architectural structures were

after the tomb was painted. This is perhaps most evident inside the Tomba dei Demoni Azzurri, where a large trench was carved into the chamber's floor, after it was prepped and painted, in the exact area where the chamber is most reverberant (Ortoleva, 2023a). Can these observations further inform regarding auditory and visual experiences inside the painted tomb space?

As intimated, research suggests that visual stimuli seem to influence static observation of a space (Guttman et al., 2005). However, when moving, auditory experience becomes much more influential. The presence of various structures inside the burial chamber, that indicate funerary ritual in the exact areas of the tomb where sound is magnified, suggests that funerary participants in these areas were more guided by acoustic experience. Funerary observers, on the other hand, who were perhaps not situated in these same areas, would have had a completely different tomb experience, one guided more by visual stimuli inside the tomb (for an analysis of visual perception inside the tomb involving light, see Ortoleva, 2023b). The acoustic variation of specific locations inside the tomb, some generating a more robust sonic experience than others, suggests that the funerary event was potentially controlled on some level by the use of different instruments and sound-source placements.

The placement of each sound source during the acoustic survey played a primary role in the sonic response of each tomb. When a sound source was placed near the top of the painted tomb's dromos, more echoes were triggered than when the sound source was placed at the bottom of the dromos. This was especially evident with the solo female a cappella singing and the playing of a lyre. This suggests that a musician or vocalist could have been positioned at the top of the corridor, thereby triggering more substantial echoes inside the dromos and the burial chamber itself, as seen inside the Tomba dei Demoni Azzurri. The majority of tombs with dromoi, that transported sounds more effectively from the top of the dromos, date to 450 BCE and earlier, which suggests that the Tomba Querciola dates to 450 BCE rather than 400 BCE, as often suggested by scholars (as based on the analysis of tomb paintings; Steingraber, 1986). The fact that musical sound is concentrated so differently, depending on where the sound source is situated, is crucially important. As previously noted, there is clear evidence across Etruria for ancestral cult having been practised as connected to the funerary space. In the Etruscan town of Cisra, now known as Cerveteri (Latin, Caere) there is clear evidence that tumuli were climbed. Prayon has drawn on such evidence to propose that the tomb space was perhaps seen as a giant

navigable altar (Prayon, 2010). The present findings further suggest that the internal nature of the Tarquinian tomb may itself have worked much like a musical instrument, to be 'played' according to the spatial location (and orientation) of funerary performers and/or mourners. Sound therefore became a tangible sensory experience inside the tomb, with the capability of being bodily and perceptually manipulated.

In the areas inside the tomb where longer reverberation times were identified, tomb paintings depict more humans, whether dancers and musicians or banqueting and music. Whether via the placement of the body in specific areas of the tomb to trigger strong acoustic responses, or the painting of multiple bodies in areas of the tomb that are more reverberant, the common denominator here is not, it seems, visual representations of music, but rather, the human body's capacity to physically create, stimulate and manipulate auditory experience.

Conclusion

What we see or hear is never because of a singular sense, but rather the product of the brain deciphering and synthesizing multiple sensory data to ultimately construct personal experience (Van Rullen et al., 2014). Clarifying such processes sheds light not only on Etruscan burial practices, but also how we ourselves envision the painted tomb. From the amplification of specific musical instruments near architectural structures such as trenches, to the propagation of sound originating outside of the bounds of each painted burial chamber, sound and auditory experience emerge as crucially important to our understanding of Etruscan painted tombs. Indeed, Etruscan tomb paintings involving music and dance may represent far more. The accentuation of reverberation in areas of the tomb that have banqueting images with musicians is interesting. However, visual images of musicians may not necessarily align with sound effects inside painted tombs. The illustration of dancers, in more reverberant areas of the tomb, versus the portrayal of musicians, is a striking example of this, as is the propensity to portray less acoustically impactful instruments such as the double pipes. Even more striking is the tendency to symbolically show acoustically powerful instruments. This suggests that the lyre was revered as a magical, and perhaps even deific, instrument. Indeed, this is exactly how the lyre is shown on a fourth-third century BCE Etruscan bronze mirror from Bolsena, on which the Etruscan prophetic figure of Cacū (Latin, Cacus) is seemingly depicted as receiving divine messages from his lyre (De Grummond, 2006).

Such iconography clearly embodies the import of listening to presumed otherworldly musical messages.

The present findings highlight the importance of an acoustic survey of the painted tomb space in providing information that is difficult if not impossible to ascertain solely from visual analyses involving tomb architecture, paintings and even material objects. Conversely, acoustic data cannot be considered without acknowledging and building upon such scholarship. Further limitations of the present study include the limited number of assessed tombs. It is therefore important to acoustically document further Etruscan tombs (painted and unpainted) across a wider spectrum of regions and chronologies in pre-Roman Italy (for an acoustic analysis of an Etruscan unpainted tomb, see Ortoleva, [forthcoming](#)).

Trevor Cox recently noted that: to overlook sound, is to render ancient monuments incomplete ([2014](#), 60). While it is perhaps easy to disregard sound when visually observing tomb paintings, because of our inability to touch or ‘see’ sound with our own eyes, an assessment of Etruscan tomb paintings without any consideration of auditory experience in many ways inhibits our ability to think beyond our own subjective realities regarding what the painted tomb may mean. As such, the painted tomb continues to be ‘incomplete’, and the ever-elusive Etruscan funerary event remains beyond our grasp.

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Notes

- 1 In Tarquinia, scholars estimate that of approximately 6,100 chambered tombs at the Necropoli dei Monterozzi, roughly 400–600 tombs include paintings (see Cavagnaro Vanoni, 1997; Marzullo, 2017; 2018). In contrast to Tarquinia, 14 painted tombs are recorded in Chiusi, 11 in Cerveteri (not including multiple fragments of paintings that solely contain decorative elements), three tombs each in Vulci and Orvieto (one five kilometres away in the commune of Porano) and two tombs in Blera, Sarteano, Magliano Toscana and Populonia (see Steingraber, 1986; 2006; Marzullo, 2017; 2018; see Figure 12.2). One painted tomb has also been discovered in Bomarzo, Cosa, Grotte San Stefano, Arte, San Giuliano and Tuscania (for a review of paintings at many of these tombs, see Steingraber, 1986; for a comprehensive survey of tomb paintings in Tarquinia, see Marzullo, 2017; 2018).
- 2 Large tumuli from the late eighth–seventh centuries BCE in Tarquinia developed into smaller structures during the early sixth century BCE and are generally tied to the growth of a ruling class (see Prayon, 1975; Barker and Rasmussen, 1998; Leighton, 2004).
- 3 Other crucial scholarship documenting Etruscan painted tombs include Naso's work, focused on the early development of tomb paintings (1996; 2005). Steingraber's documentation of wall paintings continues to provide important details related to the progression of tomb paintings across Chiusi, Orvieto and Tarquinia (1981; 1986; 2006; 2014). Marzullo's more recent work uses photogrammetry and survey techniques to document Tarquinia's painted tombs (2017; 2018).
- 4 It is important to note that the ISO standard was developed to regulate acoustic assessment across contemporary living spaces and as such archaeoacoustic studies are often adapted to thus consider the particular requirements of an archaeological context. For example, in the present study, the need to complete the acoustic survey in a short period of time is not advised by the ISO. For a more in-depth review of ISO requirements versus those of archaeological contexts see Till, 2019.

References

- Adinolfi, G., Carmagnola, R. and Cataldi, M. (2005) 'La Tomba dei Demoni Azzurri: Lo scavo di una tomba violata'. In *Dinamiche di sviluppo delle città nell'Etruria meridionale: Veio, Caere, Tarquinia, Vulci. Studi Etruschi*, Volume 1: 431–53.
- Bakarezos, E., Vathis, V., Brezas, S., Orphanos, Y. and Papadogiannis, N. A. (2012) 'Acoustics of the Chelys: An ancient Greek tortoise-shell lyre', *Applied Acoustics*, 73: 478–83. <https://doi.org/10.1016/j.apacoust.2011.11.010>.
- Barker, G. and Rasmussen, T. (1998) *The Etruscans*. Oxford: Blackwell.
- Becker, M. (1990) 'Etruscan social classes in the VI century bc: Evidence from recently excavated cremations and inhumations in the area of Tarquinia'. In H. Heres and M. Kunze (eds), *Die Welt der Etrusker*. Berlin: Bertelsmann, 23–35.
- Becker, M. (1993) 'Human skeletons from Tarquinia: A preliminary analysis of the 1989 Cimitero site excavations with implications for the evolution of Etruscan social classes', *Studi Etruschi*, 58: 211–48.
- Bonfante, L. (1981) 'Etruscan couples and their aristocratic society', *Women's Studies: An interdisciplinary journal*, 8(1–2): 157–87.
- Bonghi Jovino, M. (1987) 'Gli scavi nell'abitato di Tarquinia e la scoperta dei "bronzi" in un preliminare inquadramento'. In M. Bonghi Jovino and C. Chiaramonte Treré (eds), *Tarquinia: Ricerche, scavi e prospettive*. Rome: L'Erma di Bretschneider, 59–70.
- Bonghi Jovino, M. (ed.) (2001) *Tarquinia: Scavi sistematici nell'abitato, Campagne 1982–1988*. Rome: L'Erma di Bretschneider, 59–70.
- Bonghi Jovino, M. and Chiaramonte Treré, C. (eds) (1997) *Tarquinia: Testimonianze archeologiche e ricostruzione storica: Scavi sistematici nell'abitato. Campagne 1982–1988, Roma*. Rome: L'Erma di Bretschneider.
- Brandt, J. R. (2015) 'Passage to the Underworld: Continuity or change in the Etruscan funerary ideology and practices (6th–2nd c. bc)'. In J. R. Brandt, M. Prusac and M. R. Hakon (eds), *Death and Changing Rituals: Function and meaning in ancient funerary practices*. Oxford: Oxbow Books, 105–84.

- Brandt, J. R. (2020) 'Emotions in a liminal space: A look at Etruscan tomb paintings'. In H. von Ehrenheim and M. Prusac-Lindhagen (eds), *Reading Roman Emotions*. Stockholm: Stockholm University Press, 41–68.
- Bruni, S. (2009) 'Rituals and ideology of the orientaling aristocracies: Pisa and the origins of the *funus imaginarius*'. In J. Swaddling and P. Perkins (eds), *Etruscan by Definition: Papers in honour of Sybille Haynes, MBE*. London: British Museum Press, 74–80.
- Camporeale, G. (2009) 'The deified deceased in Etruscan culture'. In S. Bell and H. Nagy (eds), *New Perspectives on Etruria and Early Rome*. Madison: University of Wisconsin Press, 220–50.
- Carrese, M. (2010) 'La documentazione degli strumenti e oggetti sonori in Etruria alla luce della classificazione organologica'. In M. Carrese, E. Li Castro and M. Martinelli (eds), *La Musica in Etruria: Atti del convegno internazionale, Tarquinia, 18–20.9.2009*. Tarquinia: Assessorato alla Cultura, 229–68.
- Cataldi Dini, M. (1986) 'La Tomba dei Demoni Azzurri'. In M. Bonghi Jovino and C. Chiaramonte Treré (eds), *Tarquinia: Ricerche, scavi e prospettive*. Rome: L'Erma di Bretschneider, 37–42.
- Cataldi Dini, M. (1993) *Tarquinia*. Rome: Quasar.
- Cavagnaro Vanoni, L. (1997) 'Dromoi non completati e l'utilizzo dello spazio nella necropoli dei Monterozzi'. In *Etrusca et Italica: Scritti in ricordo di Massimo Pallottino*, Volume 1. Rome: Istituti Editoriali e Poligrafici Internazionali, 117–30.
- Cicero (1923) *De Senectute; De Amicitia; De Divinatione*, translated by W. A. Falconer. Cambridge, MA: Harvard University Press.
- Colonna, G. and Colonna di Paolo, E. (1997) 'Il letto vuoto, la distribuzione del corredo e la "cinestra" della Tomba Regolini Galassi'. In *Etrusca et Italica: Scritti in Ricordo di Massimo Pallottino*, Volume 1. Rome and Pisa: Istituti Editoriali e Poligrafici Internazionali, 131–72.
- Cox, T. (2014) *Sonic Wonderland: A scientific odyssey of sound*. London: Bodley Head.
- Cristofani, M. (1975) 'Il "dono" nell'Etruria arcaica', *La Parola del Passato*, 161: 132–52.
- Cristofani, M. (1987) 'Pittura funeraria e celebrazione della morte il caso della Tomba dell' Orco'. In M. Bonghi Jovino and C. Chiaramonte Treré (eds), *Tarquinia: Ricerche, scavi e prospettive*. Rome: L'Erma di Bretschneider, 191–202.
- Damgaard Andersen, H. (1997) 'The archaeological evidence for the origin and development of the Etruscan city in the 7th to 6th centuries BC'. In H. Damgaard Andersen, S. Horsnæs, S. Houby-Nielsen and A. Rathje (eds), *Urbanization in the Mediterranean in the 9th to 6th centuries BC*. Copenhagen: Museum Tusculanum Press, 343–82.
- De Grummond, N. (2006) *Etruscan Myth, Sacred History, and Legend*. Philadelphia: University of Pennsylvania Museum of Archaeology and Anthropology.
- European Music Archaeology Project (EMAP) (2013–18) <https://www.emaproject.eu/emap/description.html>.
- Giorgi, A., Menicocci, S., Forte, M., Ferrara, V., Mingione, M., Alaimo Di Loro, P., Inguscio, B. M. S., Ferrara, S., Babiloni, F. and Vozzi, A. (2023) 'Virtual and reality: A neurophysiological pilot study of the Sarcophagus of the Spouses', *Brain Sciences*, 13(4): 635. <https://doi.org/10.3390/brainsci13040635>.
- Guttman, S. E., Gilroy, L. A. and Blake, R. (2005) 'Hearing what the eyes see: Auditory encoding of visual temporal sequences', *Psychological Science*, 16(3): 228–35. <https://doi.org/10.1111/j.0956-7976.2005.00808.x>.
- Hagel, S. (2013) 'Better understanding the Louvre aulos', *Studien zur Musikarchäologie*, 9: 131–42.
- Hodgson, D. (2003) 'Seeing the "unseen": Fragmented cues and the implicit in Palaeolithic art', *Cambridge Archaeological Journal*, 13(1): 97–106. <https://doi.org/10.1017/s0959774303000064>.
- Huntsman, T. (2014) 'Hellenistic Etruscan cremation urns from Chiusi', *Metropolitan Museum Journal*, 49: 141–50.
- Iozzo, M. (2009) 'Un nuovo strumento musicale nel Museo Archeologico di Chiusi'. In S. Bruni (ed.), *Etruria e Italia preromana: Studi in onore di Giovannangelo Camporeale*. Pisa: Fabrizio Serra Editore, 481–6.
- ISO 3382 (2009) *Acoustics: Measurement of room acoustic parameters, Part 1: Performance spaces*. Geneva: International Organization for Standardization.
- Izzet, V. E. (2007) *The Archaeology of Etruscan Society*. Cambridge: Cambridge University Press.
- Jambrosic, K., Horvat, M. and Domitrovic, H. (2008) 'Reverberation time measuring methods', *Journal of the Acoustic Society of America*, 123(5): 3617. <https://doi.org/10.1121/1.2934829>.
- Jannot, J.-R. (1974) 'L'aulos étrusque', *Archeologia Classica*, 43: 118–42.

- Jannot, J.-R. (1979) 'La lyre et la cithare, les instruments à cordes de la musique étrusque', *Archeologia Classica*, 48(2): 469–507.
- Kron, G. (2013) 'Fleshing out the demography of Etruria'. In J. M. Turfa (ed.), *The Etruscan World*. New York: Routledge, 56–78.
- Lawergren, B. (2007) 'Etruscan musical instruments and their wider context in Greece and Italy', *Etruscan and Italic Studies*, 10: 119–38.
- Lawrence, D. H. (1992) *Sketches of Etruscan Places and Other Italian Essays*. Cambridge: Cambridge University Press.
- Leighton, R. (2004) *Tarquinia: An Etruscan city*. London: Duckworth.
- Lewers, T. H. and Anderson, J. S. (1984) 'Some acoustical properties of St Paul's Cathedral, London', *Journal of Sound and Vibration*, 92(2): 285–97. [https://doi.org/10.1016/0022-460X\(84\)90562-5](https://doi.org/10.1016/0022-460X(84)90562-5).
- Li Castro, E. (2017) 'Etruscan music'. In A. Naso (ed.), *Etruscology*. Boston: De Gruyter, 841–54.
- Li Castro, E. and Scardina, P. (2011) 'The double curve enigma', *Music in Art*, 36 (1–2): 203–17.
- Linington, R. E. (1980) *Lo scavo nella zona Laghetto della necropoli della Banditaccia a Cerveteri: Rassegna di studi del civico museo archeologico e del civico gabinetto numismatico di Milano*. Milan: Ripartizione cultura e spettacolo.
- Livy (1924) *Livy in Fourteen Volumes*, translated by B. O. Foster. London: Heinemann.
- Maggiani, A. 2005. 'Simmetrie architettoniche, dissimmetrie rappresentative: Osservando le pitture della Tomba degli Scudi di Tarquinia'. In F. Gilotta (ed.), *Pittura parietale, pittura vascolare: Ricerche in corso tra Etruria e Campania, Atti Convegno Santa Maria Capua Vetere, 28 maggio 2003*. Naples: Arte Tipografica Editrice, 115–32.
- Malafouris, L. (2007) 'Before and beyond representation: Towards an enactive conception of the Palaeolithic image'. In C. Renfrew and I. Morley (eds), *Image and imagination: A global prehistory of figurative representation*. Cambridge: McDonald Institute for Archaeological Research, 287–300.
- Maras, D. F. (2016) 'Gods, men, turtles: Terracotta lyre-players in Etruscan votive deposits'. In A. Bellia and C. Marconi (eds), *Representations of Musicians in the Coroplastic Art of the Ancient World: Iconography, ritual contexts and functions*. Rome: Istituti Editoriali e Poligrafici Internazionali, 163–78.
- Martinelli, M. (2007) *Spettacolo e sport in Etruria: Musica, danza, agonismo e rappresentazioni tra Italia e Mediterraneo*. Florence: Regione Toscana.
- Marzullo, M. (2017) *Spazi sepolti e dimensioni dipinte nelle tombe etrusche di Tarquinia*. Milan: Ledizioni.
- Marzullo, M. (2018) *Grotte Cornetane: Materiali e apparato critico per lo studio delle tombe dipinte di Tarquinia*. Milan: Ledizioni.
- Mattioli, T. and Díaz-Andreu, M. (2018) 'Rock art, music, and acoustics: A global overview'. In B. David and J. McNiven (eds), *The Oxford Handbook of the Archaeology and Anthropology of Rock Art*. Oxford: Oxford University Press, 503–28.
- Naso, A. (1996) *Architetture Dipinte*. Rome: L'Erma di Bretschneider.
- Naso, A. (2005) *La Pittura Etrusca*. Rome: L'Erma di Bretschneider.
- Ortoleva, J. K. (2021) 'Sounds of Etruria: Aural characteristics of the Tomba dell'Orco, Tarquinia', *Antiquity*, 95(383): 1179–94. <https://doi.org/10.15184/aqy.2021.111>.
- Ortoleva, J. K. (2022) 'Making sense of landscape: A new study of sound propagation between Tarquinian funerary and habitation settings', *Etruscan and Italic Studies*, 25(1–2): 79–112. <https://doi.org/10.1515/etst-2022-0004>.
- Ortoleva, J. K. (2023a) 'Sounds of the blue daemon: A new aural study of the Etruscan Tomba dei Demoni Azzurri, 450–430 bc', *Journal of Archaeological Science: Reports*, 49: 104000. <https://doi.org/10.1016/j.jasrep.2023.104000>.
- Ortoleva, J. K. (2023b) 'Visions of light: An investigation of visual perception inside the Etruscan painted tomb space', *Journal of Archaeological Science*, 160: 105887, 1–18. <https://doi.org/10.1016/j.jas.2023.105887>.
- Ortoleva, J. K. (forthcoming) 'Dancing with cicadas: An investigation of space and sound at the Etruscan Tomba di Caronte in Cerveteri, Italy'. In A. Benner and C. Dominici (eds), *Space is the Place: An exploration of the interplay between architecture and space in the classical world*. Bicester: Archaeopress.
- Ortoleva, J. K. and Barnard, A. (2021) 'Sound properties of painted tombs', *Journal of the Acoustical Society of America*, 150: A249.

- Ovid (1931) *Fasti*, translated by J. G. Frazer. Loeb Classical Library. London: Heinemann.
- Pallottino, M. (1937) *Tarquinia (Monumenti Antichi, 36)*. Rome: Bardi.
- Pallottino, M. (1955) *Art of the Etruscans*. New York: Vanguard Press.
- Papadakis, N. M. and Stavroulakis, G. (2018) 'Low-cost omnidirectional sound source utilizing a common directional loudspeaker for impulse response measurements', *Applied Sciences*, 8: 2–20.
- Pernigotti, A. P. (2021) 'Luci e ombre: Orientamento e illuminazione naturale nei templi etruschi'. In L. Donati, P. Bruschetti and V. Mascelli (eds), *Luci dalle tenebre: Dai lumi degli Etruschi ai bagliori di Pompei* (exhibition catalogue). Arezzo: Tiphys Edizioni, 115–20.
- Petrizzi, C. (1986) 'Il tumulto monumentale di Poggio Gallinaro'. In Maria Bonghi Jovino (ed.) *Gli Etruschi di Tarquinia*. Modena: Edizioni Panini, 206–15.
- Pliny (1938) *Naturalis Historia*, translated by H. Rackham. Cambridge, MA: Harvard University Press.
- Prayon, F. (1975) *Frühetruskische Grab-und Hausarchitektur*. Heidelberg: F. H. Kerle.
- Prayon, F. (2010) 'The tomb as altar'. In L. Bouke van der Meer (ed.), *Material Aspects of Etruscan Religion: Proceedings of the international colloquium, Leiden, May 29 and 30, 2008*. Walpole, MA: Peeters, 75–82.
- Repp, B. H. and Penel, A. (2002) 'Auditory dominance in temporal processing: New evidence from synchronization with simultaneous visual and auditory sequences', *Journal of Experimental Psychology: Human Perception and Performance*, 28: 1085–99.
- Rizzo, M. A. (1987) 'La Ceramica a Figure Nere, and La Ceramica a Figure Rosse'. In M. Martelli (ed.), *La Ceramica degli Etruschi*. Rome: L'Erma di Bretschneider, 31–42.
- Robinette, K. M. and Whitestone, J. J. (1992) 'Methods for Characterizing the Human Head for the Design of Helmets'. AL-TR-1992-0061, Armstrong Laboratory, US Air Force Systems Command, Wright-Patterson Air Force Base, Dayton, Ohio.
- Rodiño, L., Mansilla, J., Sato, S., Arias, A., Masson, F. and Palma, I. (2015) 'Comparison of room acoustic parameters calculated by different types of software.' Paper presented at the Internoise Conference, San Francisco, 9–12 August.
- Rogers, C., Lister, J. and Febo, D. (2006) 'Effects of bilingualism, noise, and reverberation on speech perception by listeners with normal hearing', *Applied Psycholinguistics*, 27: 465–85. <https://doi.org/10.1017/S014271640606036X>.
- Romanelli, P. (1948) 'Tarquinia, scavi e ricerche nell'area della città?', *Notizie degli Scavi di Antichità* 1948, 193–270.
- Rouveret, A. (1974) 'La Tombe du Plongeur et les fresques étrusques: Témoignages sur la peinture grecque', *Revue Archéologique*, 1: 15–32.
- Sarti, S. (2010) 'Gli strumenti a corda degli etruschi: Uso e iconografia'. In M. Carrese, E. Li Castro and M. Martinelli, (eds), *La Musica in Etruria: Atti del convegno internazionale Tarquinia 18–20 settembre 2009*. Tarquinia: Tipografia Ceccarelli, 185–204.
- Seneca (1971) *Naturales Quaestiones*, translated by T. H. Corcoran. London: Heinemann.
- Serra Ridgway, F. R. (2004) 'Revisiting the Etruscan Underworld', *Accordia Research Papers*, 10: 127–41.
- Sorrentino, C. (2013) 'Pyrgi, ricerche di archeozoologia: Dati preliminari'. In M. P. Baglione and M. D. Gentili (eds), *Riflessioni su Pyrgi: Scavi e ricerche nelle aree del santuario*. Rome: L'Erma di Bretschneider, 245–60.
- Steingraber, S. (1981) *Etrurien Städte, Heiligtümer, Nekropolen*. Munich: Hirmer.
- Steingraber, S. (ed.) (1986) *Etruscan Painting: Catalogue raisonné of Etruscan wall painting*. New York: Johnson Reprint.
- Steingraber, S. (2006) *Abundance of Life: Etruscan wall painting*, translated by R. Stockman. Los Angeles: J. Paul Getty Museum.
- Steingraber, S. (2014) 'Etruscan and Greek tomb paintings in Italy, c.700–400 bc'. In J. J. Pollitt (ed.), *The Cambridge History of Painting in the Classical World*. Cambridge: Cambridge University Press, 94–142.
- Stoddart, S. K. F. (2009) 'The Etruscan body', *Accordia Research Papers*, 11: 137–52.
- Sugiyama, S., Takeuchi, N. and Inui, K. (2018) 'Effect of acceleration of auditory inputs on the primary somatosensory cortex in humans', *Scientific Reports*, 8: 12883. <https://www.nature.com/articles/s41598-018-31319-3>.
- Taylor, L. (2011) 'Mourning becomes Etruria: Ritual, performance and iconography in the seventh and sixth centuries', *Etruscan and Italic Studies*, 14: 39–54.

- Taylor, L. (2014) 'Performing the prothesis: Gender, gesture, ritual and role on the Chiusine reliefs from archaic Etruria', *Etruscan and Italic Studies*, 17(1): 1–27.
- Taylor, L. (2020) 'Reading the ritual: Representation and meaning on an Etruscan funerary monument in Perugia', *Etruscan and Italic Studies*, 23(1–2): 3–28.
- Till, R. (2019) 'Sound archaeology: A study of the acoustics of three World Heritage sites: Spanish prehistoric painted caves, Stonehenge, and Paphos theatre', *Acoustics*, 1: 661–92. <https://doi.org/10.3390/acoustics1030039>.
- Torelli, M. (1983) 'Ideologia e rappresentazione nelle tombe tarquiniesi dell'Orco I e II', *Dialoghi di Archeologia*, 2: 7–17.
- Torelli, M. (1999) 'Funera Tusca: Reality and representation in archaic Tarquinian painting'. In B. Berman and C. Kondoleon (eds), *The Art of Ancient Spectacle*. New Haven, CT: Yale University Press, 146–61.
- Van Rullen, R., Zoefel, B. and Ilhan, B. (2014) 'On the cyclic nature of perception in vision versus audition', *Philosophical Transactions of the Royal Society B*, 369: 1–14. <https://doi.org/10.1098/rstb.2013.0214>.
- Warden, P. G. (2008) 'The Etruscan way of death'. In P. G. Warden (ed.), *From the Temple and the Tomb: Etruscan treasures from Tuscany*. Dallas: Southern Methodist University, 95–113.
- Warden, P. G. (2009) 'The blood of animals: Predation and transformation in Etruscan funerary representation'. In S. Bell and I. Nagy (eds), *New Perspectives on Etruria and Rome: Papers in honor of Richard D. DePuma*. Madison: University of Wisconsin Press, 198–219.
- Warden, P. G. (2011) 'The temple is a living thing: Fragmentation, enchainment, and the reversal of ritual at the acropolis sanctuary of Poggio Colla'. In N. T. de Grummond and I. Edlund-Berry (eds), *The Archaeology of Sanctuaries and Ritual in Etruria*. Portsmouth, RI: Journal of Roman Archaeology, 55–67.
- Warden, P. G. (2018) 'Devoti in bronzo'. In A. Nocentini, S. Sarti and P. G. Warden (eds), *Acque Sacre, culto etrusco sull'Appennino toscano, 28 settembre 2017–28 febbraio 2018, Palazzo del Pegaso, Firenze* (exhibition catalogue). Florence: Tipografia del Consiglio regionale della Toscana, 21–32.
- Weber-Lehmann, C. (1985) 'Spätarchaische Gelagebilder in Tarquinia', *Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung*, 92: 19–44.
- Weber-Lehmann, C. (1986) 'The Archaic period, in Etruscan painting'. In S. Steingraber (ed.), *Etruscan Painting: Catalogue raisonné of Etruscan wall painting*. New York: Johnson Reprint, 44–53.
- Weber-Lehmann, C. (2007) 'The evidence for wooden sarcophagi in Etruscan tombs', *Etruscan and Italic Studies*, 10: 141–51.

Sensing what can't be seen: augmenting experiential impressions of Etruscan Vulci through a remote sensing and GIS application

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When remote sensing data is published via a GIS-based application (geographic information system) it can allow archaeologists and visitors alike to perceive aspects of the archaeological landscape that would otherwise not be part of the modern sensorial experience. This chapter takes the archaeological park of Vulci, the subject of ongoing excavation and survey research, as a pilot study for such an approach. As such, it is a touristic park where the results of current ground penetrating radar surveys (GPR) could be integrated into the visitor's experience. GPR is being more frequently employed by researchers to analyse subsurface archaeological features and even to reconstruct the urban organization of entire ancient cities. It also has great potential to augment the experience of nonspecialist visitors to the park. There are aspects of almost every archaeological site's landscape that are not currently visible at the surface, but which could dramatically alter the impression of a site's past, allowing the viewer to gain a more complete understanding of the past lived experience. There is a vast difference between walking over an empty field, in which one is told that some structures may lie beneath, and being able to track in real time your location over those structures, via a mobile GIS application. The experience is more than visual, in that it allows the visitor to cognitively transform the landscape around them and to engage more fully with questions around the nature of the ancient experience. By employing such an application in the field at Vulci, this chapter will demonstrate how innovative publication strategies can provide a new direction for remote sensing surveys, to contribute to cultural heritage management and public engagement.

This chapter takes two different approaches to the word ‘sensing’. The first will be that of remote sensing, technologies that allow us to remotely sense the presence of archaeological features at or below the surface of the landscape. The advent of remote sensing technologies has brought about a veritable revolution in the investigation of archaeological landscapes.

For the vast majority of the field’s history, archaeologists have investigated ancient urban spaces through time-intensive excavation. Even when whole urban landscapes lie within archaeologically accessible topography – open land that is not occupied by modern structures – the process of excavating an entire urban plan can take centuries. Take Pompeii for example, where excavation began in 1748 and continues to this day (Corti, 1951; Goalen, 1995). The other main methodological option has historically been field walking surveys. These are useful for understanding occupation extent and the location of new sites, but their data resolution and depth are limited. They are also affected by land use and depositional patterns that can obscure genuine archaeological features, in addition to issues of sampling that need to be accounted for (Fish and Kowalewski, 1990; Terrenato, 2000; Tartaron, 2003). Aerial survey has proven useful in certain instances, but is highly reliant on weather conditions, especially drought, to reveal archaeologically relevant patterns in the landscape (Bewley, 2003; Verhoeven and Sevara, 2016).

Remote sensing has the potential to circumvent several of these limitations (Campana, 2017; Goodman and Piro, 2013; Leisz, 2013). It can cover an entire urban area in the space of one excavation season. It is noninvasive, which allows the archaeologist to employ it in locations where excavation would not be tolerated or feasible. These surveys do not rely on extraordinary weather conditions to deliver results and, while each remote sensing technology has different strengths and weaknesses in terms of the materiality of the surface it is penetrating, one such technology will almost certainly be successful in any given scenario. The combination of these strengths makes remote sensing a powerful new tool in archaeological investigation, though it by no means replaces excavation, which is still necessary for precise dating and identification of certain features. What it does allow for is the rapid broad-scale mapping and visualization of otherwise invisible and inaccessible archaeological landscapes.

The second approach that this paper is taking to the term ‘sensing’ is that of sensorial experience, specifically the modern experience of visitors and archaeologists to an apparently empty archaeological

landscape. The experience of a typical visitor is much different from that of the archaeologist, who knows what to expect from an urban site of a given culture and is thus able to ‘fill in’ the landscape, however accurately, with the ‘missing’ features. The archaeologist will expect that only a small percentage of the total urban area would be excavated, but this is not the initial expectation of a touristic visitor. When visitors enter a park and encounter a sporadically excavated landscape, they may understandably be given the impression that the ancient landscape was similarly sparsely occupied. They are left with an experience lacking a comprehensive impression of the ancient landscape. Signage can alleviate this shortcoming to a certain degree, but falls far short of the first-hand impression that walking among the excavated remains of ancient structures provides. This chapter will propose a new approach that offers a way of addressing this experiential and sensorial gap, between the ancient and modern landscapes.

The approach outlined herein intertwines the two sensing paradigms to produce new meanings from the archaeological landscape. To accomplish this goal, a smart-device application was developed that could guide visitors through the results of remote sensing surveys, as they travelled through current-day spaces in real-time. The app was then piloted, in partnership with Archeoverse¹, at the archaeological park of the ancient Etruscan city of Vulci, in Lazio, and provides visitors there with the ability to explore the spaces of the park, augmented by visualization of remote sensing data that brings buried structures into view.² The visualization of the buried features is projected onto the surface of the modern park and annotated with pop-ups that furnish users with interpretations of the structure’s use, contextualizing information, and comparative reconstructions of similar structures. In other words, objective observations of structural foundations are contextualized with subjective interpretations of use and chronology. The visual stimuli of the archaeological landscape trigger the imagination of the user as they view the landscape through the lens of the app. The landscape of the park is thus transformed – from seemingly empty to densely populated – and the true nature of its ancient occupation is revealed to the user (Figure 13.1).

Cultural and historical background

The Etruscans were the most internationally active Italic civilization in the centuries before Rome’s rise to dominance. Prior to Roman conquest, a loose confederation of Etruscan city-states controlled ancient Etruria,



Figure 13.1 Aerial view of Vulci's urban territory. *Source:* Forte et al., 2020, visualization by the author.

roughly corresponding to modern-day Tuscany (Riva, 2020; Smith, 2014). At its peak, their cultural influence extended even further into the Po Valley and Campania. The Etruscan culture had its roots in the Early Iron Age of Central Italy (950–750 BCE) as the process of settlement centralization took hold throughout the region. During this phase, the small villages typical of the Late Bronze Age were abandoned and their inhabitants coalesced into proto-urban centres that would go on to become the great cities of Classical Etruscan culture (Cardarelli, 2018: 373–6; Marino, 2015; Pacciarelli, 2017; Stoddart, 2020). Simultaneously, a material culture emerged that served to increasingly differentiate social rankings, particularly in burial assemblages, through the eighth century BCE (Bonghi Jovino, 2005; Pacciarelli, 2016). This package of material culture, consisting primarily of impasto ceramic biconic funerary urns, bronze fibulae and war regalia, has been traditionally labelled as the Villanovan culture, but is now recognized as the earliest phase of the Etruscan culture.

Through the seventh century BCE, the Etruscan society crystallized into an urbanized and literate culture that became one of the Greek world's greatest trading partners (Bernardini and Camporeale, 2004; Naso, 2000; Stoddart, 2020: 196; Torelli, 1981). This is attested by the rich burial assemblages found within Etruscan necropolises, containing a staggering amount of imported Greek black-figure and red-figure pottery. It is fair to say that access to the Etruscan trade market was a large impetus for the Greek colonization of Southern Italy. The Etruscans themselves also produced a range of their own distinctive crafts, including metalworking, bucchero pottery and locally produced black-figure and red-figure ceramics. Trade between the Etruscans, the Phoenicians and the Greeks spurred the accumulation of wealth and the process of urbanization for all involved (Cerchiai, 2017; Damgaard Andersen, 1997; Izzet, 2007; Riva, 2010; 2020: 80). This was not a one-way acculturative process, but one in which each culture influenced the other and participated in the same networks of transmission and competition. As a result, common modes and mediums came about for the expression of personal and communal power. It was within this context that the first monumental architecture appeared in the seventh century BCE, across both Greek and Etruscan cultures. In Etruria, monumental architecture first took the form of large burial tumuli and richly decorated 'palatial complexes', as in the famous example at Murlo (Meyers, 2013; Tuck and Nielson, 2001; Torelli, 1993; Tuck, 2016). Around the middle of the sixth century BCE, these forms were replaced with monumental temples and other public structures (Donati, 2000; Steingraber, 2000;

Lulof, 2014). Prime examples of these forms can be found in the temple complexes at Tarquinia, Cerveteri and Marzabotto, where large temples were paired with public squares and, in a few instances, meeting halls. This period of prosperity, expansion and construction was the apogee of Etruscan regional power. Moreover, the shift in focus and investment, from private to public architecture, can be read as indicative of a corresponding shift in the socio-political organization of Etruscan cities, from one centred around personal authority to that of state authority (Murray, 2011).

The fifth and fourth centuries BCE, however, would see the cities of Etruria come into increasingly frequent and intense conflict with their territorial neighbours. Warfare led to the contraction of Etruscan territorial control, yielding to the Gauls in the Po River Valley and to the Greeks in Campania (Cuozzo, 2013: 215–16; Sassatelli and Govi, 2013: 297–9). Eventually, the Romans consolidated control over Central Italy, after a long period of sporadic conflict, when they defeated the last serious concerted military effort mounted by the Etruscans at the Battle of Lake Vadimo in 283 BCE. Yet this did not spell the end of Etruscan culture, whose cities, temples, burial practices and language would continue to persist into the Roman period (Ceccarelli, 2016; Jolivet, 2013). In fact, the fusing of Classical period Etruscan and Roman cultural elements was in many ways what led to the formation of republican era artistic, architectural and political forms.

Vulci itself formed within the developing cultural milieu of Central Italy, beginning as a Villanovan proto-urban centre and eventually becoming a major Etruscan urban centre of production and trade. The city went through all of the major developments outlined above, from the increase in social stratification spurred on by the influx of trade, to the shift in monumental public architecture in the sixth century BCE. Excavations began at Vulci in the last quarter of the eighteenth century with the discovery of richly endowed tombs and the extraction of their contents (Buranelli, 1992: 5–6; Moretti Sgubini, 2012; Tamburini, 2000: 20–1). More scientific excavations and field surveys would commence in the second half of the twentieth century with the investigation of the urban centre of the city (Whitling, 2019: 57).

The results of those investigations have revealed that the first region of Vulci to be populated was the Pozzatella area, just to the west of the plateau proper, which was occupied as early as the eleventh century BCE (Moretti Sgubini, 2006; Pacciarelli, 2017) (Figure 13.2). The northern part of the plateau seems to have subsequently become the focus of occupation moving into the early Etruscan period. These

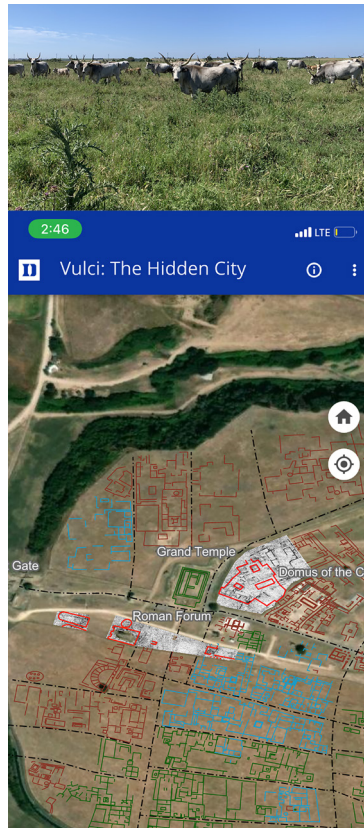


Figure 13.2 Above, a view of the cow pastures that make up much of Vulci's current landscape. Below, the opening view of the app, visualizing the ancient landscape of Vulci, including the interpreted results of recent remote sensing surveys. *Source:* author.

early phases of occupation are known primarily through the excavation of the associated necropolises and the results of field walking survey (Pacciarelli, 2001: 137–9). Early excavations focused on funerary contexts, for a number of reasons. Primarily, they hold the promise of intact contexts and, in the nineteenth and early twentieth centuries, furnished the great wealth of artefacts that filled museums (Dennis, 1848: 411). It is also the case that most structures built in this period were constructed from perishable materials that do not survive well within the archaeological record. Even so, field walking survey has found evidence for clusters of early occupation in these areas of Vulci's plateau, and the decorative elements of the large elite dwellings around which those clusters were focused (Bianchi, 2016: 43–4; Moretti Sgubini

and Ricciardi, 2006; Tamburini, 2000: 32). Presumably, it was one of these elite groups that built the monumental Cuccumella tumulus, in the seventh century BCE, which is the largest such burial structure in all of Etruria (Moretti Sgubini, 2015). Furthermore, it is evident from burial assemblages that external trade and craft production for local markets both played a major role in the increasing social stratification of Vulci's populace through the seventh century BCE (Tamburini, 2000: 32; Bianchi, 2016: 5–31).

This chapter will review the process of making the application, from gathering the underlying data, to designing the map visualizing that data, and finally to building the app that furnishes the visitor with an interactive version of the map that augments their in-park experience. However, before discussing the process of designing and building the app, a brief review of the history of excavation at Vulci and the Etruscan culture to which it belonged will provide context for the app's implementation.

The oldest excavated structure visible within the urban landscape of Vulci today is the Grand Temple, which dates to the second half of the sixth century BCE and was excavated by Renato Bartoccini between 1956 and 1958 (Moretti Sgubini, 1997). The remains and scattered decorative elements of other sanctuaries from this period have also been located, especially in association with major routes into and out of the city (Massabò, 1985). There was clearly a major uptick in the construction of monumental public architecture of Vulci in this period and the urban centre seems to have continually expanded southward across the plateau. The extent of the urban area is evidenced by the results of aerial photography and remote sensing techniques that clearly indicate the presence of city blocks full of structures, as well as the city walls and gates that were likely built sometime in the fourth century BCE (Forte et al., 2022; Marino, 2015; Moretti Sgubini, 2012: 67; 2017; Pocobelli, 2004). These walls may have been preceded by earthen ramparts or other defensive structures that do not survive, but certainly demarcate the extent of the city during at least the later Etruscan phase. However, little of this period is actually visible in the current landscape of the park.

Vulci was occupied continuously through the Roman period, after its conquest in 280 BCE, until it was abandoned at some point in the third or fourth centuries CE. This is the period from which the majority of visible structures date, although even these structures are sparsely excavated. Excavations in the urban area, by Mario Moretti and Anna Maria Moretti Sgubini, from the 1960s through to the early 2000s,

continued the excavation of the Domus of the Cryptoporticus and other Roman period structures first uncovered in the mid-twentieth century, including a *mithraeum* sanctuary, the base of a monumental dedicatory arch, and the central *decumanus* thoroughfare (Moretti Sgubini, 2012). The large structure of the Domus of the Cryptoporticus, a luxurious Roman-era dwelling, now dominates the landscape of Vulci's archaeological park.

The most recent excavations have been focused on the forum area. The Vulci 3000 archaeological project has investigated a city block just to the east of the forum that is focused around a small Roman period temple or sanctuary, possibly dedicated to the imperial family or the local protective *lares* deities (Forte et al., 2020; McCusker and Forte, 2017). In the earlier occupation layers, the project has also uncovered structural and artefactual evidence for the previous use of the space as an Etruscan era sanctuary. The geophysical survey and excavations by the Universität Freiburg have uncovered the remains of another monumental temple adjacent and likely contemporaneous to the Grand Temple (Franceschini and Pasiaka, 2021a; 2021b). Taken together, the evidence derived from the various excavation projects indicates that Vulci was a powerful regional centre during the Etruscan era and continued to be a locus of wealth into the imperial period.

Nonetheless, because a very small percentage of the urban centre itself has been excavated, approximately 5 per cent of the total area, the current state of the park gives the impression of a rather unoccupied landscape. The main sites for visitors to the park are the aforementioned Etruscan temple, which only survives in its foundations and podium, and the large Roman *domus*, which is the most impressive structure visible today. However, the remaining emptiness seems to have had a profound impact on both scholarly and touristic impressions of the site, as Vulci is often described as being significantly reduced in the Roman period, despite no archaeological evidence for its destruction (for instance, Carandini, 1985; Bianchi, 2018). Within this context, the Vulci 3000 project sought to either verify or reassess the state of urban occupation at Vulci through a multimodal remote sensing survey incorporating drone-based multispectral imaging and ground penetrating radar technology. Several new monumental structures were identified in the resulting data as well as evidence for large-scale occupation throughout the Roman period. These results have been published and will hopefully generate new scholarly perspectives on the occupation history of Vulci, but there is still a need to address the public perception of the ancient urban landscape. The following methodology seeks to

address this need, through the publication of a freely downloadable smart device application that allows visitors to the park to spatially explore the ancient landscape revealed by the remote sensing data.

Methodology

The first phase of this project was the collection of the remote sensing data. The core technology utilized was ground penetrating radar (GPR) after it was established that magnetometry-based techniques suffered from interference, due to the volcanic soil of the plateau (Forte et al., 2020). The Vulci 3000 archaeological project, directed by Professor Maurizio Forte, in partnership with the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology, directed by Dr Immo Trinks, undertook the GPR survey of the archaeological park in the summer of 2018 (Forte et al., 2022). The survey utilized a 16-channel 400 MHz MALÅ Imaging Radar Array (MIRA), one of the highest resolution imaging GPR units available at the time, and two smaller motorized SPIDAR units, one featuring six channels at 500 MHz and one featuring four channels at 400 MHz. Their different physical characteristics allowed the units to cover diverse terrain and the different frequencies allowed for different penetration characteristics between the units. Wider frequency bands tend to penetrate deeper, with lower resolution, whereas narrower bands tend to penetrate less deeply, but with higher resolution. Between the various units, the team captured results for nearly 10 hectares of Vulci's surface area.

To capture the broader archaeological landscape, the targeted GPR data was supplemented by drone flights, using a Sensefly eBee equipped with three separate Canon PowerShot S110 cameras for near infrared, red edge and RGB light. The imagery from the radiometrically calibrated cameras can be combined into indexes that assess crop health, especially the normalized difference vegetation index (NDVI). Because crop health can be influenced by subsurface structures, this method is able to detect patterns that correspond to potential archaeological features. Flying at an average altitude of 85 m, each pixel of the output photomosaic represents 3.5 square centimetres of ground surface. By taking over 30,000 photos, the team was able to cover the entire plateau using this multispectral imaging method.

The results immediately reveal that Vulci's urban landscape was rather densely occupied (Figure 13.1). The domestic quarter to the north-east of the forum is especially well defined in the data. Additionally,

several major public structures have also been identified in the forum area. Because the signal of the GPR units is primarily reflected by the highest stratum of structures, the evidence largely represents the Roman period. Etruscan period structures can also be identified in areas where there was no later Roman construction or where previously existing structures and infrastructure were incorporated into the fabric of the Roman period city. Several of the structures identified in this survey will be examined in more detail in the user experience section, below, when the chapter takes a guided tour through the application, from the perspective of an app user. Overall, the results suggest a more prosperous city than is often supposed for the Roman phase of Vulci's history and also provide a snapshot of the city's fullest extent, likely corresponding to its sixth century BCE phase. These observations are important results for our scholarly investigation of Vulci's history. We wanted to leverage this data in a way that would further enhance its impact on the perception of Vulci's archaeological landscape, beyond the scope of academic enquiry.

Design

With this goal in mind, an application was developed that incorporates selected portions of the rasterized data set and allows visitors to spatially interact with them. This work was done in technical partnership with Archeoverse, who funded the creation and distribution of the app on both iOS and Google Play Store and are working with us in the ongoing design of the app's user interface. The essential goal was to create an application that would augment the reality of a user's experience at the archaeological park, by projecting the subsurface archaeological features onto the surface where visitors could then interact with them, by both walking around them and opening information dialogue boxes linked to the projected features. The perceptual experience of the landscape will be transformed in the imagination of the user who views the landscape anew through the app. Users will be prompted to reconstruct the ancient landscape in their mind as they explore the park, while comparing the buried ancient landscape with the modern. Physical movement is also an essential design aspect of the application's user experience. Moving through this hidden landscape would allow users to appreciate the size and spatial context of the features in a profound way that is simply inaccessible through static images. It would also fundamentally alter their perception of the larger landscape's density, by replacing cow pastures with a dense network of urban streets and neighbourhoods.

To accomplish this task, we began by mapping the remote sensing data. The team at the Ludwig Boltzmann Institute processed the GPR data to produce high-resolution rasters which can be brought into a GIS environment and overlaid onto a satellite image basemap of the park. Each of the orthomosaic raster images represents a different depth of the captured data. These ‘depth slices’ allow the archaeologist interpreting the data to follow the full vertical extent of a feature, as it moves from just below the surface to depths of up to 5 m, by progressively ‘turning on’ the raster layers associated with each depth within the GIS viewer. Images from the drone flights were similarly processed into an NDVI orthomosaic raster by the Vulci 3000 team.

Both sets of raster data were then vectorized, which involves the interpretation of the features visible in the raster data which are then traced out in a GIS vector layer. The vector layer comprises polygons that can then be visualized separately from the raster image layers from which they were derived. Visualizing the vector polygons separately from the rasters allows the outline of features from the raster data to be overlaid directly onto the satellite imagery of the park without the rasters themselves obscuring the actual ground surface of the park. It also allows the creator to associate data, such as feature identifications, depths and phasing, with each polygon. That data can then be used to assign symbology to the polygon layer. For instance, all polygons associated with the Roman phase of Vulci’s occupation can be assigned one colour and Etruscan phase structures another.

The vectorization process was carried out in a local, that is to say not cloud-based, GIS environment using ArcGIS Pro. All of the raster data was brought into this environment so that a unified vector polygon layer could be created that incorporated the results of each remote sensing technique. A new feature layer was created to contain the vector polygons. During the creation process, it was necessary to consider what data fields we wanted to associate with each polygon. Fields can always be added later, but it is far simpler to have the data structure in place before one begins capturing data. If it is decided later on that a new field will need to be added, then that field will have to be filled retroactively for each identified feature. We decided to assign each feature an identification, a public or private use, a likely phase range, a notes field and a source field where the creator of the polygon could indicate in which raster layers the feature was visible. With the data structure in place, all features were then identified across the various raster layers and traced out using the ‘create polygon’ tool in ArcGIS Pro.

After the main vector layer was produced, two additional vector layers were added. The first was for the streets, which were traced as lines instead of polygons, and the second layer was for the most important structures that we wanted to highlight for visitors to the park. The second layer would reduplicate features from the main layer so that they could be visualized separately and was provided with additional fields that could be used to provide explanatory text and a URL for a hosted image of a potential reconstruction of the feature. Those fields will later be used to populate pop-up information boxes inside of the app.

The final step in preparing the data for use within the application was the selection and clipping out of the most important regions of the rasters representing the raw survey data. Because raster layers are far larger in file size than vector layers, it was necessary to select only the most important regions to improve file streaming and download-size for the final app. We chose regions around the public buildings in the forum area, and the large *domus* in the domestic quarter to the north-east of the forum, as they were the most significant remains to the interpretation of Vulci's urban plan that is clearly visible in the GPR data. The smaller raster sections then needed to be reformatted and exported as keyhole markup language (KML) files, so that they could be uploaded to our eventual webmap that would form the basis of the visualization within the application.

Once the vector feature layers and raster layers were prepared within ArcGIS Pro they were exported and uploaded to ArcGIS Online. From there, they were added to a web map that was configured to symbolize the data in the manner desired for the visualization within the final app. With the aim of highlighting the most important structures, a bright colour was chosen for the vector layer. The structures comprising the remainder of the ancient urban landscape were assigned more muted colours that are still visible against the basemap of satellite data. Each colour of those vector polygons represents a different phase of occupation with which that structure is most likely associated. The street network was assigned a dashed black line symbol, to clearly differentiate it from the surrounding structures. The raster layers were then placed underneath the vector layers, so that the vector lines and polygons are overlaid on the features visible in the raster images.

Another aspect of configuration necessary to apply to the webmap, prior to its incorporation in the final app, was the design of the 'pop-up' dialogue boxes that provide explanatory text and reference images for the highlighted features. Directing the 'pop-up configurator' within the webmap to the appropriate fields for the text and image URLs, which

link to the location of the images hosted on a cloud drive, allowed it to automatically populate the dialogue boxes. With the symbology set and the dialogue boxes designed, the webmap could then be used to form the basis of an application.

The first iteration of the application was designed as a web-based app. A web-based solution was chosen due to the ease of development and especially the speed of deployment. No code is needed within the Esri ArcGIS Online ecosystem, with web-based applications being designed exclusively through a 'drag and drop' graphical user interface and text fields. Functionality is determined by the selection of 'widgets' that the designer selects and places within the layout of the app. Widgets include functions such as live location tracking and layer selection. The selected widgets then appear as buttons that trigger their associated functionality. The app is accessed via a URL that can be navigated to either by manually entering the web address or by setting up a QR code for users to scan. Distribution of the web application was therefore extremely simple. Because it was hosted on the Esri cloud server that was included in our licence, we did not need to submit it to any app stores for approval and any changes made to the application were immediately reflected in the live version.

However, when testing this initial version of the app in the field, we encountered several shortcomings inherent in the web-based nature of the platform. Primarily, because the application needed to stream in not only the underlying data but all of the functionality from the cloud, it was extremely taxing on the cellular data connection available at the Vulci archaeological park. Tracking was also less precise than we would have liked and loss of connection would cause the app to reset. The ability to zoom in on features was also limited and there was little control over the aesthetic design of the app, including landing pages and dialogue boxes that delivered key information. Because these problems were fundamentally related to the web-based nature of the app, there was no viable workaround while we were married to that platform.

At this point, it became clear that a native smart device application, targeting usability on even low-end smart devices, would give us greater control over functionality and mitigate connection issues through the cellular data service available in the park. As a result, we decided to design an app that would be downloaded directly to a user's device and used natively, as a standalone app. We decided to build the application using Esri's AppStudio desktop software due to its 'out of the box' inclusion of code templates for mapping tools and modules. It also provides access to the cloud-based solution for versioning, archiving and internally

distributing the app through ArcGIS Online. That feature, combined with the AppStudio player, greatly simplifies the testing process without the need to distribute the app through manual sideloading or using an additional service, like Apple's TestFlight.

The AppStudio desktop application is a custom interface and compiler produced by Esri and based on the Qt Creator software, which is itself a development environment for writing and compiling graphical user interface applications. While Esri does offer template code for various application modules, the customization of the app interface, the addition and removal of certain functionality and the editing of layout elements is accomplished directly through working with the underlying code. The difficulty is that the application designer will have to be conversant with QML, which is a markup language based on JavaScript to interface with the Qt framework for developing touch-based applications. However, because it is based on the very commonly used JavaScript, it should be familiar to many, if not most, individuals who have previously worked with code.

We decided to build a native application that functions as a viewer for the webmap we had already created. That decision was made because it would allow us to import structured data and symbology from that map into the application, as well as make changes to the map that would be implemented in the app instantly. If the application utilized a static version of that map, a new version of the application would have to be published every time we wanted to make even minor adjustments to symbology. With the revised configuration, if a change needs to be made in the colour of a polygon representing a certain feature, it can be executed directly in the webmap and that change will immediately be reflected in the app the next time a user loads it.

The final and perhaps most important benefit of constructing the application as a viewer for our webmap, is that it provides a great degree of flexibility for the app's future implementation. Because the viewer can be configured to display any webmap created using ArcGIS Online, simply by inserting its URL into the appropriate locations within the code, the source code can quickly be deployed at any number of different sites. All it would take to spin up a new application is the creation of a new webmap and the inclusion of new design elements, such as text and images, pertinent to the site at hand. Once those elements are changed, the code can be recompiled into a new application and uploaded to the various smart device app storefronts.

When we set about designing the application interface, the first question to consider was what functionality we wanted to be

available to users, as those choices would dictate our approach. A high-accuracy positional tracker, and the ability to open informative pop-ups by interacting with the features, were the paramount concerns. Such functions will allow users to interact with the buried archaeological features both spatially and tactually and are thus key to the application delivering on its goal, to engage users in the discovery of the ancient urban landscape. The locator tool, from the Esri AppFramework code library, provided the prior function. It was configured to allow for the highest degree of spatial precision the user's device is capable of, but only after asking the user for their permission. A highly modified version of the Identify Features tool provided the ability for users to open informative boxes with text and images.

A secondary goal of the design was to allow users to turn layers on and off, to visualize different sets of data. We had to think about where and how we wanted to position the legend and the list of layers. Because these were secondary activities, they are included in an 'information' button in the map header that opens these views. By not exposing the layer list when the user first opens the map, it presents the user with an uncluttered and full view of the ancient urban landscape as their first impression. This invites them to first interact with the landscape spatially, which is our main goal. However, explanatory text on the opening page and in the 'about' section of the app encourages the user to explore further interactivity, contained within the 'information' menu. Of course, we also provided customized headers, icons, themes, images and texts, throughout the application, to provide a cohesive aesthetic particular to our app and to most efficiently convey its functionality.

Once all of the desired functionality and formatting had been built into the application, we acquired an API key from Esri to provide our application access to Esri's geolocation and satellite imagery basemap services. We then uploaded the application code to our ArcGIS Online cloud storage and downloaded it onto several devices for testing, via the free Esri AppStudio player smart device application. The AppStudio player can download any application a member of your organization has uploaded to ArcGIS Online and run it on a smart device as if it were a native application, although actually still running inside the AppStudio player. That functionality allows for testing on actual smart device hardware, instead of on simulated devices within the Qt debugger, and is a more reliable method for testing device compatibility and functionality, such as geopositioning.

The app was then field tested to ensure proper functionality and usability on a range of devices. Thankfully everything worked as intended

and so, after adjusting font sizes and adding logos for the parco archeologico naturalistico di Vulci and our technical partners Archeoverse, the code was compiled into Android and iOS application files, using the desktop AppStudio. The compiled application files were submitted to the respective app storefronts for review, a process that took several days. Both versions were eventually approved and the app can currently be found under the name AN_Vulci and downloaded for free by any visitor or interested reader, from either the Google Play Store or the Apple App Store.

User experience

This chapter will now provide a walkthrough of the in-park user experience of the application.³ As mentioned in the design section, above, the application opens into a start page that explains its functionality. It also acknowledges contributors and owners of the application, the Park of Vulci and Archeoverse, respectively, with their titles and logos. When the user is ready to begin, they click the start button and are brought into the app proper, where they are confronted with the entirety of the ancient urban landscape. This view impresses upon them the density and extent of the ancient landscape, in contrast with the empty cow pastures they are looking at in the modern landscape (Figure 13.1).

That sensorial contrast naturally prompts the user to consider where they are standing within the ancient landscape, visible through the application, and the first action the app guides the user towards is the 'track location' button, that allows them to achieve that orientation. The stark comparisons that this feature enables, between the seemingly empty modern landscape and the evidently densely occupied ancient landscape, visible in the map presented by the application, engages the user's imagination. It prompts them to consider what structures may have been present, how they would have been used, and how they would have impacted the landscape. In this way, the 2D map triggers more critical engagement by the user than a 3D reconstruction might, in that it requires the user to contribute to the reconstruction rather than passively receive it. It also bases the user's interpretations of the landscape on the objective literal foundations of the structures visible in the data, while providing some subjective guidance to prompt their imagination.

Allowing users to track their movement in real-time is the critical aspect of the app's user experience. Overlaying their position, on top of the GPR rasters and archaeological features, places them within the

hidden ancient landscape of the park. Through using the app on site, users can fill in the empty spaces of the park and reconstruct the ancient landscape all around them. It also provides a sense of embodiment for the user, placing them within ancient spaces and revealing the true scale of individual structures and the landscape. By exploring the ancient landscape through the lens of one such hypothetical user it will be possible to convey the impact that the application has on the user's sensorial impression of the park's spaces.

The effect can be transformative in regard to the cognitive and sensorial experience of visiting the park. Visitors are invited to reconstruct the urban fabric of Vulci and fill in the 'empty' spaces of the landscape. Their perception of the city is radically altered by the ability to peer under the surface, discover ancient structures, and place themselves within those spaces. When users are able to place themselves within the ancient landscape, the scale, density and contexts of that landscape are revealed to them in an intuitive manner that far surpasses the impact of static information panels.

Beyond this immediate impact, we wanted the app to inform visitors to the park of how this knowledge of the ancient landscape was generated. Therefore, we designed the application not only to visualize the features discovered in the data, but to demonstrate their actual form and how the archaeological interpretation moved from data to identification. We did so by including sections of the raster images themselves, within the visualization presented by the app, so that viewers could see the data compared directly to the polygon interpretive layers. Furthermore, we built-in the ability to toggle between various 'depth slices' of the GPR data, illustrating how certain features are visible at different depths and prompting users to consider what implications this has for their interpretation. By exposing the data to the visitor in this way, it encourages them to interact with the landscape in a more engaged manner, to question what is hidden within its depths, and to consider the process through which archaeological knowledge is created.

The forum area

When visitors enter the park today one of the first sights they are greeted with is the Grand Temple. This temple only survives in its foundations, but their scale remains impressive. The visitor's understanding of this structure is aided by the information panel, put in place by the park, that provides a prospective reconstruction of the structure and a text that details the dating and identification of the temple. It does a commendable

job of contextualizing the temple within Etruscan culture and facilitates the viewer's mental reconstruction of the building to its original state. However, what the panel cannot achieve is a proper recontextualization of the structure within the larger ancient urban landscape.

The panel mentions that the forum area lies directly to the south, but a visitor to the park would naturally assume that it stood on its own, dominating the empty space of the forum as it does today. There are no excavated structures adjacent to it. Across the *decumanus* from the temple today lies the ruins of a small mediaeval chapel and then open pastures. There is nothing to suggest the presence of a thriving forum cluttered by centuries' worth of monumental public construction.

However, as soon as the user glances down at their device, they will see that the forum was exactly that; surrounded on all sides by large public structures whose presence defined its space (Figure 13.3). The impression of the landscape is immediately transformed. It is intuitively clear that the temple would not have stood in isolation but as part of a larger programme of structures that were all spatially linked. When the temple is viewed in isolation it is appreciated for its grandeur and the cultural significance of the activities it housed, but when viewed from this new perspective, in the midst of a whole neighbourhood of structures, it becomes so much more meaningful. Noticing the link between the temple, the forum and the surrounding buildings challenges the user to consider why the structures were placed in that specific location, what they had in common and what set them apart from the rest of the urban landscape.

To answer these questions, they can turn to the application and investigate the space through its unique perspective on the otherwise hidden landscape. The first structure they are likely to encounter in their investigation is just to the south-west of the temple. The GPR data visible in this region highlights a large public structure that would have delineated the western border of the forum. The problem with investigating this structure is that it is currently underlying an existing apsidal church of the late antique or mediaeval period. Therefore, the structure is unlikely ever to be fully excavated, making information gathered about the structure in alternative ways vital to its interpretation. It also means that the only way visitors will be able to 'see' it, is through this type of GPR data. Thus, the application we have designed is, at the moment, the only medium through which visitors to the park would have any idea that this once major structure exists at all.

Naturally, visitors will question what this large structure was used for in antiquity. We may begin by examining the physical features of the

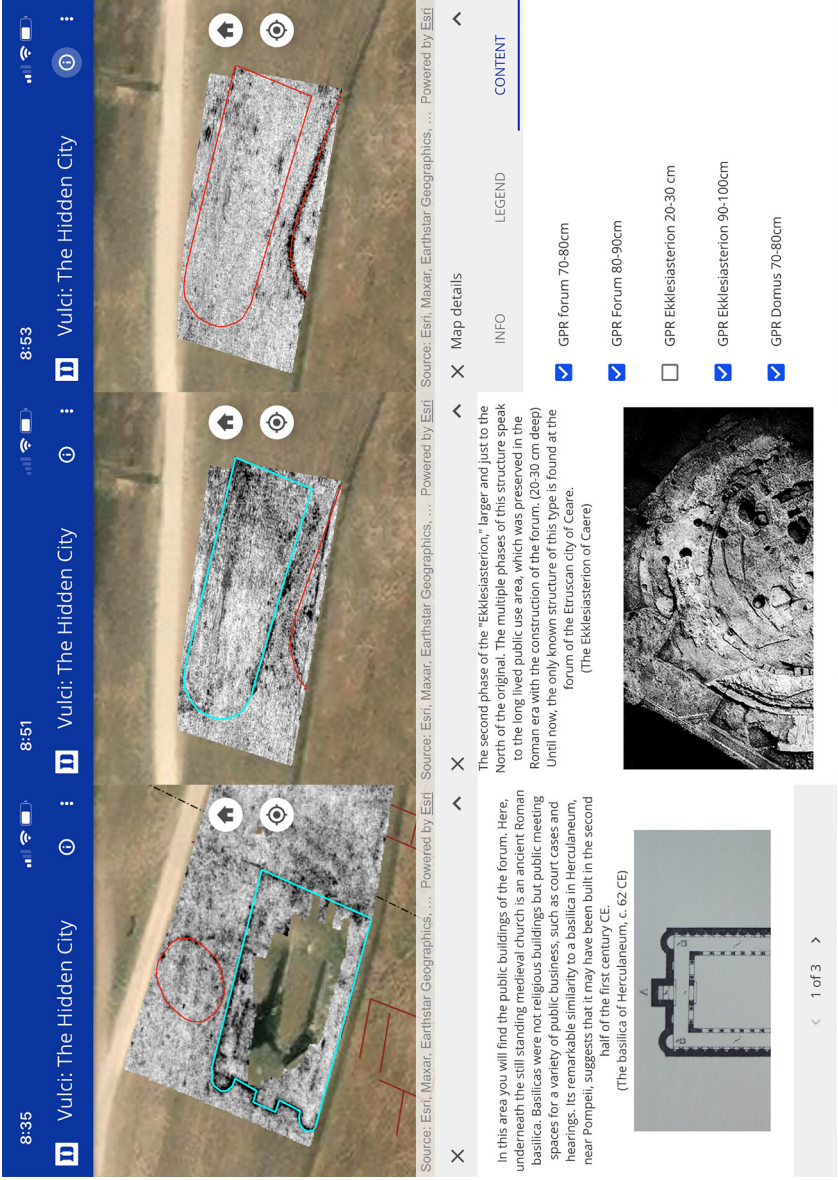


Figure 13.3 The user's view of the application as they interact with the archaeological features in the forum area by moving through them spatially and selecting various overlays. *Source:* author.

structure itself. Features related to this structure are visible in GPR slices as deep as 150–160 cm, although a darker and clearer outline of the structure is visible at 120–130 cm. The inside walls and features become evident and most clear at 80–90 cm, which is the layer visualized in [Figure 13.3](#). Its structure is visible in nearly 2 metres worth of the depth slices, suggesting substantial remains. Users can toggle between several depth slices in this area to see for themselves how the structure extends vertically through the data and the strata of the soil.

Certain aspects of its layout provide clues for its identification. The buried structure measures 26 metres on the long sides and 19 metres on the shorter sides, with two small apses in the north-west and south-west corners of the west wall. In the centre of the west wall there is a rectangular exedra. Two aisles running along the interior of the northern and southern walls are also visible in the GPR data. Those aisles appear to have been paved, while the central area does not show evidence of paving. This suggests an open-air structure with a colonnaded or roofed area along its internal borders.

All of these individual features allow us to make an interesting comparison, to the *Augusteum* of Herculaneum, which is presented to the user when they select the archaeological feature representing the ancient structure (D'Andrea et al., [2017](#)). The informative pop-up includes a reference image and citation for the *augusteum* and a comparative analysis, explaining that while the *augusteum* facing the north end of Herculaneum's forum is larger in size than the structure from Vulci's forum, the layouts of the two structures are remarkably similar. Both this structure and the *augusteum* exhibit the uncommon layout of a small apse at each corner, on the far, short side, with a small rectangular exedra in the middle. The *augusteum* also only has two aisles, with a large open-air nave in the middle. The late date of the Herculaneum structure's construction, during the 60s CE, could suggest a similar date and use for the structure at Vulci.

Perhaps the most interesting clue to the use of the ancient structure is its location under the later church. The church is built directly in the centre of the earlier structure's floor plan and it is unlikely that such a placement is coincidental. This point is driven home even more clearly, to the application user, as they stand inside both the mediaeval ruins and the virtually reconstructed Roman structure simultaneously. There is therefore a strong reason to argue for an intentional continuity in the use of space over the centuries. If so, then this is further evidence of a previous cultic function for the ancient structure. Furthermore, the fact that this space was chosen for the most important structure in the

profoundly diminished mediaeval occupation of the plateau speaks to the conceptual importance of the previous structure within the configuration of the city. An *augustum* is thus an excellent fit as one of the most important cult structures in any Roman city, representing the presence of the central state, all across the empire.

Other structures fill the area around the forum, such as the rostra or altar just to the east of the *augustum* and what is likely a smaller temple to the south. However, the second most important structure from an archaeological perspective is the Etruscan era *ekklesiasterion*, a gathering place for public bodies, just to the west of the Roman period forum. This structure is analogous in design and spatial configuration to the *ekklesiasterion* at the Etruscan city of Caere, where it too lies adjacent to a temple precinct and forum (Bellelli, 2016). That being said, Vulci's structure would be the only other structure of this type yet discovered in an Etruscan city and thus an important comparandum. Again, this comparison is presented to the user with text and figures via an informative pop-up. The visitor using the application to position themselves within the landscape can also receive a greater appreciation of the spatial context that the *ekklesiasterion* occupied, in close connection with the Etruscan temple but also with the space later occupied by the Roman forum. That location suggests that the public configuration of this urban space stretches back from the Roman period to at least the sixth century BCE, when the Etruscan city was at its monumental peak. One final observation the user of the app is guided to make is that two different phases of the structure are visible in the GPR data, which the user is invited to toggle between. The app prompts the user to consider why one structure is at a lower depth than the other and what the implications are for the use of the *ekklesiasterion* over time. Indeed, moving between the various depths emphasizes the *longue durée* development of the public spaces of Vulci.

Domestic structures

The next area of the park we will explore is to the north-east of the forum, across the main street of the *decumanus* from the current area of the Vulci 3000 project's excavation. The region between the Grand Temple and the Domus of the Cryptoporticus returned very intriguing results from the GPR survey: a huge Roman aristocratic dwelling, comparable to the *domus* immediately bordering it. The information pop-up associated with this feature describes the size of the dwelling, which is even larger than its neighbour, but the description does not convey its scale as effectively

as physically walking from one end of the structure to the other. When the user does so and realizes that the structure occupies nearly the entirety of the empty field in which they stand, the immense proportions of this urban *domus* can be comprehended (Figure 13.4).

The most immediately obvious feature, within the GPR data visible on the map, is the water-gathering impluvium and surrounding atrium, that comprise the core of Roman period *domus* floorplans. When the user selects the feature representing the atrium they are presented with information explaining its role as the public space within a Roman house and an image of the reconstructed atrium from the House of the Silver Wedding, at Pompeii. This interaction contextualizes the space, giving it meaning beyond its sheer proportions. It also gives the user an avenue into reconstructing the ancient space that would have surrounded them, within the landscape of the park.

Several *cubicula*, multipurpose dayrooms, can also be seen around the perimeter of the atrium, as well as the *alae* (wings), and the *tablinum*

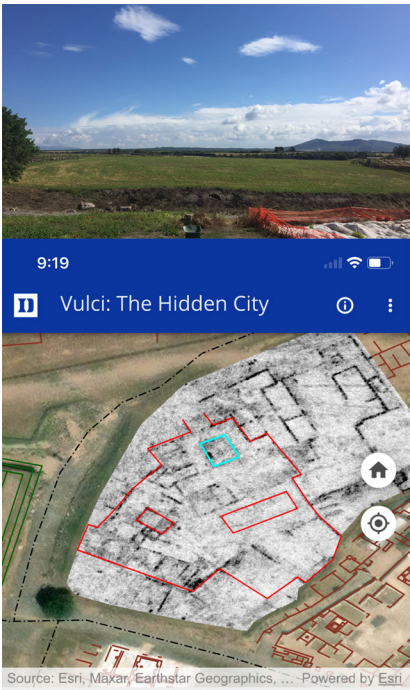


Figure 13.4 A comparative view of what the user sees in the modern landscape of Vulci when standing in the field containing the Roman villa (above) and what they see when viewing the landscape through the application (below).
Source: author.

on the eastern side of the atrium. Tablina are often considered to be the 'study' of the Roman *domus*, where the head of the household, the *paterfamilias*, would greet his clients. The tablinum is usually slightly elevated above the floor level of the atrium, which was the public area of the house and where his clients would have stood. These spaces are elaborated in the informative pop-ups associated with the *domus* and, as the user proceeds through them, they experience the sequence of movement that would have taken place in the ancient past. Moving through the tablinum, there is a peristyle courtyard, the core of the private suite of the house where the family would host friends and esteemed guests. On the other side of this peristyle there is a further set of spaces, most likely including a luxurious garden area. This private quarter of the house also is supplemented in the app with an image of an analogous reconstruction from Pompeii, this time from the House of the Marine Venus, to assist the user in visualizing the ancient spatial context.

The structures immediately to the south potentially contain a second impluvium complex, yet it is oriented on a different axis from the *domus* to the north and additional rooms appear to have interceded into the space of the surrounding atrium. The application presents the visitor with the following explanation for the odd presence of a second atrium, when they select its feature. There is a second atrium present in the neighbouring Domus of the Cryptoporticus, which was later converted into a suite of guest rooms. At Pompeii there is also evidence of houses with two atria, such as the House of Menander and the House of Citharist, often hypothesized as having resulted from the combination of two previously existing houses into an expanded residence. The lack of apparent boundary walls and the truncated nature of the southern structures suggests a similar process in which the larger domus to the north expanded and absorbed, so to speak, the domus to its south. The firsthand act of exploring these domestic spaces through the app powerfully augments the visitor's experience, in which they can simultaneously stand in an empty field and an ancient Roman atrium. Having thoroughly explored this once empty field, it has now become a rich landscape bustling with scenes of ancient life.

Conclusion

The native smart device application discussed in this chapter provides users with an augmented view of archaeological landscapes, but the approach is not without some important limitations to consider in

future implementation. One limitation of the approach laid out above is the reliance on Esri's ecosystem and API to underpin the geospatial functionality of the app. This situation puts the designer at the mercy of the company's whims, if the ArcGIS Online platform is discontinued at some future point. The reliance on third-party platforms at some point in the application publication pipeline is nearly unavoidable, especially for academic projects that operate at a vastly smaller scale than major technology corporations and must therefore utilize some out-of-the-box solutions for various components of a project, for its completion to be feasible. One smaller drawback of our specific use of the Esri AppStudio platform is the need for a designer to be familiar with coding principles and the QML language. However, QML is based on the commonly used JavaScript, and the AppStudio includes some modules and templates to ease the coding process. In the end, the approach has facilitated the creation of an application that can be flexibly implemented at archaeological sites, to effectively augment visitors' sensorial experience in the landscape, beginning with a pilot implantation at the park of Vulci.

Vulci was one of the grandest cities of the Etruscan society, but the modern landscape is sparsely occupied with vast open areas, broken up only by the occasional ancient structure. The application *AN Vulci* reveals to the user that the ancient landscape was quite different. It stretched over 100 hectares of territory, much of it densely occupied with centuries of construction. By placing the user within that ancient landscape, the app allows them to explore it, as they move through the seemingly empty spaces, radically altering the sensorial experience of the park. The contrasts, evident in the modern and archaeological landscapes, prompt the user to engage their imagination in the reconstruction of the spaces around them. As they move through and interact with the objective archaeological features, the experience is further enhanced with subjective comparative reconstructions and contextualizing information that facilitate a more robust understanding of the ancient landscape of Vulci.

The application's most important contribution is that it facilitates the embodiment of the archaeological landscape. Through it, a visitor, or even a seasoned archaeologist, can stand in an empty pasture and visualize the areas of densest occupation, the public monuments and the scenes of daily life all around them. Users can physically and cognitively place themselves within ancient and modern spaces simultaneously, enhancing their sensorial experience of the archaeological landscape. The impact of scale and spatial context, provided through the user experience, is irreproducible in any other format. In sum, by publishing

the results of remote sensing surveys through this application, we have been able to deliver an engaging and profoundly augmented experience of Vulci's landscape.

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Archeoverse Srl provided funding for this application and own the application distribution and intellectual property rights. Copyright belongs to the author, Antonio LoPiano.

Notes

- 1 Archeoverse is a technical development company working in cultural heritage preservation and engagement.
- 2 For an exploration of ancient sensorial experiences of the Etruscan necropolises, spaces that in many ways were meant as a mirror image of the cities of the living, see Jacqueline Ortleva's chapter in this volume investigating the soundscape of Etruscan tombs.
- 3 To follow along or explore further areas of the park virtually, you may download the app from either the iOS store or the Google Play Store, listed under AN_Vulci.

References

- Bellelli, V. (2016) 'The urban area'. In N. T. De Grummond and L. Pieraccini (eds), *Caere*. Austin: University of Texas Press, 49–58.
- Bernardini, P. and Camporeale, G. (2004) *The Etruscans Outside Etruria*. Los Angeles: J. Paul Getty Trust Publications.
- Bewley, R. H. (2003) 'Aerial survey for archaeology', *The Photogrammetric Record*, 18(104): 273–92.
- Bianchi, E. (2016) *Vulci: Storia della città e dei suoi rapporti con greci e romani*. Rome: L'Erma di Bretschneider.

- Bianchi, E. (2018) 'Italy after the Pyrrhic War: The beginnings of Roman colonization in Etruria', *Klio*, 100(3): 765–84.
- Bonghi Jovino, M. (2005) 'Città e Territorio: Veio, Tarquinia, Cerveteri e Vulci, Appunti e Riconsiderazioni'. In O. Paoletti and G. Camporeale (eds), *Dinamiche di Sviluppo delle Città nell'Etruria Meridionale: Veio, Caere, Tarquinia, Vulci (Atti del XXIII convegno di studi Etruschi ed Italici: Roma, Veio, Cerveteri/Pyrgi, Tarquinia, Tuscania, Vulci, Viterbo 2001)*. Pisa: Istituti Editoriali e Poligrafici Internazionali, 27–58.
- Buranelli, F. (1992) *Gli Scavi a Vulci della Società Vincenzo Campanari: Governo pontificio (1835–1837)*. Rome: L'Erma Di Bretschneider.
- Campana, S. (2017) 'Drones in archaeology: State-of-the-art and future perspectives', *Archaeological Prospection*, 24(4): 275–96.
- Carandini, A. (1985) *La Romanizzazione dell'Etruria: Il territorio di Vulci*. Milan: Electa.
- Cardarelli, A. (2018) 'Before the city: The last villages and proto-urban centres between the Po and Tiber Rivers', *Origini*, 41(2): 359–82.
- Ceccarelli, L. (2016) 'The Romanization of Etruria'. In S. Bell and A. Carpino (eds), *A Companion to the Etruscans*. Chichester: Wiley Blackwell, 28–40.
- Cerchiai, L. (2017) 'Urban society'. In A. Naso (ed.), *Etruscology*. Boston: De Gruyter, 617–44.
- Corti, E. C. (1951) *The Destruction and Resurrection of Pompeii and Herculaneum*. London: Theodore Brun.
- Cuozzo, M. (2003) *Reinventando la tradizione: Immaginario sociale, ideologie e rappresentazione nelle necropoli orientalizzanti di Pontecagnano*. Salerno: Pandemos.
- Cuozzo, M. (2013) 'Etruscans in Campania'. In J. MacIntosh Turfa (ed.), *The Etruscan World*. London: Routledge, 301–18.
- Damgaard, A. (1997) 'The archaeological evidence for the origin and development of the Etruscan city in the 7th to 6th centuries BC'. In A. Damgaard (ed.), *Urbanization in the Mediterranean in the 9th to 6th Centuries BC*. Copenhagen: Museum Tusculanum Press, 343–82.
- D'Andrea, A., Bosco, A. and Barbarino, M. (2017) 'A 3D environment to rebuild virtually the so-called Augusteum in Herculaneum', *Archeologia e Calcolatori*, 28(2): 437–46.
- Dennis, G. (1848) *The Cities and Cemeteries of Etruria*. London: John Murray.
- Donati, L. (2000) 'Civil, religious and domestic architecture'. In M. Torelli (ed.), *The Etruscans*. New York: Rizzoli, 222–32.
- Fish, S. K. and Kowalewski, S. A. (eds) (1990) *The Archaeology of Regions: A case for full-coverage survey*. Clinton Corners, NY: Percheron Press.
- Forte, M., Danelon, N., Johnston, D., McCusker, K., Newton, E., Morelli, G. and Catanzari, G. (2020) 'Vulci 3000'. In M. Forte and H. Murteira (eds), *Digital Cities: Between histories and archaeology*. Oxford: Oxford University Press, 13–41.
- Forte, M., Trinks, I., Hinterleitner, A., Klein, M., LoPiano, A., McCusker, K., Schiel, H., Schlögel, I., Trausmuth, T., Vonklich, A., Wallner, M. and Neubauer, W. (2022) 'Multimodal remote sensing applications in the Etruscan-Roman city of Vulci', *Journal of Field Archaeology*, 47(8): 501–21.
- Franceschini, M. and Pasiëka, P. P. (2021a) "'Da niuna cura accompagnato fuori che quella di scoprire antiche cose": Nuovi dati sugli scavi Campanari a Vulci (Rapporti di scavo inediti, 09.11.1835–28.05.1836)', *Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung*, 127: 322–74.
- Franceschini, M. and Pasiëka, P. P. (2021b) 'Südetruskische Metropole Vulci'. *Jahresbericht 2020 der Fritz Thyssen Stiftung*. Cologne: Fritz Thyssen Stiftung, 106–7.
- Goalen, M. (1995) 'The idea of the city and the excavations at Pompeii'. In T. Cornell and K. Lomas (eds), *Urban Society in Roman Italy*. New York: St Martin's Press, 181–202.
- Goodman, D. and Piro, S. (2013) *GPR Remote Sensing in Archaeology*. Berlin: Springer.
- Izzet, V. (2007) *The Archaeology of Etruscan Society*. Cambridge: Cambridge University Press.
- Jolivet, V. (2013) 'A long twilight: "Romanization" of Etruria'. In J. MacIntosh Turfa (ed.), *The Etruscan World*. London: Routledge, 151–79.
- Leisz, S. J. (2013) 'An overview of the application of remote sensing to archaeology during the twentieth century', *Springer Briefs in Archaeology*, 56: 11–19.
- Lulof, P. S. (2014) 'Reconstructing a golden age in temple construction: Temples and roofs from the last Tarquin to the Roman Republic (c.530–480 BC) in Rome, Etruria and Latium'. In *Papers on Italian urbanism in the first millennium BC. Journal of Roman Archaeology Supplementary Series*, 97: 113–25.

- Marino, T. (2015) 'Aspetti e fasi del processo formativo delle città in Etruria meridionale costiera'. In M. Rendelli (ed.), *Le città visibili: Archaeologia dei processi di formazione urbana (Alghero, Complesso di S. Chiara, 31 gennaio–1 febbraio 2014)*. Rome: Officina Edizioni, 97–141.
- Massabò, B. (1985) 'Contributo alla conoscenza topografica di Vulci: Le aree sacre di Fontanile di Legnisina e di Polledrara', *Bollettino d'arte del Ministero per i beni culturali e ambientali*, 29: 17–28.
- McCusker, K. L., Forte, M., Favreau, J. and Patalano, R. (2017) 'The Vulci 3000 project: A digital workflow and disseminating data'. In *Shallow Pasts, Endless Horizons, Sustainability and Archaeology: Proceedings of the 48th annual Chacmool conference*. Calgary: Chacmool Archaeological Association, 96–105.
- Meyers, G. E. (2013) 'Approaching monumental architecture: Mechanics and movement in archaic Etruscan palaces', *Papers of the British School at Rome*, 81: 39–66.
- Moretti Sgubini, A. M. (1997) 'Il Tempio Grande di Vulci: Le terrecotte architettoniche di fase arcaica'. In P. S. Lulof (ed.), *Deliciae fictiles II*. Amsterdam: Thesis, 151–64.
- Moretti Sgubini, A. M. (2006) 'Alle origini di Vulci'. In M. P. Angeletti (ed.), *Archeologia in Etruria Meridionale: Atti delle giornate di studio in ricordo di Mario Moretti, Civita Castellana, 14–15 novembre 2003*. (*Studia archaeologica*; 147). Rome: L'Erma di Bretschneider, 317–61.
- Moretti Sgubini, A. M. (2012) 'Vulci'. In G. Nenci, G. Vallet, U. Fantasia and C. Ampolo (eds), *Bibliografia Topografica della Colonizzazione Greca in Italia e nelle Isole Tirreniche*, Volume 21. Pisa: Torre Castelluccia Zambrone, 1082–154.
- Moretti Sgubini, A. M. (2015) 'Tumuli a Vulci, tumuli a Tuscania'. In G. M. Della Fina (ed.), *La Delimitazione dello Spazio Funerario in Italia dalla Protostoria all'Età Graica: Recinti, circoli, tumuli. Atti del XXIII Convegno Internazionale di Studi sulla Storia e l'Archeologia dell'Etruria (Orvieto 2014)*, in *AnnFaina XXIII*. Rome: Edizioni Quasar, 597–636.
- Moretti Sgubini, A. M. (2017) 'Riflessioni sulle mura di Vulci'. In S. Quilici Gigli and L. Quilici (eds), *Atlante Tematico di Topografia Antica*, Volume 27. Rome: L'Erma di Bretschneider, 65–86.
- Moretti Sgubini, A. M. and Ricciardi, L. (2006) 'Vulci: Materiali architettonici di vecchi e nuovi scavi'. In I. E. M. Edlund-Berry, G. Greco and J. Kenfield (eds), *Deliciae Fictiles III*. Oxford: Oxbow books, 103–15.
- Murray, C. (2011) 'Constructions of authority through ritual: Considering transformations in ritual space as reflecting society in Iron Age Etruria'. In N. Terrenato and D. C. Haggis (eds), *State Formation in Italy and Greece: Questioning the neoevolutionist paradigm*. Oxford: Oxbow Books, 119–216.
- Naso, A. (2000) 'The Etruscan aristocracy in the Orientalizing period: Culture, economy, relations'. In M. Torelli (ed.), *The Etruscans*. Milan: Bompiani, 111–30.
- Pacciarelli, M. (2001) *Dal Villaggio alla Città: La svolta proto urbana del 1000 AC nell'Italia Tirrenica*. Florence: All'insegna del Giglio.
- Pacciarelli, M. (2016) 'The earliest processes toward city-states, political power and social stratification in Middle Tyrrhenian Italy', *Origini*, 39(1): 165–202.
- Pacciarelli, M. (2017) 'The transition from village communities to protourban societies'. In A. Naso (ed.), *Etruscology*. Boston: De Gruyter, Volume 1: 561–80.
- Pocobelli, G. F. (2004) 'Vulci: Il contributo della fotografia aerea alla conoscenza dell'area urbana'. In G. Ceraudo and F. Piccarreta (eds), *Archeologia Aerea: Studi di Aerotopografia Archeologica I*. Rome: Libreria dello Stato, Istituto Poligrafico e Zecca dello Stato, 127–43.
- Riva, C. (2010) *The Urbanisation of Etruria: Funerary practices and social change, 700–600 BC*. Cambridge: Cambridge University Press.
- Riva, C. (2020) *A Short History of the Etruscans*. London: Bloomsbury Academic.
- Sassatelli, G. and Govi, E. (2013) 'Etruria on the Po and the Adriatic Sea'. In J. MacIntosh Turfa (ed.), *The Etruscan World*. London: Routledge, 281–300.
- Smith, C. J. (2014) *The Etruscans: A very short introduction*. Oxford: Oxford University Press.
- Steingraber, S. (2000) 'Etruscan urban planning'. In M. Torelli (ed.), *The Etruscans*. Milan: Bompiani, 291–311.
- Stoddart, S. (2020) *Power and Place in Etruria*. Cambridge: Cambridge University Press.
- Tamburini, P. (2000) 'Vulci e il suo territorio'. In M. Celuzza (ed.), *Vulci e il suo territorio nelle collezioni del museo Archeologico e d'Arte della Maremma* (exhibition catalogue). Milan: Bocca, 17–45.
- Tartaron, T. F. (2003) 'The archaeological survey: Sampling strategies and field methods', *Hesperia Supplements*, 32: 23–45.

- Terrenato, N. (2000) 'The visibility of sites and the interpretation of field survey results: Towards an analysis of incomplete distributions'. In R. Francovich, H. Patterson and G. Barker (eds), *Extracting Meaning from Ploughsoil Assemblages*. Oxford: Oxbow Books, 60–71.
- Torelli, M. (1981) 'Il commercio greco in Etruria tra l'VIII ed il VI secolo AC'. In M. Napoli (ed.), *Il Commercio Greco nel Tirreno in Età Arcaica: Atti del Seminario in Memoria di Mario Napoli, Salerno 1981*. Salerno: Università degli Studi, Facoltà di Lettere e Filosofia, Istituto di Storia Antica e Archeologia, 67–82.
- Torelli, M. (1993) 'Regiae d'Etruria e del Lazio e immaginario figurato del potere', *Studies in the History of Art*, 43: 85–121.
- Tuck, A. (2016) 'The three phases of domestic space at Poggio Civitate'. In G. M. Della Fina (ed.), *Dalla Capanna al Palazzo: Edilizia abitativa nell'Italia preromana: Atti del XXVIII Convegno internazionale di studi sulla storia e l'archeologia dell'Etruria. Annali della Fondazione per il Museo Claudio Faina*, Volume 23. Rome: Edizioni Quasar, 301–17.
- Tuck, A. S. and Nielsen, E. O. (2001) 'An Orientalizing period complex at Poggio Civitate (Murlo): A preliminary view', *Etruscan Studies*, 8(11): 35–64.
- Verhoeven, G. and Sevara, C. (2016) 'Trying to break new ground in aerial archaeology', *Remote Sensing*, 8(11): 918. <https://doi.org/10.3390/rs8110918>.
- Whitling, F. (2019) *Western Ways: Foreign schools in Rome and Athens*. Berlin: De Gruyter.
- Zifferero, A. (1991) 'Forme di possesso della terra e tumuli orientalizzanti nell'Italia centrale Tirrenica'. In E. Herring, R. Whitehouse and J. Wilkins (eds), *The Archaeology of Power: Papers of the fourth conference of Italian archaeology*. London: Accordia Research Centre, 107–34.

Epilogue

How scholars of archaeology and heritage have come to their sense!

David Howes

The human sciences have undergone numerous ‘turns’ since the middle of the last century, beginning with the linguistic turn (culture as ‘structured like a language’, culture ‘as text’), the pictorial turn (with its accent on ‘visual culture’ and ‘visual literacy’), the corporeal turn (or ‘embodiment as a paradigm for research’), and the sensory turn (‘sensuous scholarship’). The latter turn was signalled by the publication of *The Taste of Ethnographic Things: The senses in anthropology* (Stoller, 1989), the first book to advocate for the incorporation of the senses into fieldwork practice in a purposive, meaningful and explicit way (see also Howes, 1991; Stoller, 1997), followed by *Doing Sensory Ethnography* (Pink, 2009), a highly useful how-to manual, and most recently, the magisterial *Routledge International Handbook of Sensory Ethnography* (Vannini, 2023) with its all-star roster of contributors.

The sensory turn in archaeology is comparatively recent, beginning with *An Archaeology of the Senses: Prehistoric Malta* (Skeates, 2010) and continuing with *Archaeology and the Senses* (Hamilakis, 2013). It may be said to have ‘arrived’ with the publication of *The Routledge Handbook of Sensory Archaeology* (Skeates and Day, 2020) and now this book, *New Sensory Approaches to the Past*, which consolidates the field of sensory heritage and archaeology in a singularly compelling manner. Sensory archaeology has thus matured more rapidly than any of the other disciplinary branches (anthropology, history, geography, sociology and so on) of the interdisciplinary field of ‘sensory studies’ (Bull et al., 2006; Howes, 2022a). Its highly welcome ‘arrival’, moreover, testifies to the fact that ‘a spectre is haunting academia – the spectre of the senses’ (to add a twist to that famous pronouncement of Marx and Engels, regarding Europe in *The Communist Manifesto*). Sensory archaeology,

like sensory anthropology, stands for the socialization of the senses in contrast to the privatization/interiorization of the senses and sense-experience in (Western) psychology. Perception, or meaning-making – what we call ‘sense-making’ – does not just go on ‘in some secret grotto in the head’ (Geertz quoted in Howes, 2023: 14–15): it is first and foremost a *social* activity (Classen, 1993). Psychologists take note.

In what follows, I would like to offer some comparative reflections on just how archaeologists have come to their senses, and how, by so doing, they have contributed quite literally to *fleshing out* the idea of an ‘archaeology of perception’ or stratigraphy of ‘knowledges’. We owe the latter idea to Michel Foucault (1973; 2002), but he only ever used the term ‘archaeology’ metaphorically, to denote different ‘discursive formations’. Contemporary archaeologists (and heritage scholars) dig deeper – beyond texts, beneath ‘discourse’ – to expose the prehistoric (and historic) scaffolding of the senses, or *sensory* formations. The following comparative assessment of developments in archaeology and diverse sister disciplines consists of a series of seven propositions.¹ It is primarily keyed to the chapter by Sue Hamilton, Professor of Prehistory at the Institute of Archaeology, UCL, entitled ‘Pathways to a new sensory past: a summative critique’, that opens this book, but also draws in other chapters as appropriate. Of note: the latter chapters sound in other disciplines and approaches besides sensory archaeology and flesh out the nascent (companion) paradigm of sensory heritage. We shall return to this point in the conclusion.

1. The senses figure as both object of study and means of enquiry in the new sense-based archaeology

To elaborate: picking up on Constance Classen’s point in her classic ‘Foundations for an anthropology of the senses’ (1997) article – namely, that the anthropology of the senses is a distinctive *approach* (not just another disciplinary subfield) – Michael Herzfeld states: ‘The broad range of applications for a sensory analysis of culture indicates that the anthropology of the senses need not only be a “subfield” within anthropology, but may provide a fruitful perspective from which to examine many different anthropological concerns’ – from politics and gender to ‘religious beliefs and practices to the production and exchange of goods’ (Herzfeld, 2001: 252–3). Phillip Vannini (2023) goes so far as to say that any ethnographic writing that is not informed by the principles of sensory ethnography is ‘zombie ethnography’. As with sensory ethnography,²

so with sensory archaeology: the present book is specifically about applied *methods*, or ‘promot[ing] sensory enquiry as a key interdisciplinary methodological tool to better understand past places, social practice and objects’ (Hamilton, [Chapter 1](#), this volume).

2. There is a prehistory to the new sensory approach to the past within archaeology

In her introductory chapter, Hamilton provocatively remarks that the sensory turn in archaeology is more in the nature of a ‘return’ – a restoration of the Romantic tradition of antiquarianism as exemplified by the work of Belzoni, Wiltshire, Hoare and others, whose descriptions of the process of discovery were rich in sensory evocations – the dust, the claustrophobia, the thrill of unwrapping mummies (see further, Classen, [2019](#)) augmented by to-scale watercolour illustrations (by Philip Crocker, in Hoare’s case). So too with, for example, the geography of the senses, which reaches back beyond the seminal mid-1990s text of Paul Rodaway, *Sensuous Geographies: Body, sense and place* ([1994](#)) to such precursors (or founders, in retrospect) as Alexander von Humboldt (1769–1859) and J. G. Granö (1882–1956), whose works were distinguished by their ‘multi-sensory attunement to the environment itself’ (Anne Buttmer quoted in Howes, [2022a](#): 24–5). For Granö, the ‘real object’ of geographical research does not consist of landforms but the environment that the human being perceives with the senses. The history, anthropology and sociology of the senses also have their precursors: Johan Huizinga in the case of cultural history (Ankersmit, [2018](#)), W. H. R. Rivers and Franz Boas in the case of anthropology (Howes, [2023](#): 24–33) and Georg Simmel ([1997 \[1907\]](#)) in the case of sociology (see Howes [2022a](#): chapters 1 and 2). In retrospect, these founders were ahead of their time, or to put this another way, in the beginning, all anthropology was sensory. The same goes for cultural history and for sociology. Why then did the senses recede from the forefront of each of these disciplines and lie fallow for so many decades?

3. Taking leave of the senses: the professionalization of the discipline

Hamilton notes how the systematization (or deromanticization) of archaeological enquiry during the late nineteenth and early twentieth

centuries resulted in the demise of the ‘sensual text narrative’ and rise of the preformatted field recording sheet. ‘Writing without sense’ became the norm, insofar as the protocols of culture-historical and then processual archaeology left no room for sensory observation, responses and embellishment. In the case of anthropology, the scientization of field research likewise resulted in the senses being sidelined and attention shifting to the investigation of social structures and functional analysis. This abstraction of the senses was exacerbated by the ‘writing culture’ movement of the 1980s, which obviated any attention being paid to sensing cultures, only to ‘textualizing’ them (Howes, 2003: chapter 1).

4. Coming back to the senses: from an exclusive focus on stratigraphy, chronology and typology to sensology and ‘feeling along with’

Conventional professional archaeologists pay careful attention to stratigraphy – that is, to pinpointing the provenance of things in space-time with a high degree of exactitude, and to arranging the objects so unearthed in elaborate typologies based on their form, which is to say their visual appearance. Sensory archaeologists, partly due to the influence of phenomenology, are more attuned to the *multiple* sensory properties of things – meaning not just their form, but also their texture (rough/smooth), their sound (archaeoacoustics or ‘auralization’: Díaz-Andreu et al.; Ortoleva, El-Dardiry et al., this volume), their smell (archaeo-osmology: Khetrapal; Kirkbride, this volume), their taste (archaeogastronomy), and the sense of time itself (Graham, Chapter 4, this volume), as well as their performative aspects. By ‘performative aspects’ we mean (following Hamilakis, 2013) attending to how such objects, as are uncovered, would have been used in processions and other transactions – that is, *mobilized* (for example, Graham, this volume), or what a vessel would have contained (for example, wine and how it lubricated social relations) not just its shape (see further, Lash et al., 2023).

Of particular note: sensory archaeologists are as committed to trying to reconstruct the ‘sensoria’ of past cultures as to excavating their material remnants.³ This experiential, ‘atmospheric’ or ‘de-ontological’ approach (see Bille and Flohr Sørensen, 2019), which abjures reifying the past (so reducing it to things), is nicely exemplified by the work of Matt Leonard and the Durand Group (a volunteer organization made up mainly of engineers) in their explorations of the subterranean landscapes of the Western Front (Leonard, 2016; this volume, Chapter 7). For sure,

Leonard and company came across and documented diverse things in the course of their subterranean excursions (a hearing trumpet that was used to eavesdrop on the enemy, the polyglot graffiti carved into the tunnel walls), but their overarching interest lies in experiencing this underground world *as it would have been for the combatants* (crawling, wriggling, learning to depend on senses other than sight) and revelling in – as well as analysing and reflecting on – the camaraderie that obtains in such close quarters. This emphasis on emulating or reproducing and thereby reliving past social relations can also be seen in Graham's [Chapter 4](#) and in Hamilton's discussion of teamwork, such as barn-raising and interpreters wearing period costumes, in her introductory chapter.

5. Foregrounding intrasensory and intersensory relations, tracing the parameters of the sensible

Conventional archaeological research remains centred on analysing spatial layouts. With the advent of sense-based research, the focus has shifted onto how space is mediated by the senses – the *construction* of the sensorium (Baumanova, [Chapter 5](#), this volume). This new focus is exemplified by Hamilton's account of the importance of determining 'how far in maximal conditions a person can hear, see and smell specific things' – the parameters of the sensible, or 'sensory affordances', as she calls them – and how this enables the archaeologist to 'explore the sensory qualities of the past using our present-day bodies as tools'. Thus, looking around, while traversing a space on foot, can tell the researcher things about the 'intervisibility' of sites, monuments and people. Hamilton goes further in her chapter titled 'From home to landscape' ([Chapter 6](#), this volume) by raising the issue of 'intersensoriality' (Howes, 2022a: 99) or 'sensory juxtapositions': 'For example, what might have been seen but not heard between coeval sites and intra-site locales'. This relational, multimodal approach to the study of past sensoria is of capital importance: it echoes the media theorist Marshall McLuhan's idea of the sensorium as a dynamic 'collideroscope' (Howes, 2022a: 70). The idea of objects as 'sensorial assemblages', which we owe to Hamilakis (2013), also speaks to this new focus on the interrelationship of the senses, along with memory, affect and time (Graham, [Chapter 4](#), this volume). Finally, many of the chapters in this book break out of the archaeology laboratory (where everything is still) and embrace walking, for meaning is often best 'gleaned in motion' (Jordan and Mura, [Chapter 9](#), this volume).

6. Living archaeology

Hamilton devotes a section of her programmatic chapter to the topic of ‘remaking sense’ in open-air, living history and themed museums, such as the Jorvik Viking Centre in York, with its animatronic characters, (artificial) heritage odours and simulated sounds of tenth-century everyday village life. After years of anticipation, I visited the Centre in 2022 and experienced a profound letdown: the cart that transported me to the different stations was cramped and jerky, the legendary smell of wet cat never materialized. ‘Inactive phenomenology’ (Hamilton’s term) is an entirely apt description for the ‘Jorvik Viking experience’. By contrast, there are many current experiments in ‘sensory museology’ that do deliver profoundly immersive and engagingly interactive experiences of the sense-scapes of the past, and these venues are not only good for the entertainment and edification of the visitor, they also have great potential for a ‘research phenomenology’ (Hamilton’s term again).⁴ A fascinating series of studies could be made of the differential elaboration and engagement of the senses across all these sites, beginning with Gedis Lankauskas’s classic study of the solicitation of the senses at the socialist theme park on the outskirts of Grūtas, Lithuania in ‘Sensuous (Re)Collections’ (Lankauskas, 2006).

7. Ecumenism in research

In her summative critique, in [Chapter 1](#), Hamilton preaches ecumenism, a broad church approach to methodology: ‘[methods can be] rooted in diametrically opposite philosophies’, she suggests, and some are heavily dependent on technologies (for example, ‘desktop recreation’ and GIS mapping) while others are not (for instance, ‘*in situ* embodied interpretation’ such as via walking, insofar as walking is infra-technological, a technique of the sensing body), but archaeologists should embrace all of them, she avers. The trick is how to combine them: for example, how to conjoin ‘remote sensing’ and ‘intimate sensing’ (see Granö, above; Porteous, 1990; Leonard, 2016; see also Howes, 2022b). LoPiano’s chapter ([Chapter 13](#), this volume) offers some highly perspicacious reflections on this score. McLuhan would have approved of such a ‘collideroscopic’ approach, as would Lévi-Strauss. One can imagine how the latter would smile on the emergent notion of the archaeologist as bricoleur (cobbling together diverse methods) and the preeminence of ‘wild thought’ – the most elementary form of science, which is to say

to say ‘the science of sensible qualities’ (Lévi-Strauss, 2021) – in this landmark collection of essays. All of the contributors seek to bring the sense(s) of the past to the forefront of consciousness. ‘Lead with the senses!’, is the banner cry of the new material science of the past.

Conclusion

The notion of sensory heritage or ‘intangible heritage’ has also been gaining increased traction of late, beginning with the 2003 UN Intangible Heritage Convention and continuing with the 2021 French Sensory Heritage Law (*Loi visant à définir et protéger le patrimoine sensoriel des campagnes françaises*) aimed at defining and protecting the sensory heritage of the French countryside. That law was promulgated in response to a lawsuit brought by second-home owners (‘neo-rurals’), against a boisterous rooster named Maurice, whose crowing they perceived as a nuisance (Bendix, 2021). The patrimonialization of the sounds and smells of rural cultural areas is a further manifestation of ‘the spectre haunting Europe’, alluded to above – the spectre of the senses.

Within academia, the concept of heritage has likewise undergone a sensory revolution in recent years, as evidenced by the majority of the chapters in this collection, with their extra-archaeological (or living heritage) focus and the multiplicity of methods they deploy, including material preservation and post-humanist and new materialist approaches, public survey methods, architecture and art history, and telecommunication engineering, to mention but a few.

By way of closing, I would like to invoke one further methodological twist, which has to do with indigenizing academic research. In a landmark project directed by Kahente Horn-Miller, Professor of Indigenous Studies and Rebekah Ingram, Research Associate in the Geomatics and Cartographic Research Centre at Carleton University, Ottawa, an effort is being made to retrieve the Indigenous place names of the Kanyen’kehà:ka (Mohawk).⁵ This language revitalization and cultural recovery project uses the Cybercartographic Model for collaborative research with Indigenous communities in conjunction with Carleton’s Nunaliit mapping framework, to document and preserve Indigenous toponyms in the form of a (digital) ‘Atlas of Kanyen’kehà:ka (Mohawk) Space’. The mapping framework enables community members to contribute multimedia files to the atlas, including interviews with Elders, oral

histories, stories, audio, video and photographic recordings connected to the places named. Horn-Miller related to me how the research protocol involves going out on the land together with select Elders, and how the latter would speak the name of a given site while turning round and round (embodying and enacting a 360 degree perspective). In this highly dynamic, experiential and interactive, multimodal fashion, the research process and resulting atlas give voice to the landscape and disrupt the silence of the colonial-settler gaze. Horn-Miller's initiative is vital to the decolonization of the territorial, linguistic and sensory heritage of the Kanien:keha'ka and the reintroduction of the understanding of 'land as relation' (Kress and Horn-Miller, 2023). The collaborative spirit and focus on sense- and place-making of this indigenous-led project bridges past and future in the pathways it opens up.

Notes

- 1 These seven propositions should be read in conjunction with the twelve propositions for the advancement of sensory studies generally in the Prologue to *The Sensory Studies Manifesto* (Howes, 2022a: 12–13).
- 2 François Laplantine nicely captures the gist of this method in *The Life of the Senses*: 'the experience of [ethnographic] fieldwork is an experience of sharing in the sensible [*le partage du sensible*]. We observe, we listen, we speak with others, we partake of their cuisine, we try to feel along with them what they experience' – and, together with them, 'make sense' of that experience (Laplantine, 2015: 2).
- 3 By 'sensorium' we mean (following Walter J. Ong, a student of Marshall McLuhan) 'the entire sensory apparatus as an operational complex'; differences in cultures 'can be thought of as differences in the sensorium, the organisation of which is in part determined by culture while at the same time it makes culture' (Ong, 1991: 28).
- 4 Collaborative sensory archaeology, or engaging with the descendants of past makers, of the sort practised by Marie-Pierre Gadoua (2014) at the McCord Museum of Canadian History in Montreal, where she invited Inuit elders to participate in a handling session with the McCord collection of Inuit artefacts, is another vital pathway to the past and a crucial step in the direction of decolonizing archaeology (see also Binter, 2014; Goldner, 2022).
- 5 The project is entitled 'Preserving and Growing Kanyenkehaka Spatiolinguistic Capacity through the Atlas of Haudenosaunee Space'. See further, Ingram et al., 2019 and <https://mohawkatlas.org/index.html>.

References

- Ankersmit, F. (2018) 'Huizinga on historical experience'. In D. Howes (ed.), *Senses and Sensation: Critical and primary sources*, Volume 2. Abingdon: Routledge, 23–38.
- Belzoni, C. (1820) *Narrative of the Operations and Recent Discoveries within the Pyramids, Temples, Tombs, and Excavations, in Egypt and Nubia*. London: John Murray.
- Bendix, R. (2021) 'Life itself: An essay on the sensory and the (potential) end of heritage making', *Traditiones*, 50(1): 43–51.
- Bille, M. and Flohr Sørensen, T. (eds) (2019) *Elements of Architecture: Assembling archaeology, atmosphere and the performance of building spaces*. Abingdon: Routledge.

- Binter, S. (2014) 'Unruly voices in the museum: Multisensory engagement with disquieting histories', *The Senses and Society*, 9(3): 342–60.
- Bull, M., Gilroy, P., Howes, D. and Kahn, D. (2006) 'Introducing Sensory Studies', *The Senses and Society*, 1(1): 5–8.
- Classen, C. (1993) *Worlds of Sense: Exploring the senses in history and across cultures*. London: Routledge.
- Classen, C. (1997) 'Foundations for an anthropology of the senses', *International Social Science Journal*, 153: 401–12.
- Classen, C. (2019) 'Touching the deep past: The lure of ancient bodies in nineteenth-century museums and culture', *The Senses and Society*, 9(3): 268–83.
- Foucault, M. (1973) *The Birth of the Clinic: An archaeology of medical perception*. London: Tavistock.
- Foucault, M. (2002) *Archaeology of Knowledge*. London: Routledge.
- Gadoua, M.-P. (2014) 'Making sense through touch: Handling collections with Inuit Elders at the McCord Museum', *The Senses and Society*, 9(3): 323–41.
- Goldner, J. (2022) 'In the Spirit of Engagement: Memories and the sensorium in Algonquin canoe-building'. Doctoral thesis, Oxford University. <https://ora.ox.ac.uk/objects/uuid:9a5278a8-ff22-4169-bbaa-63fe5c84999c>.
- Hamilakis, Y. (2013) *Archaeology and the Senses: Human experience, memory and affects*. Cambridge: Cambridge University Press.
- Herzfeld, M. (2001) 'Senses'. In *Anthropology: Theoretical practice in culture and society*. Oxford: Blackwell, 240–53.
- Howes, D. (ed.) (1991) *The Varieties of Sensory Experience: A sourcebook in the anthropology of the senses*. Toronto: University of Toronto Press.
- Howes, D. (2003) *Sensual Relations: Engaging the senses in culture and social theory*. Ann Arbor: University of Michigan Press.
- Howes D. (2022a) *The Sensory Studies Manifesto: Tracking the sensorial revolution in the arts and human sciences*. Toronto: University of Toronto Press.
- Howes, D. (2022b) 'The misperception of the environment: A critical evaluation of the work of Tim Ingold and an alternative guide to the use of the senses in anthropological theory', *Anthropological Theory*, 22(4): 443–66. <https://doi.org/10.1177%2F14634996211067307>.
- Howes, D. (2023) *Sensorial Investigations: A history of the senses in anthropology, psychology and law*. University Park, PA: Penn State University Press.
- Ingram, R., Anonby, E. and Taylor, R. F. (2019) 'Mapping Kanyen'keha (Mohawk) ethnophysiological knowledge'. In E. Anonby, K. Murasugi and R. E. Taylor (eds), *Further Developments in the Theory and Practice of Cybertography*. Cambridge, MA: Elsevier.
- Kress, M. and Horn-Miller, K. (2023) *Land as Relation: Teaching and learning through place, people and practices*. Toronto: Canadian Scholars Press.
- Lankauskas, G. (2006) 'Sensuous (re)collections: The sight and taste of socialism at Grūtas Statue Park, Lithuania', *The Senses and Society*, 1(1): 27–52.
- Laplantine, F. (2015) *The Life of the Senses*. Abingdon: Routledge.
- Lash, R., Chesson, M. S., Alonzi, E., Kuijt, I., O'Hagen, T., Ó Néill, J. and Burke, T. (2023) 'Sensational ensembles: Picnicking and pilgrimage on Inishark Island, Co. Galway, Ireland, AD 1650–1960', *Current Anthropology*, 64(4): 380–409.
- Leonard, M. 2016. *Beneath the Killing Fields: Exploring the subterranean landscapes of the Western Front*. Barnsley: Pen & Sword Books.
- Lévi-Strauss, C. (2021) *Wild Thought: A new translation of 'La Pensée sauvage'*. Chicago: University of Chicago Press.
- Ong, W. J. (1991) 'The shifting sensorium'. In D. Howes (ed.), *The Varieties of Sensory Experience*. Toronto: University of Toronto Press, 25–30.
- Pink, S. (2009) *Doing Sensory Ethnography*. London: Sage.
- Porteous, J. D. (1990) *Landscapes of the Mind: Worlds of sense and metaphor*. Toronto: University of Toronto Press.
- Rodaway, P. (1994) *Sensuous Geographies: Body, sense and place*. London: Routledge.
- Simmel, G. (1997 [1907]) 'Sociology of the senses'. In D. Frisby and M. Featherstone (eds), *Simmel on Culture: Selected writings*. London: Sage, 109–19.
- Skeates, R. (2010) *An Archaeology of the Senses: Prehistoric Malta*. Oxford: Oxford University Press.
- Skeates, R. and Day, J. (eds) (2020) *The Routledge Handbook of Sensory Archaeology*. Abingdon: Routledge.

- Stoller, P. (1989) *The Taste of Ethnographic Things: The senses in anthropology*. Philadelphia: University of Pennsylvania Press.
- Stoller, P. (1997) *Sensuous Scholarship*. Philadelphia: University of Pennsylvania Press.
- Vannini, P. (ed.) (2023) *The Routledge International Handbook of Sensory Ethnography*. Abingdon: Routledge.

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'This volume is a breath of fresh air with a "methodological transparency" to sensory approaches to the past exemplified through an exciting and diverse range of case studies from multiple disciplinary perspectives.'

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New Sensory Approaches to the Past assembles a series of research projects investigating cultural environments through the lens of the senses. The book presents the latest approaches to sensory archaeology and heritage research that aim to understand the lived experience of past inhabitants. Interdisciplinary case studies carry out investigations in three different registers: personal and embodied, teamwork and collective responses to the historical environment, and digital reconstruction. An international cast of contributors includes archaeologists, architects, sociolinguists, military experts, cultural studies scholars and acoustics specialists, with research sites spanning Palaeolithic rock art to a 1960s North American fairground. Descriptions and analyses of sensory in-situ investigations offer methodological transparency, with the visual analysis that is common in archaeology and heritage assessments placed alongside ethnographic techniques, landscape survey, sound recording, preservation advocacy work and various forms of digital reconstruction. This interdisciplinary approach harmonizes research terminologies across fields, fostering a comprehensive understanding of sensory-based studies and the methods used to carry them out. The book revitalizes familiar concepts with new insights and provides a platform to examine and resolve interdisciplinary ambiguities, making it an invaluable resource for advancing sensory research.

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