'Knowledge-scapes' in Archaeology: An Introduction

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Abstract

As part of the introduction to the ARC volume 35.2 on 'knowledge-scapes', this paper introduces the concept, its components and its application in archaeology. The origins, development and use of knowledge-scapes in the fields of cognitive theory and archaeology are explored and contextualized within current archaeological thinking. Practical approaches to the study of knowledge-scapes are also presented by using the papers published in this volume as case studies. These papers offer a variety of methods, datasets and approaches to identify, explore and interpret past landscapes of knowledge. We argue that the study of the dynamic transmission and transformation of knowledge in the past, including the related socio-cultural and material aspects, should be a core aspect of archaeological research.

On 'knowledge' and 'scapes'

> Knowledge and skill are dimensions of activity which are both archaeologically inferrable and socially central (Robb 2010: 508; after Sinclair 1995).

Knowledge has long been a subject of study in philosophy, anthropology and sociology, and has more recently become a focus of research in history and archaeology. Definitions of knowledge are a matter of age-old philosophical debate. In the context of archaeology and history, "[...] it may be useful to think of information as raw, while knowledge has been cooked" (Burke 2015: 13). Acknowledging that information is never objectively raw, as 'data' is selected, perceived and processed by humans, there is, however, a difference in processing quantity and quality between information and knowledge. In the words of anthropologist Fredrik Barth, knowledge is "what a person employs to interpret and act on the world. [...] all the ways of understanding that we use to make up our experienced, grasped reality" (Barth 2002: 1).

These definitions highlight that knowledge is not one coherent body of information, but is relational, related to and emerging from the context of the individual or society and its relationships. Knowledge includes information but also experience, skills, technological knowledge, concepts, beliefs and ritual knowledge (Barth 1995, 2002; Burke 2015, 2020; Sørensen and Rebay-Salisbury 2013). Knowledge can be explicit but also implicit or tacit (Polanyi 1966), everyday and concrete, abstract and conceptual, local or universal (Burke 2015: 16; Scott 1999), agreed upon or disputed (Robb 2010). Even within a society, different variations of knowledge can coexist, complement, compete and conflict (Burke 2015: 24). What is worth knowing varies as much as what is taken for granted. In Marchand's words (2010: 3): "Making knowledge [...] is an ongoing process shared *between* people and *with* the world" (author's emphasis). Knowledge emerges from and is reproduced through practice, in active interaction (Ingold 2011: 159). The same is true for the exchange of knowledge between individuals, generations and societies. To account for the variety in forms and expressions of knowledge scholars have variously proposed the use of 'knowledges' in the plural (e.g. Burke 2015; Foucault 1997; Haraway 1988; Worsley 1997).

For anthropologists, historians and–we argue–also for archaeologists, engaging with the myriad of aspects and variations of knowledge, the different scales of community in which it develops and the dynamics of its exchange is a fruitful endeavour. It allows us to acknowledge the specificities of societies situated in different time periods and geographical regions and at the same time compare, contrast and crystalize mechanisms of social relationships behind its evolution and change. It induces us to focus on the dynamics within and between societies and their environment, providing detail to our understanding of social coherence in the past by transcending traditional boundaries.

Acknowledging the situated character of knowledge is by no means a call for relativism (Haraway 1988; Nygren 1999). It is, as in so many other areas of archaeology, a call to treating the knowledge systems we encounter on equal terms, recognizing and not judging them by the standards of knowledge production of the Western academic tradition (Burke 2015: 273). In the contexts of US and European scholarship, the term 'knowledge' carries an implicit legacy. Here, knowledge often stands in opposition to forms of belief, including faith and spirituality, and is considered cognitive rather than symbolic or semiotic (Alexander and Dochy 1995; Flannery and Marcus 1993). Similarly, knowledge frequently carries connotations of the intellectual, rarely of the practical or material. These

prejudices do not help researchers to understand knowledge, including symbolic knowledge, particularly as it is also embodied in material practices (Dobres and Hoffman 1994; Robb 1998). We are all then "well advised to extend the concept of knowledge to include whatever the individuals and groups [we] are studying consider[ed] to be knowledge" (Burke 2015: 16). On multiple occasions Barth (1995, 2002) pointed out the advantages of an analytical framework focused on knowledge in contrast to the dominant concept of culture:

> The image of culture as knowledge abstracts it less and points to people's engagement with the world, through action. It acknowledges the fact of globally continuous variation, not separable into homogenized and mutually alien cultures. It alerts us to interchange and to flux. "Knowledge" is not characterizable as difference: indeed, the same or similar knowledge is obviously used and reproduced in different local populations to provide grounds for their thoughts and actions. But there are also very divergent bodies of knowledge and different ways of knowing within populations as well as between them. Thus a focus on knowledge articulates culture in a form that makes it transitive in the interaction between people, because of its potential use to both parties. Thereby, other modes of representation and other and more dynamic questions come to the fore when we model culture in such modalities: variation, positioning, practice, exchange, reproduction, change, creativity (Barth 1995: 66).

Where knowledge has previously been investigated in archaeology, it has focused on cognition (Renfrew and Scarre 1998), cultural transmission (Boyd and Richerson 1985; Eerkens and Lipo 2007; Shennan 2002), technology and belief (Sørensen and Rebay-Salisbury 2013), practice and agency (Dobres and Robb 2000; Robb 2010) and skill (Kuijpers 2017). Archaeologists find themselves at the intersection between propositional knowledge (i.e. 'knowing that' or French *savoir*) and practical knowledge (i.e. 'knowing how' or French *savoir-faire*), emphasizing that knowledge is something that is performed, done or made, rather than possessed. With this conceptual shift, knowledge turns from purely intellectual into material practices, from existing purely in people's minds to being in the world around them and thus visible to the archaeologist (Robb 1998: 336). Many of the archaeological studies have emphasized the challenges of investigating embodied, tacit knowledge through material remains (e.g. Kuijpers 2017; Sørensen and Rebay-Salisbury 2013). In doing so, researchers have demonstrated the need for interdisciplinary

investigations, employing ethnoarchaeology and archaeological science to inform their results. The present volume aims to contribute to the growing body of studies on ancient knowledge and to continue the conversation on how knowledge exchange transformed and evolved through time from prehistoric to modern societies and how that influenced the way societies–or specific groups within them–perceived themselves and others.

With its dynamic, "globally continuous variation" (Barth 1995: 66), the varied characters of knowledge itself and its potential as an analytical category echo Appadurai's notion of the fluid and irregular shape of global cultural flows. While we do not wish to add a sixth flow to his reflections on globalization, we propose to use the suffix '-scape' to reflect the contexts and environments in which knowledge evolves, changes, is transmitted and exchanged, and dissolves. Just as knowledge, landscapes "emerge as condensations or crystallizations of activity within a relational field" (Ingold 2011: 47). The deeply perspectival, qualitative nature of landscapes (Appadurai 1996: 33; Ingold 1993: 154) reflects the multiplicity of relations by which knowledge emerges and circulates (see also Ingold 2011: 159–163). Just as with landscapes, you cannot ask how much of a 'knowledge-scape' there is, but only what it is like (Ingold 1993: 154). 'Knowledge-scapes' therefore reflect the situated, socially-constructed and physical spaces which connect individuals, materials and environments through shared ideas and practices over time.

Knowledge-scapes: From archaeology to cognitive theory and back to archaeology

The evolution of the concept

The term 'Knowledgescape' or 'KnowledgeScape' was first used in the context of cognitive, anthropological theory and knowledge management, where it draws on and is applied to modern social, political and economic developments. Shariq (1999: 247) proposed a cognitive theory of 'knowledgescape' to study the mechanisms of knowledge transformation during its transfer. To investigate this aspect, he built on the distinction between internal and external cognition and postulated their interaction as the basis of transformation during knowledge transfer (Shariq 1999: 245–246). He expanded on the cognitive theory of external symbolic storage (ESS) proposed by Merlin Donald (1991, 1998) and included institutional, normative and practical knowledge (Shariq 1999: 246) to explain the human interaction

behind knowledge transfer in an institutional context. A 'knowledgescape' in Shariq's (1999: 247) words represents the temporal "shared physical, virtual and mental spaces" in which knowledge transfer is embedded.

Donald's original model (1991) focused the exploration of symbolic storage on early writing systems. At a conference held at the McDonald Institute for Archaeological Research, in 1996, archaeologists Colin Renfrew and Chris Scarre advocated for a central role of material culture within a model that sought to understand the human mind (Renfrew 1998; Renfrew and Scarre 1998). Donald (1998) attended the conference and revised his model to include a phase of symbolic material culture as a result of these discussions. Archaeology's earliest concern with the human mind and cognition has heavily influenced this first cognitive theory of knowledgescapes.

In the early 2000s, 'KnowledgeScape' was used to advocate for a knowledge turn in social sciences spatial research (Matthiesen 2005, 2009), emphasizing the diversity and contextual dependency of knowledge and its role in modern socio-spatial developments. The situated nature of knowledge and the analytical opportunities this recognition affords have led anthropologist Ibrahim Zawawi (2015) to propose to see social sciences knowledge production through the lens of knowledge-scapes in antithesis to a world-system. In a social science world-system the centre of knowledge production lies in the Western academic tradition, while other forms and spaces of knowledge production are to be found at the periphery of this Western tradition (Kuwayama 2004; Zawawi 2015). Zawawi (2015: 51) argued that acknowledging knowledge production systems on equal terms and decolonizing anthropology requires the "recognition of a 'missing scape'–a social sciences knowledge 'scape'". This, he argued, allows academic discourse to transcend national boundaries and encourages theoretical exchanges between knowledge producers on an uneven and contested–yet interactive–playing field (Zawawi 2015: 45).

Given the importance of archaeological thinking in the early stages of the development of this concept, we believe it is time to consider what archaeology can bring to table again. The long-lasting connections between individuals, materials and environments through which knowledge-scapes are maintained have been explored by evolutionary archaeologists concerned with cultural transmission theory through a systemic theorization of modes of knowledge transmission and change (Aldenderfer 1993; Boyd and Richerson 1985; Boyd et al. 2013; Henrich 2001; Shennan 2002, 2013). Although these scholars have

not used the word knowledge-scapes as such, their research explores land-scapes of knowledge transmission through the definition of cross-cultural and diachronic transmission biases, as well as modes of variation selection that determine what is culturally transmitted. These are of key importance for two reasons when applying the concept of knowledge-scapes. Firstly, the mode(s) of transmission of knowledge within a given knowledge-scape directly affects its environmental, social and temporal extent (its '-scape'), and its qualities, i.e. its dynamism (and vice versa) (Aldenderfer 1993; Eerkens and Lipo 2007; Henrich 2001; Roux 2008). This includes obstacles in the circulation as well as limits of translation or adoption of knowledge between and within social groups (Burke 2015). Thus, transmission processes sustain the link between knowledge and the dynamic scape in which it is practiced. Secondly, these evolutionary archaeology approaches allow recognizing shared structural properties among very different case studies, in this instance through the recognition of cross-cultural and diachronically operating modes of transmission and change. These shared properties, when made explicit, provide a comparative arena, a shared testable hypothesis, which emphasizes the relevance of the concept of knowledge-scapes for addressing very different even spatially, culturally and temporally distant case studies.

In 2015, '*Wissensräume*' or spaces of knowledge made their way into the German archaeological discourse at a workshop for young researchers at the Excellence Cluster TOPOI (Hofmann and Schreiber 2015). The organizers of this workshop called researchers to consider the reciprocal relationship between space and knowledge, which they describe as "travelling concepts" (Hofmann and Schreiber 2015: 11), highlighting their importance for, and analytical capabilities in, a range of disciplines both within and outside of archaeology. Both '*Raumwissen*' (spatial knowledge) and '*Wissensräume*' (knowledge spaces) were examined. The editors and contributors argued that the processes behind space and knowledge are what is of interest to historically (and archaeologically) inclined scholars (Hofmann and Schreiber 2015: 17). Their volume and ours demonstrate how '*Wissensräume*', knowledge spaces or knowledge-scapes, offer fruitful spaces for archaeological investigation. The academic dimension of archaeological inquiries into knowledge is discussed alongside inquiries into past knowledge (Schreiber 2015). Knowledge-scapes present a versatile lens, which reflects and encompasses both knowledge in the past and knowledge of the past and studies their variety, inception, change, circulation and loss within their social and physical context.

The concept of knowledge-scape can be used in many ways and contexts but in this volume it is consistently used in line with the definition outlined above. However, this term could also be used to refer to theoretical approaches, methods and interpretive frameworks to study social and community behaviour, borrowing from multiple disciplines and aiming to explore primarily knowledge exchange. In the present volume, in order to avoid confusion, it will not be used as a determinative of an umbrella of approaches or interpretative frameworks. Having clarified this, some of the diverse theoretical approaches that have been used to rediscover knowledge-scapes in this volume shall now be briefly summarized.

Integrating the concept in current archaeological theory

There can be a great deal of flexibility when archaeologists set up their theoretical frameworks and methods to rediscover ancient dynamics of knowledge exchange. A vast range of diverse theoretical approaches can be used to explain the meaning, nature and challenges associated with data and phenomena observed in evidence of human activities, allowing researchers to borrow from a range of disciplines. The papers gathered in this volume offer successful examples of the variety of theoretical approaches and methods used by the authors to explore ancient knowledge-scapes. These include theories of social landscape, materiality, actor-network and social learning as well as approaches that involve *chaîne opératoires*, communities of practice (CoP), learning networks and more. The flexibility offered by these diverse approaches to access knowledge-scapes is part of the great potential of this field of study and offers significant room for future developments. Knowledge-scapes provide a unique adaptability for explaining the manifestations of shared identities, values and knowledge operating at different scales.

Having the possibility of working at multiple scales of analysis, archaeologists can explore knowledge-scapes among small communities or villages–even among a few individuals continuing a tradition–but also at broader cross-cultural scales, such as regional or global networks. The complexity of scalar relationships has been increasingly considered as a crucial issue in archaeology, especially in the field of spatial analysis and in new materialism (Harris 2017; Lock and Molyneaux 2006). Knowledge-scapes can unite diverse types of archaeological evidence and the methods used to identify them are unique to distinctive scales of analysis and datasets. However, we believe that their study can contribute to debates concerning scalar relationships: the mechanisms

used to explain and interpret a smaller knowledge-scape–for instance a shared tradition in a household or village–can be useful for explaining distant and bigger knowledge-scapes, such as shared traditions across societies and regions. We acknowledge that different socio-cultural dynamics can emerge at different scales of analysis. However, the possible occurrence of similar processes at different social or spatial scales and the recurrence of similar kinds of processes at a different scale of analysis can be useful to approach questions related to the interconnection of micro- and macro- levels of social dimensions (DeLanda 2019: 17–20). In this regard, the study of knowledge-scapes can help to bridge and compare the learning experience of individuals with larger social dynamics and vice-versa, e.g. from household to regional behaviours. This adaptability highlights the potential of knowledge-scapes for exploring distanced and different cross-cultural phenomena.

In this volume, the concept of 'socially-constructed landscape' is one of the most consistently used with its two main components: the physical environment and the interactions between individuals and materials, which are often referred to as socially-constructed actor-network dimensions (see Ingold 1993: 154). There is now a large body of literature in archaeology that concerns the concept of social landscapes, which are generally believed to be forged not from actions, but through actions and are sustained by persistent individual activities (Ashmore 2004; Gregson and Rose 2000: 441; Whatmore 2006, 2017). These landscapes are continuously maintained (Jervis 2014: 110–111) and represent networks of meaning and relationships connected to multiple dimensions and experiences of space (Gregson and Rose 2000). Given their dynamic nature, social landscapes and landscapes of knowledge are often seen as porous or fluid, interlocking with other landscapes, multiple spheres of knowledge, identities, memories and actions (Enns 2007; Howard 2000).

Communities of practice theories suggest that 'landscapes of knowledge' can be described as actively constructed and perceived by people sharing a concern, a set of problems or a passion about a topic (see Wenger 1998; Wenger-Trayner and Wenger-Trayner 2015) to "deepen their knowledge and expertise in an area by interacting on an on-going basis" (Wenger et al. 2002: 4). This definition has proven to be useful to characterize social relations, identities and boundaries among communities, including makers, builders, producers and consumers, often beyond single settlements (Eckert 2008; Eckert et al. 2015). Key to the paradigm is the fact that members of a CoP are,

first of all, practitioners who require time and sustained interaction to gain a certain shared set of practical skills and a body of knowledge (Cummings and Van Zee 2005: 10; Gilpin and Hays-Gilpin 2012). Through the repetition of tasks in a specific social environment, practitioners develop a way of doing and a way of being. In Bourdieu's words (1977: 87) "the body hexis speaks directly to the motor function, in the form of a pattern of postures that is both individual and systemic". Skilled individuals develop a 'task habitus' and can quickly adjust their actions according to the environment without affecting the overall outcome (Ingold 2011: 94; see also Bourdieu 1977: 81). The acquisition of these ways of doing and being are not necessarily consciously chosen, although they might be. We may find the preservation of practices within a community without apparent functional reason but justified as a preservation of ancestors' traditions (Lemonier 1986). Other times, ritual contributes to processes of practice perdurance and development of task habitus, as these repetitive actions cannot be questioned once they are part of ritualized behaviour (Pfaffenberg 1992: 501). However this process takes place, individuals are the medium through which knowledge-scapes are expressed and reproduced.

The concept of landscapes of knowledge has often been discussed in association with *chaîne opératoire* approaches, CoP and task habitus theories. The study of *chaînes opératoires* in archaeology and sociocultural anthropology aims to understand the technical and social processes involved in the production, use and disposal of objects (see ARC Volume 35.1; Martinón-Torres 2002; Roux 2019a). In order to gain a detailed understanding of *chaînes opératoires*, raw materials, recipes and manufacturing processes, the integration of archaeological science techniques has proved to be remarkably valuable (Kingery 1996: 181–203; Martinón-Torres 2002, 2018; Pierret et al. 1996; Reedy 1994; Sillar and Tite 2000; Tite 1999: 182). Moving away from descriptive studies of tools, techniques and material properties (Gibson and Woods 1990; Gosselain 1998; Killick 2004), the current predominant trend favors methods to address specific archaeological or anthropological questions (Bray and Pollard 2005; Kingery 1996; Kuijpers 2018). Anthropological discourses concerning production and use of objects often interlock with CoP theories, which draw on social learning theory and see the exchange of knowledge as emerging in social contexts and evolving over time (Contu and Willmott 2003; Lave and Wenger 1991; Roberts 2006; Roberts and Vander Linden 2011; Wenger 1998).

Finally, in the present volume, CoP and Bourdieu's task habitus theories have been closely related to those of social fields (Gaventa 2003: 6) and learning networks (Engel 1993, 1997), both of which can be educational, intellectual, religious or cultural (Navarro 2006: 18). Similarities, differences and embeddedness–the extent of integration of people and traditions–among and within fields and networks, can be addressed when reconstructing knowledge-scapes, observing the degrees to which individuals or groups influenced each other and chose to interact (Borck et al. 2015: 37; Collar et al. 2015). For instance, in archaeology, the study of similarities and diversity of materials, objects, traditions and technologies allows us to get an insight into the embeddedness of fields and networks and into interactions between communities at different scales (Knappett 2016: 100–107; Roux 2019b: 169). But it also offers the opportunity to observe phenomena of sociability and homophily (the tendency of individuals to bond with similar others) and the opposite phenomena of social segregation, rejections and polarization, adding another dimension to our study of knowledge-scapes.

Practical approaches to knowledge-scapes

Archaeologists are ideally placed to consider how to identify knowledge-scapes, how they evolved through time and what sorts of societies left the traces we find today. As part of the endeavour to understand past societies and human behaviour, archaeologists use materiality and material evidence to reveal how communities interacted within and beyond their social units, and perceived and experienced themselves and others. As the papers in this volume show, archaeologists' interpretations of the relationships between people, materials and space reveal economic, social and political dynamics underlying the processes behind objects, settlements and regions. Successful studies of this kind have demonstrated the need for interdisciplinary approaches to the study of material evidence to achieve a deep understanding of social behaviours, knowledge exchange and the transfer of values.

Investigating knowledge-scapes in archaeology requires to identify and describe these knowledge-scapes through the material remains in the archaeological record and complementary evidence. Moreover, the socio-economic context of the practices that these materials represent must be taken into account to produce a socially-grounded explanation of the nature and distribution of each knowledge-scape.

Identifying knowledge-scapes in the archaeological record

It is of primary importance to confidently identify the spread of knowledge-scapes in space, time, social units, communities and materiality. Traditionally, archaeological studies have relied on the distribution and/or association of types of objects within delimited geographical areas. These analyses are primarily rooted in typological classifications that take into account different elements: shape, materials, techniques, style. Analytical studies that focus on how things are done, which can often be connected to specific learning traditions, have a particular advantage over the study of styles and stylistic patterns. The meaning behind the distribution of a particular style can be overinterpreted by archaeologists or directly linked to broader social dynamics: both of which have happened when using traditional culture-historical approaches (Michaels 1996). Whatever the criteria chosen, the foundation must be to carefully justify them as potential proxies for targeting knowledge-scapes' distributions synchronically or diachronically.

Some of the papers compiled in this volume have primarily chosen to look at the distribution of objects to support their interpretations. Two studies deal with synchronic distributions. Hadjigavriel's paper is focused on the study of *chaînes opératoires* to differentiate CoPs that are part of the knowledge-scape of the production of Red- and Black-Stroke Burnished Wares in Late Chalcolithic Cyprus. Treadway analyses deposition practices in Iron Age Scotland and Wales and shows how the recognition and re-definition of specific types of depositions (in this case hoards, pairs and single depositions in both single and multi-period deposition events) can illuminate the presence of past knowledge-scapes related to these practices that were not explicit before.

Diachronic approaches make it possible to recognize the progressive change of knowledge-scapes through time or, on the contrary, their general preservation over centuries. Two of the papers exemplify changing knowledge-scapes through time. Clark and Linares-Matás propose that the evolution of Early Pleistocene Olduwan and Acheulian lithic assemblages can be linked to some extent to the accumulation of knowledge about the environment through the creation of knowledge networks that increased the predictable access to highly ranked food resources. On the other hand, Scarsella discusses how the change in sword typology during the Archaic Period in Central Italy can be related to changes in sword-fighting, which ultimately points to the existence of different warrior communities sharing a common identity.

Latorre-Ruiz and Schweizer deal with the maintenance of knowledge-scapes over long periods of time. The former focuses on seafaring in the Bay of Biscay from the Early Bronze Age to Late Antiquity. The distribution of varied finds (from Bronze Age gold plates to Iron Age hillforts and Roman lighthouses) is used to justify the transmission of a specific knowledge-scape linked to the navigation of these coasts over millennia. Schweizer explores the Poseidonia/Paestum Heroon. By following the relationships between the material culture of the tomb, the contemporaneous funerary evidence, the archaeologically known development of the site and the historical contextualization narrated in classical texts, he shows how knowledge-scapes in sacred places can be maintained alongside socio-cultural changes and highlights their importance in the creation of cultural and social identities.

Archaeologists have long used ethnography, history, mythography, scientific techniques and other neighbouring fields to enrich their interpretations about past societies. Many of these disciplines have much to offer to archaeologists looking for knowledge-scapes, as they can provide a better understanding of their inception, extent and dynamics. In this volume, some papers are good examples of the importance of interdisciplinarity for knowledge-scapes tracking.

Laoutari offers a unique ethnoarchaeological approach to the production of halloumi cheese in Cyprus. This paper shows how social, economic and cosmological aspects interlink and are interdependent in the configuration of the halloumi-making knowledge-scape in modern Cyprus. He sheds light on the importance of low-scale approaches of household subsistence organization against the grand narratives of the Secondary Products Revolution, to better understand the particularities of development and importance of dairy practices for past societies. This 'cheese-scape' is an excellent example of how knowledge-scapes can challenge simplistic interpretations of the complexity level of so-called simple economies.

The re-analysis of myths, traditional stories and historical sources to track past knowledge-scapes offers new interpretative possibilities too. Prado approaches the *Picatrix*–a medieval text–from an interdisciplinary perspective, combining historical and natural sciences to address archaeological questions. This esoteric text from Al-Ándalus provides invaluable information about the use of common and rare plants for esoteric purposes during the tenth century AD. It allows her to reconstruct aspects of the knowledge-scape of plant use that are otherwise inaccessible as mainstream archaeological practice is highly

affected by the nature of the archaeological record. Research, taphonomic and preservation biases affect the interpretations of plant use in the past. This is an excellent example of how historical sources can inform us about advanced practices of specific sectors in society and their philosophical complexity, which ultimately enrich the interpretation of the archaeological assemblages linked to specific knowledge-scapes. Finally, Latorre-Ruiz highlights the processes of wayfinding and wayfaring as key for the maintenance and repetition of specific travel routes (by sailors navigating the Bay of Biscay, in this case). These processes are sometimes frozen in traditional stories, passed down from generation to generation and eventually may be written down in texts through which we gain preliminary access to these knowledge-spaces.

The potential of historical sources, however, can be a double-edged sword, as is discussed by Treadway. Her analysis of wetland deposits in Britain questions the over-reliance on Classical and folklore narratives as well as on Victorian approaches to materiality for interpreting these deposits. Her paper highlights the importance of being critical about how "archived physical evidence has been interpreted" (Treadway, this volume: 128) in the past. Ethnoarchaeology, myths and contemporary written sources, although useful on many occasions as some of the papers of this volume show, should not be taken at face value. It is our responsibility to maintain a critical approach to the methods and sources of documentation that we use to inform our research and to remember that interdisciplinarity does not imply to be blind to the biases of supporting evidence.

Finally, we would like to highlight other methods not covered by the papers in this volume but which may provide valuable access to knowledge-scapes. The contributions by archaeological sciences in the realm of technology and subsistence practices as well as Geographic Information Systems (GIS) applications and experimental archaeology, among others, will hopefully be explored further in the future. Particular attention should be paid to the potential of GIS applications, as they provide both analytical and illustrative opportunities to study the environments of knowledge (e.g. Howey and Frederick 2016; Supernant 2017). These approaches provide us with invaluable tools for the discovery and understanding of ancient knowledge-scapes.

Archaeological interpretation of knowledge-scapes: Potential and limitations

Although materiality is our main means to access knowledge-scapes, or at least part of them, pots, cheese or swords are only the physical manifestation of actions and performances: they do not equal knowledge-scapes. Knowledge-scapes, on the contrary, encompass dynamic bodies of shared knowledge that can sometimes translate into materiality. When materialized, they become the subject of archaeology, but can also be of interest for other subjects such as sociology, anthropology, history and more.

Interpreting knowledge-scapes beyond their material participants and manifestations requires us to link them with the concept of 'belonging in a performative way' and being part, more or less consciously, of a social unit, such as a group of people, a lineage or a tradition. As explored in the vast majority of papers in this volume, knowledge-scapes are characterized by shared skills and knowledge (i.e. implicit, explicit or codified knowledge) and the connection with the physical and social space, including embeddedness in temporal and spatial dimensions. However, one of the overarching elements is a sense of belonging to a social unit, mindful or not, associated with distinctive and different acts, practices or performances. The following papers demonstrate that diverse performances can range from sword-fighting techniques (Scarsella) to production methods and traditions (Clark and Linares-Matás; Hadjigavriel; Laoutari), from specific uses of spaces and objects (Schweizer; Prado; Treadway) to navigation strategies (Latorre-Ruiz).

When analysing practices, knowledge-scapes can help to explain the dynamics of widely available bodies of knowledge (exoteric knowledge) and those restricted to just a few individuals (esoteric knowledge). That is the case of society-mediated and individually mediated knowledge-scapes, as described, for example, in two papers published here. Hadjigavriel's paper offers a case of society-mediated knowledge, suggesting a picture of social landscapes sustained and reproduced by multiple social groups, characterized by a range of ceramic producers, traditions and consumers in Late Chalcolithic Cyprus. The Ktima Lowlands region in western Cyprus is presented as the receptacle of knowledge-scapes within which CoP from multiple sites exchanged technological knowledge and influenced distinct variants of local ceramic traditions. In this paper, societies are well aware of the existence of diverse traditions and members of society are seen to play a significant role in their continuity and

transformations. However, Prado's paper gives us a case of esoteric knowledge, suggesting the existence of more restricted knowledge-scapes, accessible only to a few individuals, with a sense of exclusivity being a key part of these traditions. In this second case, the use of frequent warnings in the *Picatrix* suggests not only that the specific esoteric knowledge-scape held within the text would be a direct danger to unlearned users, but also that only certain individuals would be successful in using this knowledge. This suggests that only a few individuals directly mediated that knowledge, with other members of society contributing indirectly to its perception of exclusivity and esoteric nature.

Although knowledge-scapes can be very informative about identity construction and maintenance, they are limited by the nature of the archaeological record and its evidence. The paper by Clark and Linares-Matás provides an excellent example on how even when we cannot access identitarian socio-cultural questions, knowledge-scapes approaches can still offer valuable information. In their work, they offer a novel explanation for the construction of knowledge networks. However, the restrictions imposed by the nature of the Early Pleistocene Olduwan and Acheulian archaeological assemblages do not allow theorization about socio-cultural matters at the same level that is possible for more recent archaeological settings. However, this limitation is overcome through the application of ideas such as technological tradition and transmission of technological skills and knowledge, which are ultimately linked to the identification of knowledge-scapes. They demonstrate that it is possible to build behavioural interpretations that allow us to explain change and knowledge transmission.

Knowledge-scapes may be also employed to understand how people perceived the world around them, their cultural memories and social identities. Schweizer explores ancient collective memories via the analysis of political and sacred spaces and structures. He observes a sense of continuity of this kind of knowledge-scapes associated with shared cultural memory among communities. Architecture, shaped things, designed spaces and associated practices directed at senses and emotions are presented as active tools of cultural ascriptions of meaning and value related to identity building. This allows the author to explore forms of social belonging and of identity forging over centuries, suggesting forms of long-term communication and meaning horizons. These ideas of long-term transmission of knowledge-scapes through different cultural settings while sharing a common diachronic experience

can also be perceived in Latorre-Ruiz's paper which puts special emphasis on the role of geographically remarkable landmarks for the preservation of navigation routes over time. Sailors in the Bay of Biscay would have maintained the same routes over changing cultural dynamics through the continuous transmission of technological knowledge when navigating. This knowledge is partly encapsulated in landmarks and other environmental features (stars, colour of the sea, etc.) and is accessed through practice. Latorre-Ruiz acknowledges these landmarks and environmental features as agents that enhance the preservation of the same navigation patterns over time.

Interpretations of knowledge-scapes are also linked to considerations about the embeddedness of people within their societies. Although this is sometimes difficult to access given the limitations of the archaeological data, papers such as Laoutari's allow us to rethink our approaches to interpreting specific production contexts: a cheese-making workshop in this case. Cosmological aspects and the social relationships of the cheese-makers with members of their community are integral to maintaining production. These are archaeologically inaccessible aspects of this knowledge-scape that enrich our interpretations when dealing with similar archaeological contexts.

The flexibility that knowledge-scapes offer to accommodate different material evidence, people and dynamics across time and scale necessitates careful consideration of their diachronic compartmentalization that have to be dealt with on a case-by-case basis. It is therefore important to define what can and cannot change in a knowledge-scape to continue being considered the same. Scarsella offers an excellent case study to consider these issues. It shows a progressive change in typology of longswords that is explained as the material result of different knowledge-scapes related to distinct fighting techniques. Analysis of the performance characteristics of the different types of swords allowed the author to justify that the nature of the fighting knowledge had changed enough to consider that each sword type is linked to separate knowledge-scapes.

Finally, with the expansion of open-access artefact databases in recent years, it is now possible to review current interpretations of assemblages using statistical and computational approaches. This is particularly relevant during the time of a global pandemic, when remote work may become the norm rather than the exception, and fieldwork may not always be an option. The reanalysis and new interpretations by Treadway offer an excellent example for the reconstruction of ancient knowledge-scapes using preexisting British databases.

Her contribution helps us understand how archived physical evidence has been interpreted in the past and, as a result, created certain biases in modern interpretations of shared knowledge and practices in antiquity. In particular, it helped to rediscover a shared tradition in Iron Age Wales and Scotland in which hoards and single objects were purposefully discarded at certain times and in specific manners, with particular shared cultural values. This allowed Treadway to reconstruct a previously unexplored knowledge-scape.

The books reviewed in this volume, edited by James Clark, highlight the potential of exploring knowledge acquisition and knowledge transmission, both key areas of interest for knowledge-scape research. The books deal with cognitive archaeology, archaeometallurgy, heritage studies and Assyriology, promoting the idea that the concept of knowledge-scapes can be of use in many different archaeological research areas.

Handbook of Cognitive Archaeology: Psychology in Prehistory, reviewed by Martín-Ramos, takes us back to Prehistory and pre-Homo times to discuss cognitive mechanisms through time in order to provide a methodological basis that combines contributions from archaeology, evolutionary biology, psychology and neuroscience. Understanding how knowledge is acquired is a key element to start theorizing about the formation of knowledge-scapes. The interdisciplinarity captured in this book is also shared by *The Routledge Handbook of Memory and Place*, reviewed by Ruf, that unites contributions from geography, anthropology, memory studies and archaeology among others. In this book, different papers explore the relevance of locus and space for remembrance and how these relate to past, present and future experiences. Although this volume focuses on heritage studies, one cannot help to link some of the ideas highlighted in the review with some of the papers in this volume, particularly Schweitzer's and Latorre-Ruiz's ones.

Metals, Minds and Mobility: Integrating Scientific Data with Archaeological Theory, reviewed by Sainsbury, aims to blend archaeological science and theory to better answer questions related to transmission of technological knowledge, social complexity and exchange. Research questions related to these topics are common in many technological studies, such as the one by Hadjigavriel in this volume, but the combination of archaeological science and theory allows us to acquire a higher socio-economic level of interpretation. We believe that approaches such as the ones compiled in this book ultimately provide a more solid ground to build knowledge-scapes-based

interpretations. To conclude, *Ancient Knowledge Networks: A Social Geography of Cuneiform Scholarship in First Millennium Assyria and Babylonia*, reviewed by McGovern, approaches the social geography of cuneiform culture by focusing on different levels of micro- and macro-analysis. This book challenges traditional interpretations of cuneiform literature and offers thought-provoking ideas about the evolution of practice over time that inevitably reminds us of the importance of the dynamic nature of knowledge-scapes in the *long-durée*.

Conclusions

With this volume of the *Archaeological Review from Cambridge* (*ARC*) dedicated to knowledge-scapes, we advocate the use of this concept in archaeology. Ironically, archaeological thought inspired the development of the concept in other disciplines at the turn of the twenty-first century. Questions of space and knowledge have become increasingly investigated in archaeology and neighbouring disciplines in the past few years. Now, we believe it is time to bring the concept "back home" and incorporate it into our archaeological interpretations.

We understand knowledge-scapes as dynamic socially-constructed landscapes which connect individuals, materials and space through shared ideas, norms and practices over time in a specific setting subject to change. We have offered in this introduction a summary of the different theoretical approaches that can be used to reconstruct these unique spaces, among which we would like to emphasize the importance of CoP, landscapes of knowledge, learning networks, task habitus and *chaînes opératoires*. These theoretical approaches also offer thoughts and suggestions for future research trajectories concerning social mechanisms of assimilation, homophily, xenophobia and differentiation, that can generate polarization and spatial separation of populations, which are particularly relevant issues in contemporary archaeology and global social dynamics today. Taken further, knowledge-scapes may provide the lens through which to approach aspects of not-knowing, the loss of knowledge in past societies. Part of the dynamics of knowledge exchange is the transformations that knowledge can undergo during its practice, enactment and interaction.

The papers in this volume offer examples on how to approach knowledge-scapes in the archaeological record in a practical way, combining traditional archaeological approaches based on the distribution of material synchronically and diachronically. They also offer examples of how interdisciplinary studies in archaeology can improve our artefact-based interpretations. Ultimately, these

papers explore a range of topics related to transmissions and transformations of knowledge and related questions on social identity, mobility and others. Together with the book reviews, we believe that the papers demonstrate the core values and benefits of investigating knowledge-scapes in archaeology.

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