



HAL
open science

Issues of theory and method in the analysis of Paleolithic mortuary behavior: A view from Shanidar Cave

Emma Pomeroy, Chris Hunt, Tim Reynolds, Dlshad Abdulmutalb, Eleni Asouti, Paul Bennett, Marjolein Bosch, Ariane Burke, Lucy Farr, Robert Foley, et al.

► To cite this version:

Emma Pomeroy, Chris Hunt, Tim Reynolds, Dlshad Abdulmutalb, Eleni Asouti, et al.. Issues of theory and method in the analysis of Paleolithic mortuary behavior: A view from Shanidar Cave. *Evolutionary Anthropology*, 2020, 29, pp.263 - 279. 10.1002/evan.21854 . hal-02904284

HAL Id: hal-02904284

<https://hal.science/hal-02904284>

Submitted on 14 Nov 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

**REVIEW ARTICLE**

Issues of theory and method in the analysis of Paleolithic mortuary behavior: A view from Shanidar Cave

Emma Pomeroy¹ | Chris O. Hunt² | Tim Reynolds³ | Dshad Abdulmutalb⁴ | Eleni Asouti⁵ | Paul Bennett⁶ | Marjolein Bosch¹ | Ariane Burke⁷ | Lucy Farr⁸ | Robert Foley⁹ | Charles French¹ | Amos Frumkin¹⁰ | Paul Goldberg^{11,12} | Evan Hill¹³ | Ceren Kabukcu⁵ | Marta Mirazón Lahr⁹ | Ross Lane⁶ | Curtis Marean¹⁴ | Bruno Maureille¹⁵ | Giuseppina Mutri^{16,17} | Christopher E. Miller¹⁸ | Kaify Ali Mustafa¹⁹ | Andreas Nymark³ | Paul Pettitt²⁰ | Nohemi Sala²¹ | Dennis Sandgathe²² | Chris Stringer²³ | Emily Tilby¹ | Graeme Barker⁸

¹Department of Archaeology, University of Cambridge, Cambridge, UK

²School of Biological and Environmental Sciences, Liverpool John Moores University, Liverpool, UK

³Department of History, Classics and Archaeology Birkbeck, University of London, London, UK

⁴Directorate of Antiquities (Soran Province), Soran, Kurdistan, Iraq

⁵Department of Archaeology, Classics and Egyptology, University of Liverpool, Liverpool, UK

⁶Canterbury Archaeological Trust, Canterbury, UK

⁷Département d'Anthropologie, Université de Montréal, Montreal, Quebec, Canada

⁸McDonald Institute for Archaeological Research, University of Cambridge, Cambridge, UK

⁹Leverhulme Centre for Human Evolutionary Studies, Department of Archaeology, University of Cambridge, Cambridge, UK

¹⁰Institute of Earth Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel

¹¹Centre for Archaeological Science, University of Wollongong, Wollongong, New South Wales, Australia

¹²Institute for Archaeological Sciences, Senckenberg Centre for Human Evolution and Paleoenvironment, University of Tübingen, Tübingen, Germany

¹³School of Natural and Built Environment, Queen's University Belfast, Belfast, UK

¹⁴Institute of Human Origins, School of Human Evolution and Social Change, Tempe, Arizona

¹⁵CNRS, UMR5199 PACEA, Université de Bordeaux, Ministry of Culture, Pessac Cedex, France

¹⁶The Cyprus Institute, Nicosia, Cyprus

¹⁷International Association for Mediterranean and Oriental Studies (ISMEO), Rome, Italy

¹⁸SFF Centre for Early Sapiens Behaviour (SapienCE), University of Bergen, Bergen, Norway

¹⁹General Directorate of Antiquities in Kurdistan, Kurdish Regional Government, Erbil, Iraq

²⁰Department of Archaeology, Durham University, Durham, UK

²¹Centro Nacional de Investigación sobre Evolución Humana (CENIEH), Paseo Sierra de Atapuerca, Burgos, Spain

²²Department of Archaeology, Simon Fraser University, Burnaby, British Columbia, Canada

²³CHER, Department of Earth Sciences, Natural History Museum, London, UK

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2020 The Authors. *Evolutionary Anthropology* published by Wiley Periodicals LLC

Correspondence

Emma Pomeroy, Department of Archaeology,
University of Cambridge, Downing Street,
Cambridge CB2 3DZ, UK.
Email: eep23@cam.ac.uk

Funding information

British Academy; Calleva Foundation; Human
Origins Research Fund; Leverhulme Trust,
Grant/Award Numbers: ECF-2017-284, RPG-
2013-105; McDonald Institute for
Archaeological Research; Natural Environment
Research Council, Grant/Award Numbers:
NE/L002507/1, NF/2016/2/14; Rust Family
Foundation; Society of Antiquaries of London;
Wenner-Gren Foundation, Grant/Award
Number: CONF-788

Abstract

Mortuary behavior (activities concerning dead conspecifics) is one of many traits that were previously widely considered to have been uniquely human, but on which perspectives have changed markedly in recent years. Theoretical approaches to hominin mortuary activity and its evolution have undergone major revision, and advances in diverse archeological and paleoanthropological methods have brought new ways of identifying behaviors such as intentional burial. Despite these advances, debates concerning the nature of hominin mortuary activity, particularly among the Neanderthals, rely heavily on the rereading of old excavations as new finds are relatively rare, limiting the extent to which such debates can benefit from advances in the field. The recent discovery of in situ articulated Neanderthal remains at Shanidar Cave offers a rare opportunity to take full advantage of these methodological and theoretical developments to understand Neanderthal mortuary activity, making a review of these advances relevant and timely.

KEYWORDS

burial, funerary activity, mortuary activity, Neanderthal, sediment micromorphology, taphonomy

1 | INTRODUCTION

The nature and possible extent of behavioral and cognitive similarities between our own taxon, *Homo sapiens*, and our close evolutionary relatives, the Neanderthals, have fueled a longstanding and still unresolved debate.^{1–5} Evidence emerging in the last decade that these taxa interbred,^{6–8} and potentially shared greater behavioral similarities (e.g., symbolism) than previously recognized,^{9–15} gives renewed relevance to this discussion, particularly concerning the degree of resemblance between these groups, and the dynamics of their interactions that preceded the extinction of the Neanderthals and the spread of modern humans across the globe.

Within such debates, a key question concerns Neanderthal mortuary activity.^{16–22} Here, we define *mortuary behavior* or *mortuary activity* in broad terms as any activity involving and directed toward the dead body of a conspecific which may, but does not necessarily, involve any kind of ritualized or symbolic activity; and *funerary activity* or *funerary behavior* as referring more specifically to examples where activities surrounding the body of a dead conspecific involve a ritualized or symbolic component, as discussed further below. The partial remains of 10 Neanderthal men, women, and children, found during Ralph Solecki's 1951–1960 excavations at Shanidar Cave, Iraqi Kurdistan^{23–26} (Figure 1), have featured centrally in discussions about whether Neanderthals conducted purposeful burial, how variable their mortuary behavior was in time and space, if deliberate burials signify the beginnings of religious belief, and if sites with multiple burials like Shanidar Cave signify notions of “persistent places” of burial and landscape attachment—all behaviors strongly associated with modern *Homo sapiens*. Solecki argued that although some of the Shanidar Cave Neanderthals died in rock falls, others were intentionally buried,

perhaps with accompanying rites, such as the famous “Flower Burial,” and for the use of “grave markers.”^{23,27,28} Evidence from Shanidar Cave therefore feeds into wider debates about spatiotemporal variation in Paleolithic mortuary behavior, including intentional burial and cannibalism/body processing at other sites,^{19,29–31} which are relevant to characterizing Neanderthal capacities for cultural variation and innovation.

A major source of controversy has been how to identify funerary behavior in the archeological record and distinguish between scenarios leaving similar archeological signatures, for example, chance preservation of a complete body in a natural depression versus intentional



FIGURE 1 View of Shanidar Cave, seen from the south (photograph: Graeme Barker) [Color figure can be viewed at wileyonlinelibrary.com]

burial.^{17–20,32–37} Data obtained at the time of discovery are critical to confirming or disproving intentional human agency in the interment process, but the rarity of new in situ Neanderthal fossil finds has meant that most recent research has inevitably concentrated on “rereading” old excavations, primarily from western Europe, for which contextual and taphonomic information is limited.^{32,35–38} The recovery and recognition of “grave goods” during some of the early excavations of Middle Paleolithic hominin remains, for example, those of *H. sapiens* at Skhul³⁹ and Qafzeh,⁴⁰ attest to the quality of some earlier excavations, and implies their absence at other sites may be genuine. Equally, the paucity of recently excavated skeletal material has further limited the impact on the “Neanderthal burial debate” of recent advances in areas including cave geology and stratigraphy, sediment micromorphology and chemistry, biostratigraphy and forensic taphonomy that offer the potential to evaluate the archeological and cultural contexts of hominin remains more robustly than was previously possible.

In this context, renewed excavations at Shanidar Cave by some of the present authors^{41,42} offer a unique opportunity to reinvestigate the chronological, paleoclimatological, and sedimentological characteristics of the original Neanderthal finds. The recovery of new in situ remains from the original Shanidar 5 skeleton⁴³ (Figure 2a), and most recently the discovery of articulated skull and upper body parts thought to belong to one of the individuals from Solecki’s Shanidar 4, 6, 8, and 9 burial cluster⁴⁴ (Figure 2b), are highly significant, presenting a rare opportunity to study articulated Neanderthal remains and their depositional contexts with the full suite of modern archeological techniques.

A reconsideration of current theoretical, methodological, and practical approaches to debates on the evolution of hominin mortuary behavior is therefore extremely timely, and this review aims to achieve this with a focus on shaping future investigations at Shanidar Cave and other similar key sites. We begin by taking a broad perspective, considering the relevance of evidence for mortuary activity within the wider animal kingdom in shaping hypotheses and expectations for such behavior among extinct hominins, and then focusing more specifically on the investigation of mortuary behavior among past hominin taxa. In doing so, we use the emerging Shanidar Cave data to highlight the potential for investigating the evolution of mortuary activities, taking full advantage of recent advances in modern archeological science and broader theoretical perspectives.

2 | MORTUARY BEHAVIOR IN THE ANIMAL KINGDOM: A COMPARATIVE PERSPECTIVE

Identifying an appropriate null hypothesis for Neanderthal (or other hominin) mortuary behavior is an important baseline for attempting to identify and evaluate archeological evidence. Given other behavioral similarities between our taxon and Neanderthals, should the null hypothesis be that Neanderthals did not engage in mortuary activity, or should we work from the assumption that they did? Indeed, should

we assume that the earliest representatives of *H. sapiens* behaved exactly as recent modern humans do? There are indications that some of the earliest potential evidence of mortuary behavior in the Middle Paleolithic follow geographic, rather than taxon-specific patterns,²² so investigating the contexts of other Middle and Upper Paleolithic hominin remains with the same scrutiny and threshold of evidential support for interpretation is essential if we are to understand the origins of the kinds of mortuary behavior we see in recent populations of our own taxon.

The long anthropological tradition of looking to our primate relatives, or even to more distantly related species, offers an important point of departure for understanding the nature and context of mortuary activity among hominins, but one that is not always given adequate recognition. Examples of mortuary behavior (as defined above) have been documented across a wide range of species^{20,45–50} (Table 1), from the carrying of dead infants for several weeks by chimpanzee mothers, to the revisiting of elephant carcasses by members of their social group,⁴⁷ to “necrophoresis” (removal of corpses from living areas) and “necroclausalization” (corpse-covering) behavior among termites.⁴⁸ What is common to most of these mortuary practices is that they occur among species where there are long-term bonds among group members, and a relatively high level of social cognition. Thus, several of the mortuary activities commonly identified as significant or unique among humans are not necessarily as unusual as we might think, yet have not been considered by archeologists for whom burial is considered to be “symbolic” by default.^{20,46}

Spatial and temporal variation in mortuary activity within the hominin lineage, including that potentially apparent among our hominin relatives such as *Homo naledi*,⁵¹ the Sima de los Huesos hominins,⁵² Neanderthals^{19,22,53,54} and some mid and late Upper Paleolithic (Gravettian and Magdalenian) *H. sapiens*,^{20,53,55} represents an important consideration for understanding the evolution of hominin mortuary behavior, particularly since mortuary activity in recent *H. sapiens* populations is notably highly variable across space and time. The identification of geographical or temporal patterns in the archeological record is limited by research bias, preservation bias and the aggregation of evidence spanning tens of thousands of years. Nonetheless, we should recognize the possibility (or probability) that mortuary activity varied through space and time among Neanderthals^{53,54} just as it has done and does among *H. sapiens*. Indeed, the Middle and Upper Paleolithic record for mortuary activity shows periods with scant evidence interspersed with periods of relative archeological abundance. It is uncertain why evidence for intentional burial in the Middle Paleolithic seems to appear only from about 120 kya,²² when both Neanderthals and *H. sapiens* had existed for many tens of thousands of years by that point, or why intentional burial was much more widespread in Europe during the Gravettian compared with the Aurignacian.⁵⁵

Evidence for hominin cannibalism predates both Neanderthals and *H. sapiens*^{56,57} and has been suggested at a number of Neanderthal sites in Europe^{29–31} alongside evidence for possible interments or at the very least, cave sites containing articulated Neanderthal remains of multiple individuals.⁵⁸ In contrast, cannibalism is yet to be documented in the Middle Paleolithic of Southwest Asia,²² despite a

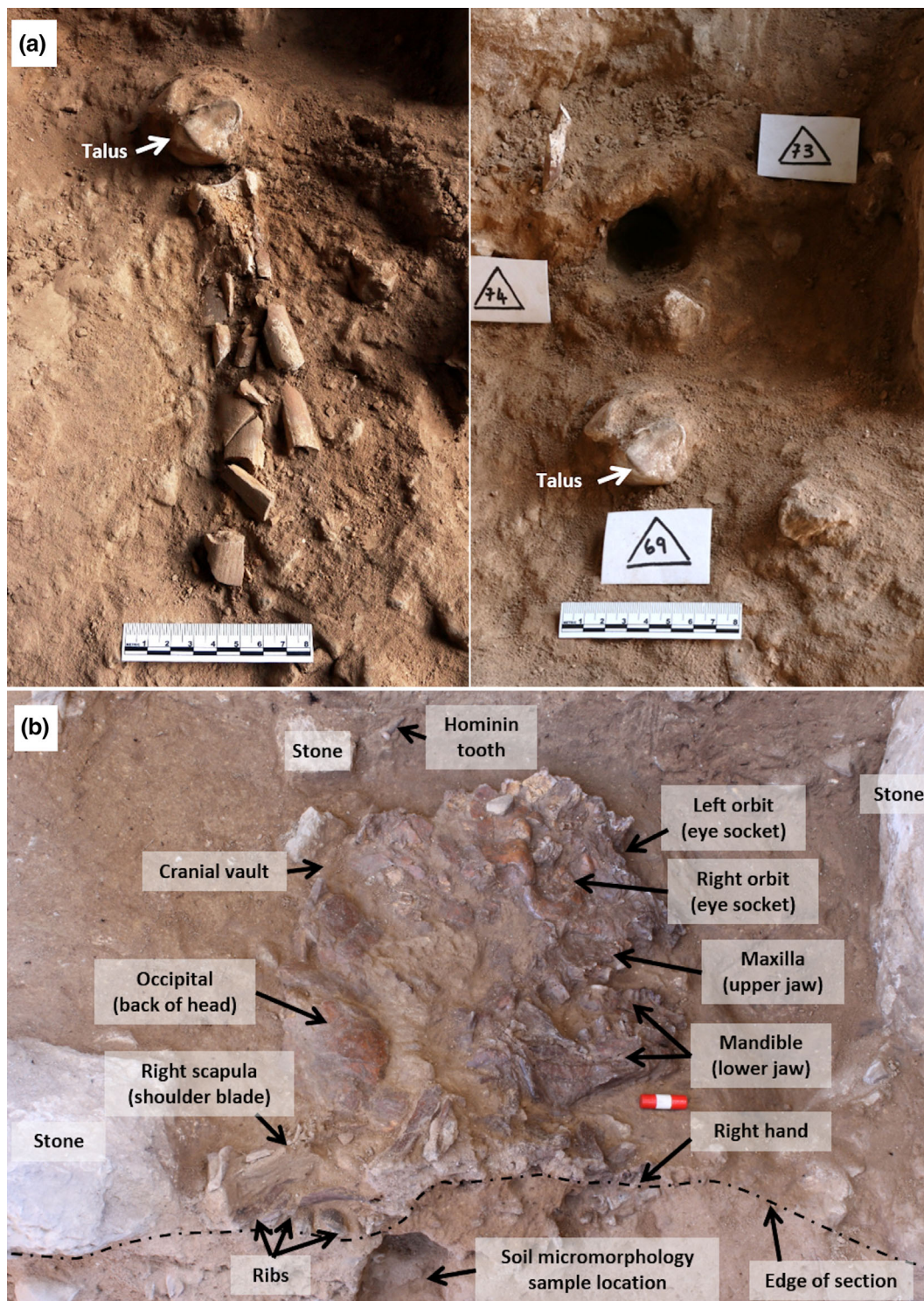


FIGURE 2 (a) Views of the Neanderthal articulated skeletal remains excavated in 2015, identified as part of Solecki's Shanidar 5, looking east; before (left) and after (right) the tibia was lifted. Note the burrow, probably of a mole rat, just above the bones; (b) the crushed skull of an adult Neanderthal excavated in 2018 adjacent to the location of Solecki's Shanidar 4 (the "flower burial"). Scales: (a) 8 cm; (b) 3 cm (photographs: Graeme Barker) [Color figure can be viewed at wileyonlinelibrary.com]

rich record of articulated Neanderthal skeletal remains from both caves (e.g., Amud,⁵⁹ Kebara,⁶⁰ Tabun,³⁹ Dederiyeh,⁶¹ Shanidar) and an open air site (site 'Ein Qashish).⁶² Cannibalism is also well documented at sites associated with Middle Paleolithic/Middle Stone Age

H. sapiens in Europe and Africa.^{63–65} Evidence suggests the bodies of conspecifics were sometimes processed for consumption and that this may have reflected ecological stress.^{66,67} There is less evidence for the use of hominin bone to make tools,³⁰ or for nondietary related

TABLE 1 Examples of mortuary behavior in different species, compiled from References,^{41–46} references therein

Species	Behavior
Chimpanzees	Carrying dead infant for up to ~70 days Attention prior to death Body processing (tooth cleaning) Cannibalism Aggression to body
Gorillas	Carrying dead infant Touching Burying with leaves Grooming dead body Vigils
Lemurs, macaques, murrelets	Mothers carry dead infants
Dolphins, orca	Carry dead Guarding the body
Elephants	Prolonged touching, attempts to lift Stay with body Revisit carcass Carry bones
Horses	Vigil Investigating the body
Magpies/jays	Flocking Bring leaves, twigs

processing of remains.²² However, at present, it is only among modern humans that we have evidence for ritual significance attributed to hominin bone tools.⁶⁴ While variation in mortuary activity in both taxa may not be entirely due to cultural variation, the important observation is that while a single baseline expectation, or null hypothesis, for Neanderthal mortuary activity cannot be easily formulated, there is no reason not to expect a level of mortuary-related activity among Neanderthals, or conversely that mortuary behavior in the earliest *H. sapiens* was expressed in the same way as in more recent populations of our taxon. Whatever the case, one cannot simply conclude from the evidence we have that “Neanderthals buried their dead.” It may be more profitable to ask why some Neanderthals buried some of their dead, some of the time.

So how can this problem be resolved, and what should we take from this comparative perspective? Ultimately, the combination and weight of multiple lines of evidence for intentionality and deliberate action appear to be essential,²² incorporating many of the components discussed below. What is also clear from ethnographic studies of humans and behavioral studies of other animals is that we must keep our minds open to alternative scenarios (e.g., covering the body with earth, or stones, or plant materials, or textiles, or a combination of materials), to whether/how these can be tested archeologically, and the impact of alternative scenarios on skeletal presentation and other aspects of the archeological evidence. We also need to take care to avoid conflating the question of a taxon's capacity for a

behavior with whether or not they undertook that behavior. While some researchers have debated whether Neanderthals practiced certain mortuary behaviors, for example, interment, very few have argued that they lacked the capacity for such behaviors.

Of the many challenges encountered during discussions about mortuary behavior that of terminology is frequent but lacks an obvious resolution.⁶⁸ Terms like “burial,” “pit,” and “grave” perhaps misleadingly evoke images of a deep, straight-sided shaft, which in terms of Neanderthal burials, are far from being the case; even assuming a degree of sediment deflation, existing examples are relatively shallow and the term “scoop” may describe reality better. Cases like these can be interpreted in multiple ways and contribute to confusion or generate disagreement where none may in fact exist. However, no single set of terminology would appear to satisfy all researchers: proposed terms such as “deposition” as a neutral description for a find of archeological human remains^{20,68} for some people still carry implicit assumptions (deposition implies action for which someone or something is responsible), while “burial” may sometimes imply intentionality. Although no simple solution is apparent, qualifying adjectives (“intentional burial,” “anthropogenic pit,” “natural gully”) help to reduce ambiguity and misunderstanding. “Mortuary activity” or “mortuary behavior” offer useful general terms for activities by conspecifics concerning or around the dead body, like cannibalism, contrasting with “funerary activity” or “funerary behavior,” which imply formal practices or rituals associated with and symbolizing the relationship of the dead to the living.

3 | SKELETAL EVIDENCE FOR NEANDERTHAL MORTUARY ACTIVITY

The skeletal remains themselves have traditionally played a central role in the assessment of hominin mortuary activity. Characteristics including skeletal completeness and articulation, body positioning, taphonomic alterations, and the relationship between individuals all feed into debates concerning the treatment of the dead.^{17,20,22,23,54,68–70} However, sometimes the resulting interpretations of mortuary behavior become too readily accepted in the literature when the strength of evidence is actually lacking. Of course, it is impossible for every individual researcher to fully reassess all available evidence and where attempts have been made, they have stimulated substantial controversy.^{17,18,32,36} Nonetheless, the detailed reexamination of the previously published remains from Shanidar Cave as part of the new work at the site raises significant questions about the accepted interpretations of this material, such as whether remains could be confidently attributed to single individuals and the likelihood of natural or anthropogenic placement of the bodies. For example, reexamination of archive photographs of Shanidar 1 (Figure 3) suggests that the placement of the skull and mandible were unlikely to have occurred naturally given the location of the skull upslope from the body and the side-by-side placement of the cranium and mandible in their anatomical orientation relative to the ground but not to one another. Plans are in place to revisit and reexamine all the available evidence in the site archives at the National Anthropological Archives and Smithsonian Institute in Washington, DC,

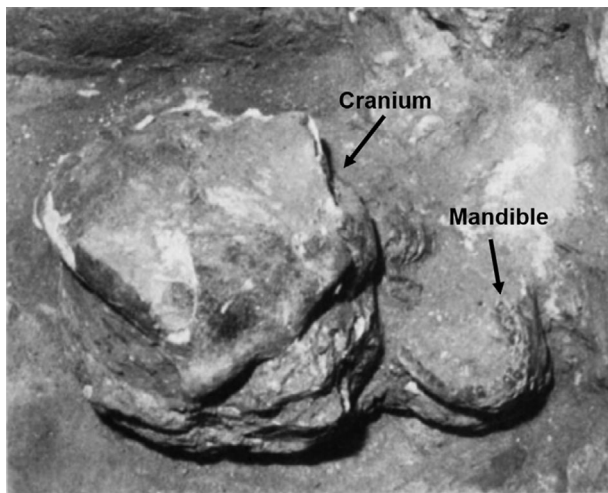


FIGURE 3 Photograph of the Shanidar 1 skull in situ, showing the displacement of the cranium and mandible⁷¹

which has been significantly enhanced by further materials donated by Ralph Solecki shortly before his death in March 2019, and materials housed in the Baghdad Museum.

Skeletal evidence related to cause of death and the taphonomic history of skeletal remains is central to understanding how hominin remains entered the archeological record and so for identifying potential hominin mortuary activity. Work at other sites to identify evidence for premortem, perimortem, and postmortem bone damage has demonstrated the effectiveness of such approaches, which are only recently being systematically applied to hominin remains^{51,72,73} (Figure 4). As bone breaks differently in its fresh, fleshed, state compared with when it is dry and the soft tissue decomposed,^{77,78} detailed analyses of bone breakage patterns at, for example, Sima de los Huesos^{74–76} (Figure 4) provide a useful model for the re-evaluation of interpretations of the Shanidar Cave Neanderthals, such as Solecki's argument that some individuals were killed on the spot by rock fall.^{23,24,27,28} Comparative taphonomic analyses of associated faunal remains, including analyses of bone breakage patterns, could also offer further insight into the depositional contexts of the hominin and animal remains, and the contribution of factors such as rock fall from the cave roof.

The potential impact of environmental factors on skeletal completeness, and how this could be better recognized and assessed, remains an important area for research and clarification. The potential effects of freezing/thawing or desiccation on the preservation and disintegration of intact bodies may be relevant to explaining hominin skeletal completeness in caves such as Shanidar, but it appears that the potential impact of these kinds of processes has not been well explored in the context of hominin mortuary activity. Greater engagement with relevant "archeothanatological"^{69,79} and forensic anthropological and taphonomic literature may offer some answers,^{80–82} or reveal the need for further experimental work. The evidence for environmental conditions when bodies were deposited (see below) will be important for evaluating the likelihood of any such taphonomic effects on skeletal preservation.

Comparative work on animal skeletal articulation and completeness at sites where Neanderthal remains are recovered, and on the taphonomic processes affecting these, has been mentioned in the literature as a means of better understanding how articulated hominin remains enter the archeological record at the same sites,^{17,20} but little systematic work on this topic has been done at Shanidar Cave. Such data might present important new evidence for or against intentional burial at particular sites, although careful consideration of how both hominins and other animals used caves, and their likelihood of dying in these kinds of locations, is required. Detailed taphonomic analyses of the hominin and faunal remains for features including cortical surface weathering, burning, and anthropogenic marks in the form of cut and butchery marks, could provide indications of the differential treatment of human and faunal remains, and comparisons of cortical surface weathering could be especially useful to identify potential differences in the taphonomic and postdepositional history of the animal and hominin remains (e.g., References 36 and 38). Microscopic analyses of bone damage patterns can also be revealing about the speed of deposition and covering of the body,^{83–85} offering yet another line of evidence to more accurately reconstruct the taphonomic history of the hominin remains (although see Reference 86).

Examples from a number of sites, both Paleolithic and more recent, demonstrate the utility of carefully reconstructing the original position of the body in combination with the subsequent impact of taphonomic and anthropogenic factors, to fully evaluate potential mortuary treatment of the body, as has been emphasized in some of the literature.^{68,69,79} While this evidence is irretrievable for some of the older Shanidar Cave material because poor preservation and time constraints limited the observation of remains in situ, the reanalysis of unpublished archive material may be informative. The discovery in the current excavations of one (possibly two) partial, articulated skeletons⁴⁴ (Figure 5) directly adjacent to where a sediment block containing Shanidar 4 (the "Flower Burial") and three other partial individuals (6, 8, and 9) was removed in 1960,^{23,71} offers a valuable new opportunity to reevaluate the nature of the Shanidar 4, 6, 8, 9 cluster, the relationship between the individuals, and interpretations of potential secondary burial of some of them (which based on a reexamination of published evidence²³ would appear unlikely). The new remains clearly show that two individuals in the cluster, the new find ('Shanidar Z') and Shanidar 4, were left in extremely close proximity and in an articulated state.⁴⁴ Future work will establish in greater detail the relationship between this new individual and what appears to be a second individual found below it in 2019 that remains largely unexcavated.

4 | STRATIGRAPHIC AND SEDIMENTARY EVIDENCE FOR NEANDERTHAL MORTUARY ACTIVITY

Many of the past debates about mortuary activity and possible deliberate burials—and accidental ones exemplified by the rockfall deaths suggested by Solecki in the case of Shanidar Cave—have occurred because evidence from the sedimentary and stratigraphic context of

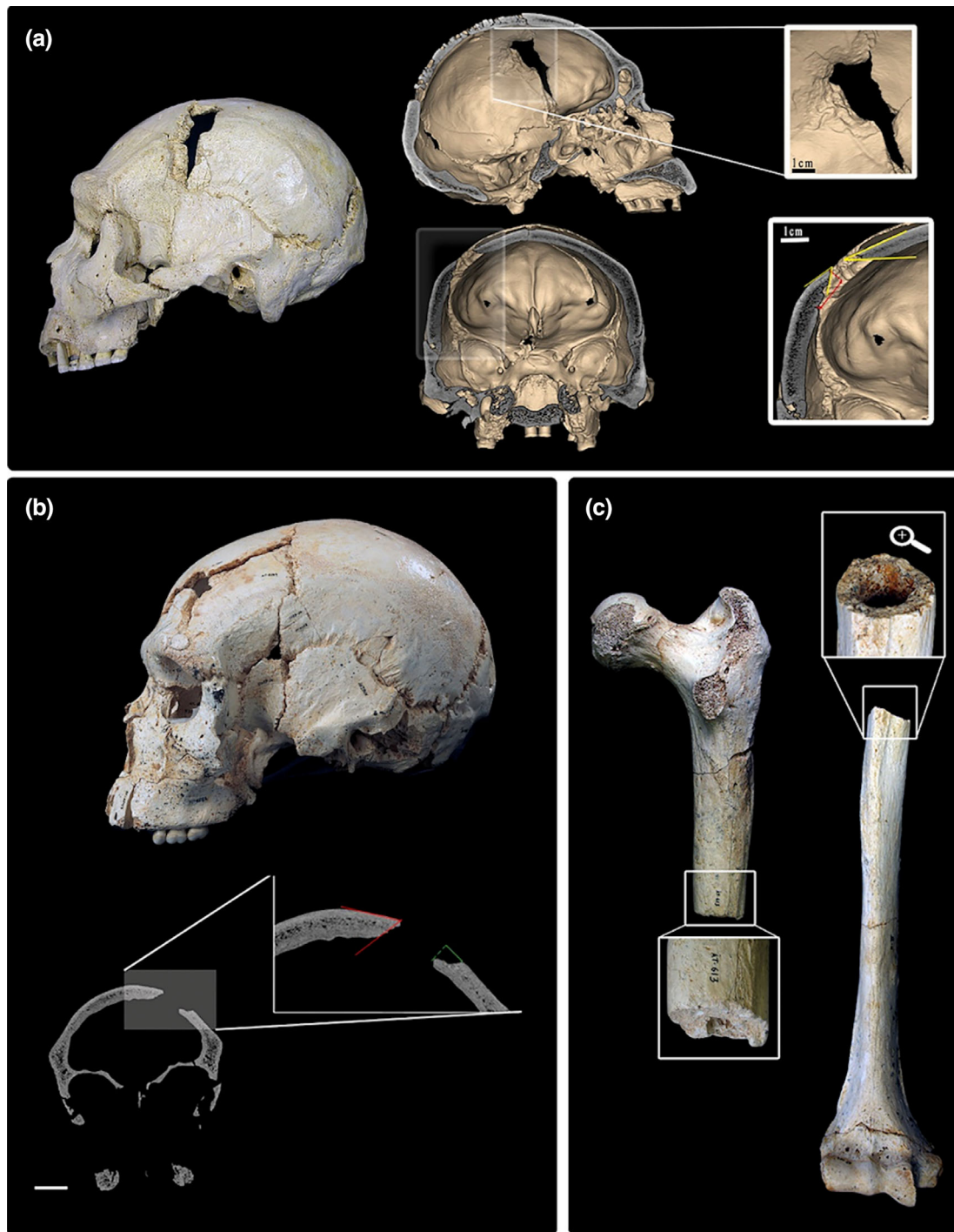


FIGURE 4 Examples of the forensic-taphonomic techniques applied for the breakage analysis of Sima de los Huesos hominin fossils: (a) Cranium 5 (Cr-5) perimortem fracture on left parietal bone (modified from Sala et al.⁷⁴); (b) Cranium 17 (Cr-17) perimortem trauma on the frontal squama (modified from Sala et al.⁷⁵); (c) examples of long bone postmortem fractures (modified from Sala et al.⁷⁶) [Color figure can be viewed at wileyonlinelibrary.com]

hominin remains was either not recorded at all or in sufficient detail, or was not published, either because it was not recognized or not thought to be of critical importance, or because the evidence, although recognized, was equivocal. Revisiting excavators' notebooks and correspondence can at times provide evidence not published at the time, as in the case of La Ferrassie,⁸⁷ Roc de Marsal,³⁷ and

Régourdou.⁸⁸ This is a very important task for the Shanidar Cave Project as much of the detailed observation by Ralph Solecki and his team remains unpublished but is present in notebooks and other records.

One of the issues to be considered in deciphering the stratigraphic and sedimentary context of human remains is that the starting point

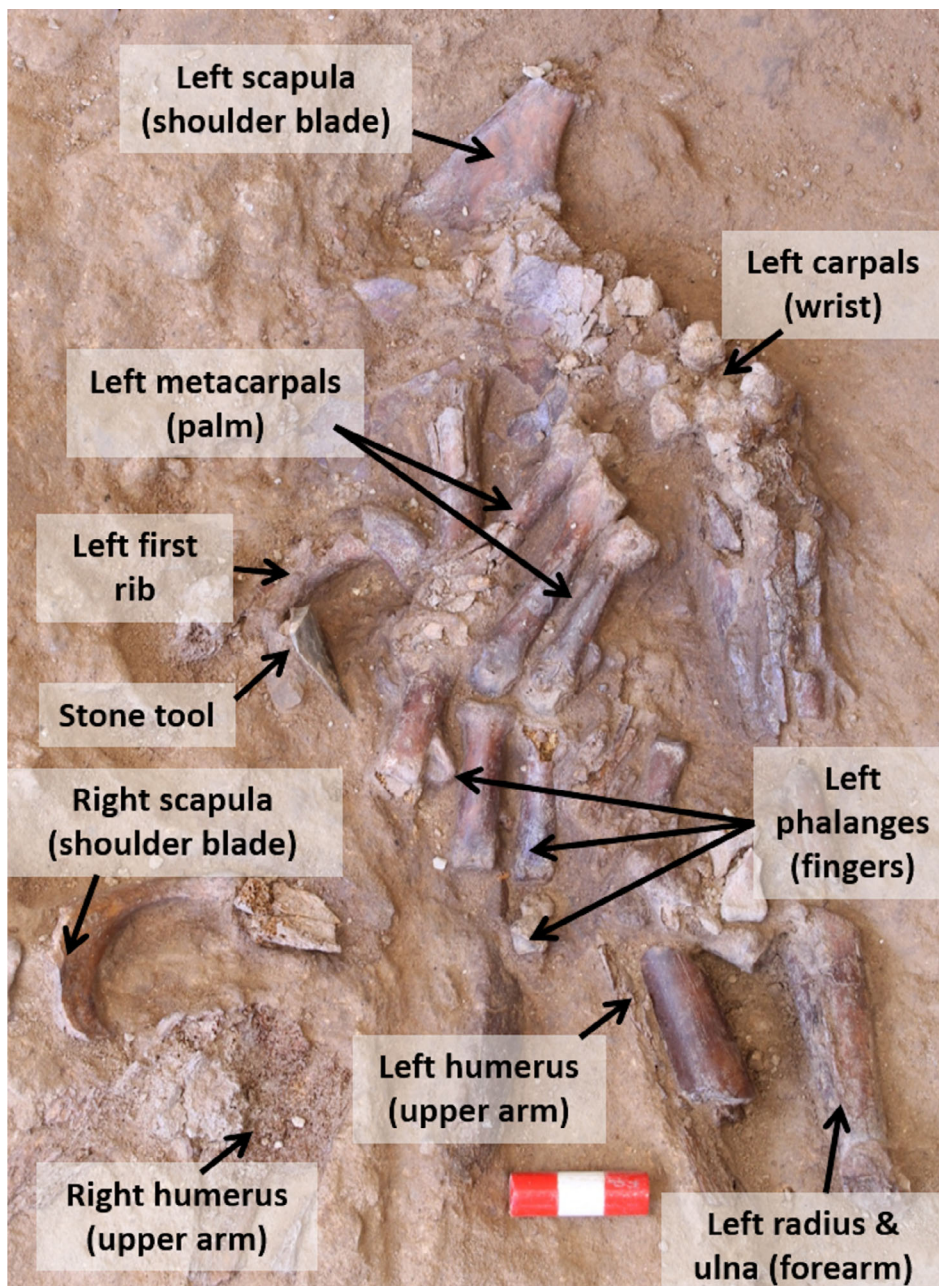


FIGURE 5 The articulated upper limbs of an adult Neanderthal excavated in Shanidar Cave in 2018, found adjacent to Solecki's Shanidar 4 (the "flower burial"), looking east. Scale: 3 cm (photograph: Graeme Barker) [Color figure can be viewed at wileyonlinelibrary.com]

cannot be assumed to be uniform. Recent human populations, both living and ethnographic, as well as some animal species display an extraordinary array of mortuary activity and resting places for the dead, as discussed above. Importantly, the state of the body, and the presence and durability of any wrapping or container, will impact considerably on the nature and action of sedimentary and diagenetic processes during and following disposal of a body, and there is a wealth of forensic evidence to draw from in addition to geoarchaeological analyses.

The details of stratification and sediment fabric (patterns of clast and fabric orientation, sorting and grading, and patterns of dissolution and mineral deposition around the individual) are of critical importance (cf. References 35, 89, and 90). The particular repose of a body is likely to conform to the surface on which it comes to rest unless in *rigor mortis* or constrained in a bundle and buried rapidly, or otherwise

laid out deliberately. The shape of the lower bounding surface and whether it cuts preexisting features may provide evidence for whether it was a natural phenomenon or anthropogenically modified in some way (e.g., Reference 36). In modern forensic cases, tool marks may occasionally survive in a cut grave,²¹ but these are rarely identified in older burials, even of comparatively recent date. In the Paleolithic, tools for excavation were probably rudimentary and not particularly effective in anything other than the softest and least consolidated of sediments or soils, so purposeful excavations are unlikely to have been very deep or very regular.

It is likely that available natural locations, for example, karstic cavities and gullies, will have been exploited by Neanderthals as locations for the disposal of their dead.^{19,22} In this scenario, bodies may have been intentionally covered, partially or completely, with sediment or

with less durable materials such as branches or brush, or skins, for example, to deter scavengers. It is, however, also likely that, during inclement conditions or if unwell, individuals may have taken refuge in sheltered gullies or karstic cavities, where they may have died and become covered by naturally accumulating sediments.^{17,18} Only by extremely careful micromorphological, sedimentological, and taphonomical analyses might we distinguish between these scenarios, but it must be borne in mind that sedimentary processes in caves are often dominated by dry (or wet) mass flows very similar to those that might occur through purposeful infilling of a cavity. Characteristic sedimentary structures and fabrics are associated with different natural and anthropogenically mediated processes of cave sediment deposition. Sedimentation in caves can be extremely variable, but sedimentary features typical of running water, mudflow, dry grain flow and fall are all common (e.g.,^{92–95}). Most of these are identifiable macroscopically, but far more may be evident through microscopic examination of sediment sample thin sections. Some may overlap with the processes operating in the infilling of graves, but the purposeful infilling of a cavity such as a grave can sometimes lead to characteristic stratification and fabric (e.g., Reference 89; Figure 6).

Postdepositional processes may provide evidence for the state of the body when it came to rest. Sediments that accumulated or were placed over and against the body may be displaced during putrefactive swelling, and then collapse into voids left by decay of soft tissues.⁸⁶ The presence of large quantities of decaying organic matter and leaking body fluids can lead to localized calcification⁸⁹ and the formation of the secondary phosphatic mineral apatite through the phosphatization of bone⁹⁸ (Figure 7). These indicators will not necessarily be present in the case of previously skeletonized or desiccated remains. Layering may be disrupted physically—predators may dig out parts of buried bodies, while plant roots and burrowing animals may favor and thus disrupt the relatively unconsolidated sediments in grave fills.¹⁸ Diagenesis, particularly in the presence of groundwater, which may precipitate or dissolve minerals, may modify sediments and can disrupt or overprint stratification, as was the case for many of the Qafzeh individuals,⁹⁹ and even destroy bone, as in the case of lower limbs of Kebara 2.¹⁰⁰ Diagenetic shrinkage/compaction is particularly marked in semi-arid and tropical environments—in some caves in these locations sediments may lose a significant part of their volume during diagenesis, with consequent disruption of stratigraphy.

5 | ECOLOGY AND AFFORDANCES

Although long regarded as a cold-adapted taxon, there is increasing evidence that Neanderthals occupied a broad ecological range characterized by a temperate climate with warm to cool temperatures and open or woodland vegetation, and that they preferred regions with high topographic diversity and moderate slopes.^{4,101–104} This ecological range was part of their niche, that is, it contained the environmental affordances of water, food, materials, and shelter required to sustain Neanderthal groups. Within their ecological range, Neanderthals' foraging lifeways likely relied on mobility not only to access food

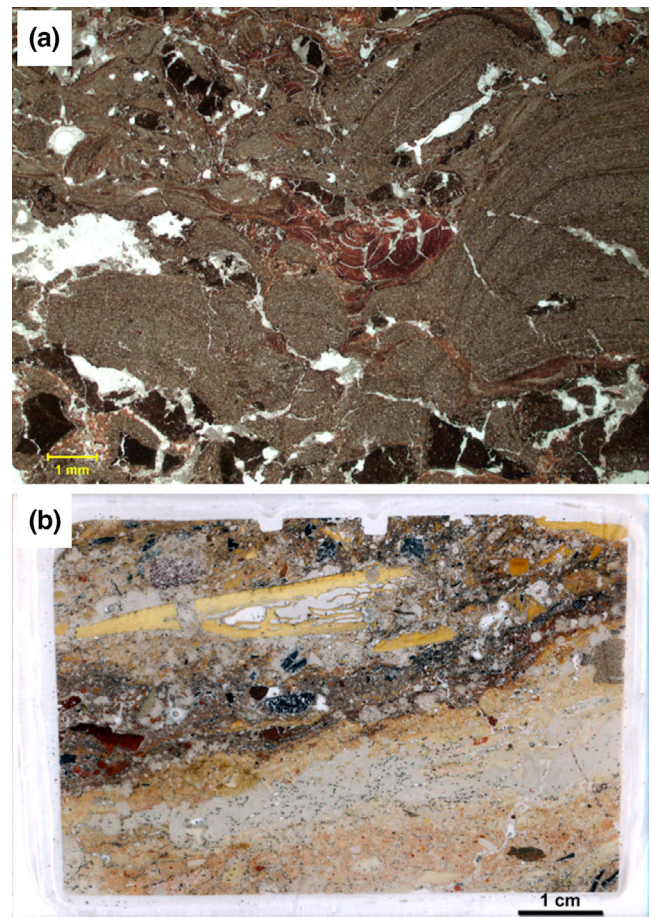


FIGURE 6 Photomicrographs of natural and anthropogenic sediments. (a) Contorted finely laminated silts and clay from Archeological Stratum 12 at Wonderwerk Cave, South Africa.⁹⁶ These waterlain deposits predate the occupation of the cave and are linked to phreatic processes of the cave system. Plane-polarized light (PPL); scale is 1 mm. (b) Thin section scan of bedded cultural material from Sibudu Cave⁹⁷ consisting, at the base, of pinkish brown angular crushed bone in a matrix of phosphatized ashes that were likely redistributed by sweeping or raking out of ashes; these are overlain by a whiter banded lens of gypsum. The upper half of the slide is a charcoal-rich layer with some burnt fibrous organic material and appears to represent a trampled in situ hearth, which is shown by a large (cm sized) bone that has been snapped in place. PPL; scale is 1 cm. (images: Paul Goldberg) [Color figure can be viewed at wileyonlinelibrary.com]

and materials but also for information gathering and social networking as a means of countering risk. These activities must have depended on both their spatial cognition and the “legibility” of the landscapes that they traversed.¹ Legibility is a concept drawn from geography¹⁰⁵ that captures spatial coherence of the landscape and the availability of navigational aids, both physical and sociocultural (places imbued with special and persistent significance from past shared experiences). Many caves in Italy may have held such special significance for Late Upper Paleolithic and Mesolithic hunter-gatherer populations.¹⁰⁶ Arene Candide, for example, was used both for occupation and for burial, the latter on repeated occasions with skeletal parts being

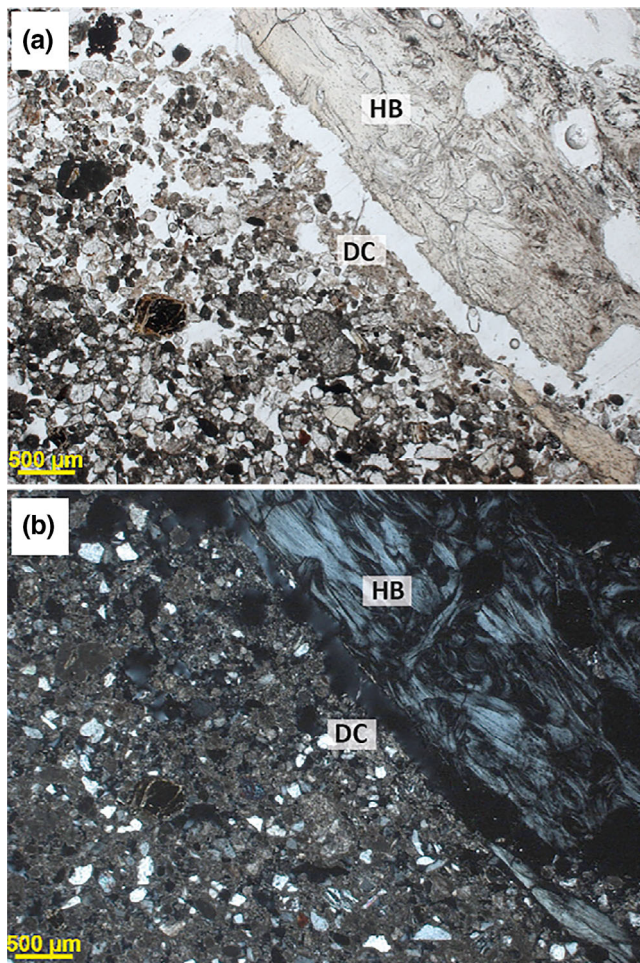


FIGURE 7 Photomicrograph of a micromorphological thin section of a human cranium and surrounding sediments from a late pre-Islamic burial in the United Arab Emirates, in plane polarized light (a) and cross polarized light (b). The grave pit was dug into bedded deposits in a Wadi; the grave-pit fill consists of sedimentary components identical to those of the Wadi deposits but lacks clear bedding structures. The fill exhibits a more porous microstructure and contains fragments of reworked bedded sediments (i.e., slaking crusts). Kutterer et al.⁹⁰ argue that decalcification (DC) of the grave pit fill directly adjacent to the human cranium (HB) was caused by decomposition of the body following burial (image: Christopher E. Miller) [Color figure can be viewed at wileyonlinelibrary.com]

displaced by subsequent interments.^{107,108} Did prominent places in the landscape have similar roles for Neanderthals, and was Shanidar Cave one of them? The cave is located on the edge of a steep gorge, surrounded by prominent rocky escarpments, under a distinct ridge that could have acted as a navigation beacon. A history of occupation would have added cultural significance to the visual salience of the site, creating a sense of place that could have been transmitted intergenerationally.

From the analysis of the faunal material excavated by Solecki¹⁰⁹ and the initial results of the new project's studies of environmental proxies including macrofauna, microfauna, mollusks, pollen and plant macrofossils, it would appear that Shanidar Cave had, when the

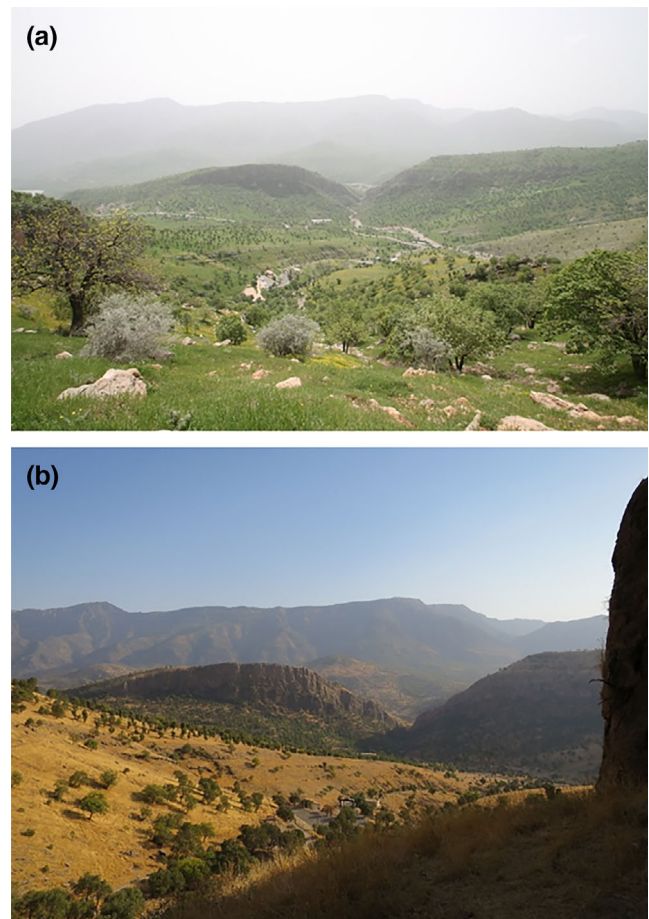


FIGURE 8 Views south from Shanidar cave: (a) in early spring; (b) in late summer (photographs: Graeme Barker) [Color figure can be viewed at wileyonlinelibrary.com]

Neanderthals were there in MIS 5–3, a climatic range not dissimilar to that of today. It is also located in a topographically diverse region in addition to providing animal and plant resources. There is a perennial spring today in the valley above the cave, and a water seep at the back of the cave where footprints observed during the new excavations indicate that animals such as wolves, hyenas, foxes, and ibex still come to drink, suggesting that water could have been locally available in the past. As well as providing spectacular views southwards down to the valley of the Greater Zab River and the mountain range beyond (Figure 8), the cave provides shelter from the hot summer sun, from rain and strong winds, and could also have provided a locality defensible against large predators, as it did for transhumant pastoralists in Solecki's time (see below).

Of course, there can be no presumption of continuity in the cave's function during successive occupations. Neanderthals may have used Shanidar Cave as a base for shelter and foraging, as a temporary stopping place and possibly as a place to shelter the dead and dying; and indeed there are indicators of differences in the pattern of occupation of the cave at different times that do not seem to be explicable simply as adaptations to different climatic regimes (though the paleoclimate data are still very coarse). The Shanidar 5 remains were

located above a thin archeological layer suggesting sporadic occupation and/or use of the cave as represented by sparse deposits of lithics, butchered bone and burnt plant remains. Hearths excavated in 2018 and 2019 within this layer and layers underneath it appear to have been short-lived fire features, based on their size and thickness, similar to those characterizing the overlying Baradostian (anatomically modern human) layers dating to MIS 3. In contrast, the new skeletal remains, found adjacent to the location of Solecki's "Flower Burial" and c. 3 m below Shanidar 5, were within a thick series of charcoal-rich occupation layers with far denser quantities of archeological material but without visible hearths. Solecki noted similar differences within the Neanderthal layers that he excavated.¹¹⁰

6 | LANDSCAPES AND "DEATHSCAPES": NEANDERTHAL "PERSISTENT PLACES"?

Neanderthal use of space in the case of Shanidar Cave can be conceptualized at three distinct scales: the space within the cave used in daily lives and mortuary activity; the landscape around the cave within several hours' walk that we presume would have been the main setting for their daily subsistence activities; and the wider landscape in which they moved (Figure 9).

At the local scale, the very constrained siting and extent of the excavation currently precludes the sort of spatial analysis that has been undertaken at sites like Molodova I, Ukraine,¹¹¹ and Grotte du Renne in France,¹¹² where simple "enclosures" of loosely cleared stones may denote the development of behavior controlling and marking

space immediately around and within reach of an individual's body. The earliest example of this is the extraordinary structure of broken stalagmite deep in Bruniquel Cave in southwest France dated to c. 175 ka.¹¹³ Such structures perhaps denote personal behavioral rituals implied by the parallel development of evidence for the symbolic decoration of the body, for example, bivalve shells to contain ochre pigment at Cueva Aviones, Spain, dating to 115–120 kya,¹⁵ eagle talons at Krapina, Rio Secco, Les Fieux and Grotte Mandrin,¹¹⁴ black raptor and corvid feathers in Gibraltar (based on cut marks on wing bones),⁹ marine shells with ochre at Grotta di Fumane, Italy, dating to before 45 kya and the manganese pigment crayons at many Middle Paleolithic sites in France.^{11,115} In the case of Shanidar Cave, it remains striking that most of the bodies or body parts seem to have been cached or placed in close proximity to each other in the center of the cave, in natural cavities and shelters afforded by massive boulders derived from the major fault that dissects the cave's ceiling above the Solecki trench. Whilst it could be argued that this clustering is a product of excavation bias, it is also the case that the "rockfall landscape" at the center of the cave provided natural niches that were utilized repeatedly for the disposal/treatment of dead individuals.

There are ethnographic examples of "deathscapes" or "necrosapes" in which certain locations are seen as appropriate for funerary use either by association with another burial or because the landform has special meaning.^{42,116} It is clearly risky to transfer concepts like these to the Paleolithic, and indeed to a different hominin taxa, but the unique assemblage of the 10 known individuals in Shanidar Cave, and especially the Shanidar 4 "cluster" or "stack," does invite such transference, particularly given that the systematic

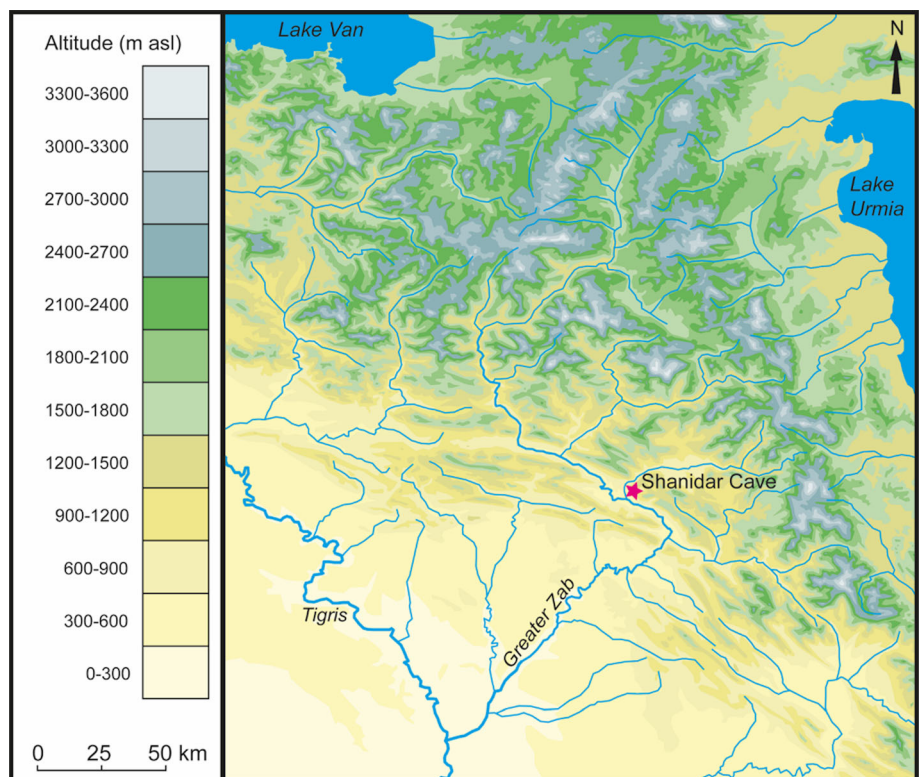


FIGURE 9 The wider landscape connectivities of Shanidar Cave (illustration: Chris Hunt) [Color figure can be viewed at wileyonlinelibrary.com]

disposal of the dead occurred in the much older Sima de los Huesos,⁷⁸ and the cluster of Neanderthal individuals at Amud, Israel, or the Middle Paleolithic *H. sapiens* burials at Qafzeh¹¹⁷ may also reflect the status of the sites as a place for burial or disposal of the dead.⁵⁹ For Neanderthals and modern humans alike, some caves seem to have been places where the dead was cached. Although the “specialness” of caves in this respect may be mostly a taphonomic artifact of the nonsurvival of remains placed elsewhere in the landscape, it is important to note that the *meanings* associated with placing the dead in caves may have differed enormously over time, including within the Neanderthal realm. In the case of Shanidar Cave, preliminary results from the optically-stimulated luminescence (OSL) and ¹⁴C dating program of the new project indicate that Neanderthals placed bodies, or parts of bodies, in the cave in fits and starts over a period of at least 20,000 years, from c. 70 kya to c. 50 kya, a period probably representing at least 1,000 Neanderthal generations, making it highly unlikely that, as with the “domestic” use of the cave, there was any consistent “burial tradition” or way(s) of treating the dead.

At the intermediate scale, most hunting and lithic provisioning for Neanderthals using the cave might be expected to have occurred within a catchment with a radius of 15 km or so. Lithic resources appear to be extremely sparse locally, with occasional chert and metamorphic cobbles within the gravels of the Greater Zab some 2 km from the cave. At the landscape scale (Figure 9), the Greater Zab River flows southwestward to the Tigris and the great plains of Iraq and to the northeast drains a structural depression that runs over 150 km along the front of the Anatolian Mountains to Zakho, with tributary river valleys draining the Zagros and eastern Anatolia. Immediately west of the small valley in which Shanidar Cave is situated, a tributary gorge runs northeastward through the Baradost Mountains into a parallel structural depression, with tributaries running northward and eastward to pass through the High Zagros on the Turkish and Iranian borders. The cave is visible from the Greater Zab valley and in Solecki's time was a prominent waymark and stopover location for transhumant shepherd communities who wintered in the cave and spent the summer months in the High Zagros. Though they have no access today to the grazing within the Shanidar Cave Reserve, transhumant pastoralists still winter in the Greater Zab valley near the cave and move their flocks on foot through the gorge on their way to the High Zagros in the spring.

Presumably there was similar seasonal variability in grazing when Neanderthals visited the cave during climatic regimes similar to today's, but it is an open question whether, in response to similar seasonal fluctuations, the major prey species (e.g., ibex and other ungulates) moved short distances between the Greater Zab and the Baradost Mountains, making them accessible within a day's walk for Neanderthals using the cave, or whether they moved more extensively into the High Zagros in summer requiring Neanderthals to undertake more extensive trips to new hunting ranges if they wanted to hunt these animals in summer. Analysis of seasonal occupation indicators and associated activity evidence at Shanidar Cave such as seasonality of faunal exploitation and lithic sourcing may help to clarify the scale of the landscape connectivities in which the Shanidar Neanderthals were enmeshed.

7 | CONCLUSIONS

Four key conclusions emerge from the above discussion. First, the Neanderthals should not be thought of as a monolithic entity: they had a geographical range that extended from Spain to Siberia and from Wales to the southern parts of western Asia and were around as a lineage for over 300,000 years, during which time they adapted to glacial and interglacial conditions and are known to have evolved physically and interbred with other taxa.^{6–8} They also evolved culturally, and indeed there are significant differences between stone tool assemblages made early and those made toward the end of their chronological range, as well as evidence for rapid changes in lithic technology in response to climate fluctuations, for instance in some French cave sequences.^{102,118} There are also spatial variations in lithic assemblages. Across this immense span of time and space it is inconceivable that adaptations and behaviors were identical. It is extremely unlikely that mortuary behaviors, as a subset of cultural activity, were uniform in time and space.

Second, it is clear that mortuary behavior has a deep history in hominins and other organisms. It should therefore not be surprising that at times there are indications that Neanderthals are associated with activities relating to the dead that might be termed funerary. The archeological record indicates that this behavior was highly variable and includes cannibalism, the use of human bone for toolmaking, and inhumations.

Third, it is misguided to look for “modern human behavior” in Neanderthals, or indeed in earlier representatives of our own taxon. The use of rigid criteria based on more recent modern human analogies to identify burial or other mortuary activity is likely unhelpful,^{22,70} as it fails to allow for potential differences in the ways in which hominins expressed mortuary behavior. We should definitely not be forcing any expectations of a “progressive” typology ranging from mortuary to funerary behavior on to what they did. It is better to examine what Neanderthals and other hominins did, where and when, with the utmost rigor and with as few preconceptions as possible, and to try to identify what factors stimulated particular behaviors.

Finally, it is possible, and indeed likely, that many apparent differences between the archeology of Neanderthals and that of more recent *H. sapiens* may be taphonomic in nature rather than reflecting contrasting behaviors. We are removed from them by the immense geomorphic disruption of the Last Glacial Maximum and by the loss through decay of all but the most durable physical components of their equipment and culture. The surprise is that anything should survive of their intimate lives and deaths and the challenge is to recover as much from the archeological record as we can.

ACKNOWLEDGMENTS

This study derives from a workshop funded by the Wenner-Gren Foundation for Anthropological Research (Grant number CONF-788) on the theme “Neanderthal Notions of Death and its Aftermath: The Contribution of New Data from Shanidar Cave” held at the McDonald Institute for Archaeological Research at the University of Cambridge, UK, in January 2019. G. B. and E. P. would like to thank in particular

the Wenner-Gren Foundation for Anthropological Research for funding the Cambridge workshop; the McDonald Institute for Archaeological Research, University of Cambridge, for hosting it; and St John's College Cambridge and Magdalene College Cambridge for accommodating most of the speakers. The new excavations at Shanidar Cave, directed by G. B., C. O. H., and T. R., are with the permission of the Kurdistan General Directorate of Antiquities, are undertaken in collaboration with the Directorate of Antiquities (Soran Province), and have been funded by the Leverhulme Trust (Research Grant RPG-2013-105), the Rust Family Foundation, the British Academy, the Society of Antiquaries, the McDonald Institute of Archaeological Research and the Natural Environment Research Council's Oxford Radiocarbon Dating Facility (grant NF/2016/2/14), all of whose support is gratefully acknowledged. A Leverhulme Trust Early Career Fellowship awarded to Ceren Kabukcu (ECF-2017-284) has enabled the archeobotanical analysis of the Shanidar Cave materials. Nohemi Sala's research is supported by the Ministerio de Ciencia e Innovación (PGC2018-093925-B-C33 MCI/AEI/FEDER, UE project and contract IJCI-2017-32804), Chris Stringer's research is supported by the Calleva Foundation and the Human Origins Research Fund, and Emily Tilby's research is supported by the Natural Environment Research Council (grant number NE/L002507/1). We would like to thank four reviewers for their detailed and helpful comments on the manuscript. This study is dedicated to the memory of Ralph Solecki, who sadly died in March 2019 aged 101 and who was an enthusiastic and generous supporter of the new work.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ORCID

Emma Pomeroy  <https://orcid.org/0000-0001-6251-2165>

REFERENCES

- [1] Burke A. 2012. Spatial abilities, cognition and the pattern of Neanderthal and modern human dispersals. *Quat Int* 247:230–235.
- [2] Ponce de León MS, Bienvenu T, Akazawa T, Zollikofer C. 2016. Brain development is similar in Neanderthals and modern humans. *Curr Biol* 26(14):R665–R666.
- [3] Gunz P, Neubauer S, Maureille B, Hublin J-J. 2010. Brain development after birth differs between Neanderthals and modern humans. *Curr Biol* 20(21):R921–R922.
- [4] Roebroeks W, Soressi M. 2016. Neanderthals revised. *Proc Natl Acad Sci USA* 113(23):6372–6379.
- [5] Wynn T, Overmann KA, Coolidge FL. 2016. The false dichotomy: a refutation of the Neanderthal indistinguishability claim. *J Anthropol Sci* 94:1–22.
- [6] Fu Q, Hajdinjak M, Moldovan OT, et al. 2015. An early modern human from Romania with a recent Neanderthal ancestor. *Nature* 524:216–219.
- [7] Green RE, Krause J, Briggs AW, et al. 2010. A draft sequence of the Neanderthal genome. *Science* 328(5979):710–722.
- [8] Kuhlwilm M, Gronau I, Hubisz MJ, et al. 2016. Ancient gene flow from early modern humans into Eastern Neanderthals. *Nature* 530(7591):429–433.
- [9] Finlayson C, Brown K, Blasco R, et al. 2012. Birds of a feather: Neanderthal exploitation of raptors and corvids. *PLoS One* 7(9):e45927.

- [10] Hoffmann DL, Standish CD, García-Diez M, et al. 2018. U-Th dating of carbonate crusts reveals Neanderthal origin of Iberian cave art. *Science* 359(6378):912–915.
- [11] Peresani M, Vanhaeren M, Quaggiotto E, Queffelec A, d'Errico F. 2013. An ochred fossil marine shell from the Mousterian of Fumane Cave, Italy. *PLoS One* 8(7):e68572.
- [12] Rodríguez-Vidal J, d'Errico F, Giles Pacheco F, et al. 2014. A rock engraving made by Neanderthals in Gibraltar. *Proc Natl Acad Sci USA* 111(37):13301–13306.
- [13] Roebroeks W, Sier MJ, Kellberg Nielsen T, et al. 2012. Use of red ochre by early Neanderthals. *Proc Natl Acad Sci USA* 109(6):1889–1894.
- [14] Stringer CB, Finlayson C, Barton RNE, et al. 2008. Neanderthal exploitation of marine mammals in Gibraltar. *Proc Natl Acad Sci USA* 105(38):14319–14324.
- [15] Zilhão J, Angelucci DE, Badal-García E, et al. 2010. Symbolic use of marine shells and mineral pigments by Iberian Neanderthals. *Proc Natl Acad Sci USA* 107(3):1023–1028.
- [16] Chase PG, Dibble HL. 1987. Middle Paleolithic symbolism: A review of current evidence and interpretations. *J Anthropol Archaeol* 6(3):263–296.
- [17] Gargett RH. 1989. Grave shortcomings: The evidence for Neanderthal burial. *Curr Anthropol* 30(2):157–190.
- [18] Gargett RH. 1999. Middle Palaeolithic burial is not a dead issue: The view from Qafzeh, Saint-Césaire, Kebara, Amud, and Dederiyeh. *J Hum Evol* 37(1):27–90.
- [19] Pettitt P. 2002. The Neanderthal dead: Exploring mortuary variability in Middle Palaeolithic Eurasia. *Before Farming* 2002(1):1–26.
- [20] Pettitt P. 2011. *The Palaeolithic origins of human burial*, London: Routledge.
- [21] Vandermeersch B, Cleyet-Merle JJ, Jaubert J, Maureille B, Turq A. 2008. Première humanité: gestes funéraires des néandertaliens. Paris et Les Eyzies-de-Tayac: Réunion des Musées Nationaux; Musée National de Préhistoire.
- [22] Hovers E, Belfer-Cohen A. 2013. Insights into early mortuary practices of *Homo*. In: Nilsson Stutz L, Tarlow S, editors. *The Oxford Handbook of the Archaeology of Death and Burial*: Oxford University Press. p 631–642.
- [23] Solecki RS. 1971. *Shanidar: The first flower people*. New York: Alfred A. Knopf Inc.
- [24] Solecki RS. 1972. *Shanidar: The humanity of Neanderthal man*, London: Penguin Press.
- [25] Trinkaus E. 1983. *The Shanidar Neanderthals*, New York, NY: Academic Press.
- [26] Cowgill LW, Trinkaus E, Zeder MA. 2007. Shanidar 10: A middle Paleolithic immature distal lower limb from Shanidar Cave, Iraqi Kurdistan. *J Hum Evol* 53(2):213–223.
- [27] Leroi-Gourhan A. 1975. The flowers found with Shanidar IV, a Neanderthal burial in Iraq. *Science* 190(4214):562–564.
- [28] Solecki RS. 1975. Shanidar IV, a Neanderthal flower burial in Northern Iraq. *Science* 190(4217):880–881.
- [29] Defleur A, White T, Valensi P, Slimak L, Crégut-Bonnoure É. 1999. Neanderthal cannibalism at Moula-Guercy, Ardèche, France. *Science* 286(5437):128–131.
- [30] Rougier H, Crevecoeur I, Beauval C, et al. 2016. Neanderthal cannibalism and Neanderthal bones used as tools in Northern Europe. *Sci Rep* 6:29005.
- [31] Trinkaus E. 1985. Cannibalism and burial at Krapina. *J Hum Evol* 14(2):203–216.
- [32] Dibble HL, Aldeias V, Goldberg P, McPherron SP, Sandgathe D, Steele TE. 2015. A critical look at evidence from La Chapelle-aux-Saints supporting an intentional Neanderthal burial. *J Archaeol Sci* 53:649–657.
- [33] Hovers E, Kimbel WH, Rak Y. 2000. The Amud 7 skeleton—still a burial. Response to Gargett. *J Hum Evol* 39(2):253–260.

- [34] Gargett RH. 2000. A response to Hovers, Kimbel and Rak's argument for the purposeful burial of Amud 7. *J Hum Evol* 39(2): 261–266.
- [35] Goldberg P, Aldeias V, Dibble H, McPherron S, Sandgathe D, Turq A. 2017. Testing the Roc de Marsal Neandertal "burial" with geoarchaeology. *Archaeol Anthropol Sci* 9(6):1005–1015.
- [36] Rendu W, Beauval C, Crevecoeur I, et al. 2014. Evidence supporting an intentional Neandertal burial at La Chapelle-aux-Saints. *Proc Natl Acad Sci USA* 111(1):81–86.
- [37] Sandgathe DM, Dibble HL, Goldberg P, McPherron SP. 2011. The Roc de Marsal Neandertal child: a reassessment of its status as a deliberate burial. *J Hum Evol* 61(3):243–253.
- [38] Rendu W, Beauval C, Crèvecoeur I, et al. 2016. Let the dead speak... Comments on Dibble et al's reply to "Evidence supporting an intentional burial at La Chapelle-aux-Saints". *J Archaeol Sci* 69:12–20.
- [39] McCown TD, Keith A. 1939. The stone age of Mount Carmel. In: *The fossil human remains from the Levallois-Mousterian*. vol 2, New York, NY: AMS Press.
- [40] Vandermeersch B. 1970. Une sépulture moustérienne avec offrandes découverte dans la grotte de Qafzeh. *C R Acad Sci Serie D* 270:298–301.
- [41] Reynolds T, Boismier W, Farr L, Hunt CO, Abdulmutalib D, Barker G. 2015. New investigations at Shanidar Cave, Iraqi Kurdistan. *Antiquity* 348: Project Gallery. Available online at <http://antiquity.ac.uk/projgall/barker348> (accessed January 11, 2017).
- [42] Reynolds T, Boismier W, Farr L, Hunt CO, Abdulmutalib D, Barker G. 2016. New investigations at Shanidar Cave, Iraqi Kurdistan. *Kopaniak K, MacGinnis J, editors. The archaeology of the Kurdistan region of Iraq and adjacent regions*, Oxford: Archaeopress. p 357–350.
- [43] Pomeroy E, Mirazón Lahr M, Crivellaro F, et al. 2017. Newly discovered Neanderthal remains from Shanidar cave, Iraqi Kurdistan, and their attribution to Shanidar 5. *J Hum Evol* 111:102–118.
- [44] Pomeroy E, Bennett P, Hunt CO, et al. 2020. New Neanderthal remains associated with the "flower burial" at Shanidar cave. *Antiquity* 94(373):11–26. <http://dx.doi.org/10.15184/aqy.2019.207>.
- [45] Anderson JR, Biro D, Pettitt P. 2018. Evolutionary thanatology. *Philos Trans R Soc Lond B Biol Sci* 373:20170262.
- [46] Pettitt P. 2018. Hominin evolutionary thanatology from the mortuary to funerary realm: The palaeoanthropological bridge between chemistry and culture. *Philos Trans R Soc Lond B Biol Sci* 373: 20180212.
- [47] McComb K, Baker L, Moss C. 2006. African elephants show high levels of interest in the skulls and ivory of their own species. *Biol Lett* 2(1):26–28.
- [48] Chouvenec T, Robert A, Sémon E, Bordereau C. 2012. Burial behaviour by dealates of the termite *Pseudacanthotermes spiniger* (Termitidae, Macrotermitinae) induced by chemical signals from termite corpses. *Insectes Sociaux* 59(1):119–125.
- [49] Gonçalves A, Carvalho S. 2019. Death among primates: a critical review of non-human interactions towards their dead and dying. *Biol Rev* 94(4):1502–1529. <https://doi.org/10.1111/brv.12512>.
- [50] Fashing PJ, Nguyen N. 2011. Behavior towards the dying, diseased, and disabled among animals and its relevance to paleopathology. *Int J Paleopathol* 1:127–128.
- [51] Dirks PHGM, Berger LR, Roberts EM, et al. 2015. Geological and taphonomic context for the new hominin species *Homo naledi* from the Dinaledi Chamber, South Africa. *eLife* 4:e09561.
- [52] Carbonell E, Mosquera M, Ollé A, et al. 2003. Les premiers comportements funéraires auraient-ils pris place à Atapuerca, il y a 350000 ans? *L'Anthropologie* 107:1–14.
- [53] Hovers E, Belfer-Cohen A. 2018. Burials, Paleolithic Callan. In: *Hillary editor. The International Encyclopedia of Anthropology*. Hoboken, New Jersey: Wiley Blackwell. <https://doi.org/10.1002/9781118924396.wbiea2010>.
- [54] Mussini C, Maureille B. 2012. Têtes coupées: données archéologiques et lignée néandertalienne. In: Boulestin B, Henry-Gambier D, editors. *Crânes trophées, crânes d'ancêtres et autres pratiques autour de la tête: problèmes d'interprétation en archéologie*. Actes de la table ronde pluridisciplinaire, Musée national de Préhistoire, Les Eyzies-de-Tayac (Dordogne, France), October 14–16, 2010, Oxford: British Archaeological Reports International Series 2145. p 47–52.
- [55] Riel-Salvatore J, Gravel-Miguel C. 2013. Upper Palaeolithic mortuary practices in Eurasia. In: Stutz LN, Tarlow S, editors. *The Oxford Handbook of the Archaeology of Death and Burial*. Oxford: Oxford University Press. p 303–346.
- [56] White TD. 1986. Cut marks on the Bodo cranium: a case of prehistoric defleshing. *Am J Phys Anthropol* 69(4):503–509.
- [57] Fernández-Jalvo Y, Díez JC, de Castro JMB, Carbonell E, Arsuaga JL. 1996. Evidence of early cannibalism. *Science* 271(5247):277–278.
- [58] Zilhão J, Trinkaus E. 2002. Social implications. In: Zilhão J, Trinkaus E, editors. *Portrait of the artist as a child: the Gravettian human skeleton from the Abrigo do Lagar Velho and its archaeological context*, Lisbon: Trabalhos de Arqueologia. p 519–541.
- [59] Hovers E, Rak Y, Lavi R, Kimbel WH. 1995. Hominid remains from Amud cave in the context of the Levantine Middle Paleolithic. *Paléorient* 21(2):47–61.
- [60] Bar-Yosef O, Vandermeersch B, Arensburg B, et al. 1986. New data on the origin of modern man in the Levant. *Curr Anthropol* 27(1): 63–64.
- [61] Akazawa T, Muhesen S, editors. 2002. *Neanderthal burials: excavations of the Dederiyeh Cave, Afrin, Syria*, Kyoto: Research Center for Japanese Studies.
- [62] Been E, Hovers E, Ekshtain R, et al. 2017. The first Neanderthal remains from an open-air middle Paleolithic site in the Levant. *Sci Rep* 7(1):2958.
- [63] Bello SM, Saladié P, Cáceres I, Rodríguez-Hidalgo A, Parfitt SA. 2015. Upper Palaeolithic ritualistic cannibalism at Gough's cave (Somerset, UK): the human remains from head to toe. *J Hum Evol* 82:170–189.
- [64] Bello SM, Wallduck R, Parfitt SA, Stringer CB. 2017. An upper Palaeolithic engraved human bone associated with ritualistic cannibalism. *PLoS One* 12:e0182127.
- [65] Saladié P, Rodríguez-Hidalgo A. 2017. Archaeological evidence for cannibalism in prehistoric Western Europe: From *Homo antecessor* to the bronze age. *J Archaeol Method Theory* 24(4):1034–1071.
- [66] Defleur AR, Desclaux E. 2019. Impact of the last interglacial climate change on ecosystems and Neanderthals' behavior at Baume Moula-Guercy, Ardèche, France. *J Arch Sci* 104:114–124.
- [67] Rodríguez J, Guillermo Z-R, Ana M. 2019. Does optimal foraging theory explain the behavior of the oldest human cannibals? *J Hum Evol* 131:228–239.
- [68] Knüsel CJ, Robb J. 2016. Funerary taphonomy: An overview of goals and methods. *J Archaeol Sci Rep* 10:655–673.
- [69] Duda H, Courtaud P, Crubezy É, Sellier P, Tillier A-M. 1990. L'Anthropologie «de terrain»: reconnaissance et interprétation des gestes funéraires. *Bull Mém Soc Anthropol Paris* 2(3–4):29–49.
- [70] Belfer-Cohen A, Hovers E. 1992. In the eye of the beholder: Mousterian and Natufian burials in the Levant. *Curr Anthropol* 33(4):463–471.
- [71] Stewart TD. 1977. The Neanderthal skeletal remains from Shanidar Cave, Iraq: A summary of findings to date. *Proc Am Philos Soc* 121(2):121–165.
- [72] Gómez-Olivencia A, Quam R, Sala N, Bardey M, Ohman J, Balzeau A. 2018. La Ferrassie 1: New perspectives on a "classic" Neandertal. *J Hum Evol* 117:13–32.
- [73] Kappelman J, Ketcham RA, Pearce S, et al. 2016. Perimortem fractures in Lucy suggest mortality from fall out of tall tree. *Nature* 537: 503–508.

- [74] Sala N, Pantoja-Pérez A, Arsuaga JL, Pablos A, Martínez I. 2016. The Sima de los Huesos crania: Analysis of the cranial breakage patterns. *J Archaeol Sci* 72:25–43.
- [75] Sala N, Arsuaga JL, Pantoja-Pérez A, et al. 2015. Lethal interpersonal violence in the Middle Pleistocene. *PLoS One* 10:e0126589.
- [76] Sala N, Arsuaga JL, Martínez I, Gracia-Téllez A. 2015. Breakage patterns in Sima de los Huesos (Atapuerca, Spain) hominin sample. *J Archaeol Sci* 55:113–121.
- [77] Johnson E. 1985. Current developments in bone technology. *Adv Archaeol Method Theory* 8:157–235.
- [78] Villa P, Mahieu E. 1991. Breakage patterns of human long bones. *J Hum Evol* 21(1):27–48.
- [79] Duda H. 2009. *The archaeology of the dead: lectures in archaeoethnology*. Translated by Anna Maria Cipriani and John Pearce, Oxford: Oxbow Books.
- [80] Pokines JT, Faillace K, Berger J, et al. 2018. The effects of repeated wet-dry cycles as a component of bone weathering. *J Archaeol Sci Rep* 17:433–441.
- [81] Tersigni MA. 2007. Frozen human bone: A microscopic investigation. *J Forensic Sci* 52(1):16–20.
- [82] Stutz AJ, Nilsson Stutz L. 2018. Burial and ritual. In: Trevathan W, editor. *The International Encyclopedia of Biological Anthropology*. Chichester, UK: Wiley Blackwell. <https://doi.org/10.1002/9781118584538.ieba0081>.
- [83] Booth T. 2017. The rot sets in: Low-powered microscopic investigation of taphonomic changes to bone microstructure and its application to funerary contexts. In: Erickson D, Thompson T, editors. *Human remains: another dimension*, New York, NY: Academic Press. p 7–28.
- [84] Hackett CJ. 1981. Microscopical focal destruction (tunnels) in exhumed human bones. *Med Sci Law* 21(4):243–265.
- [85] Hedges REM, Millard AR, Pike AWG. 1995. Measurements and relationships of diagenetic alteration of bone from three archaeological sites. *J Archaeol Sci* 22(2):201–209.
- [86] Kendall C, Eriksen AMH, Kontopoulos I, Collins MJ, Turner-Walker G. 2018. Diagenesis of archaeological bone and tooth. *Palaeogeogr Palaeoclimatol Palaeoecol* 491:21–37.
- [87] Maureille B, Van Peer P. 1998. Une donnée peu connue sur la sépulture du premier adulte de La Ferrassie (Savignac-de-Miremont, Dordogne). *Paléo* 10:291–301.
- [88] Maureille B, Holliday T, Royer A, et al. 2016. New data on the possible Neandertal burial at Régourdou (Montignac-sur-Vézère, Dordogne, France). In: Lauwers M, Zémour A, editors. *Qu'est-ce qu'une sépulture? Humanités et systèmes funéraires de la Préhistoire à nos jours. Actes des XXXVI rencontres internationales d'archéologie et d'histoire d'Antibes (October 13–15, 2015)*, Antibes: Éditions APDCA. p 175–191.
- [89] Karkanas P, Dabney MK, Smith RAK, Wright JC. 2012. The geoarchaeology of Mycenaean chamber tombs. *J Archaeol Sci* 39(8): 2722–2732.
- [90] Kutterer A, Overlaet B, Miller CE, Kutterer J, Jasim SA, Haerinck E. 2014. Late pre-Islamic burials at Mleiha, Emirate of Sharjah (UAE). *Arab Archaeol Epigraph* 25(2):175–185.
- [91] Ruffell A, McKinley J. 2008. *Geoforensics*, New York, NY: Wiley Inc.
- [92] Farrand WR. 1985. Rockshelter and cave sediments. In: Stein JK, Farrand WR, editors. *Archaeological sediments in context*, Orono, Maine: University of Maine at Orono. Center for the Study of Early Man. p 21–39.
- [93] Goldberg P. 2000. Micromorphology and site formation at Die Kelders Cave I, South Africa. *J Hum Evol* 38(1):43–90.
- [94] Goldberg P, Sherwood SC. 2006. Deciphering human prehistory through the geoarchaeological study of cave sediments. *Evol Anthropol* 15(1):20–36.
- [95] Hunt CO, Davison J, Inglis R, et al. 2010. Site formation processes in caves: The Holocene sediments of the Haua Fteah, Cyrenaica, Libya. *J Archaeol Sci* 37(7):1600–1611.
- [96] Goldberg P, Berna F, Chazan M. 2015. Deposition and diagenesis in the earlier stone age of Wonderwerk Cave, Excavation 1, South Africa. *Afr Archaeol Rev* 32:613–643.
- [97] Goldberg P, Miller CE, Schiegl S, et al. 2009. Bedding, hearths, and site maintenance in the Middle Stone Age of Sibudu Cave, KwaZulu-Natal, South Africa. *Archaeol Anthropol Sci* 1:95–122.
- [98] Karkanas P, Goldberg P. 2010. Phosphatic features. In: Stoops G, Marcelino V, Mees F, editors. *Interpretation of micromorphological features of soils and regoliths*, Amsterdam, The Netherlands: Elsevier. p 521–541.
- [99] Vandermeersch B. 2006. Ce que nous apprennent les premières sépultures. *C. R. Palevol* 5:161–167.
- [100] Arensburg B, Bar-Yosef O, Chech M, et al. 1985. Une sépulture néandertalienne dans la grotte de Kébara (Israël). *C R Acad Sci Paris* 300:227–230.
- [101] Burke A. 2004. The ecology of Neanderthals: Preface. *Int J Osteoarch* 14(3–4):155–161.
- [102] Mellars P. 1996. *The Neanderthal legacy*, Princeton, NJ: Princeton University Press.
- [103] Ochando J, Carrión JS, Blasco R, et al. 2019. Silvicolous Neanderthals in the far west: The mid-Pleistocene palaeoecological sequence of Bolomor cave (Valencia, Spain). *Quat Sci Rev* 217: 247–267.
- [104] Stewart JR, García-Rodríguez O, Knul MV, et al. 2019. Palaeoecological and genetic evidence for Neanderthal power locomotion as an adaptation to a woodland environment. *Quat Sci Rev* 217:210–215.
- [105] Golledge RG. 1999. *Wayfinding behaviour*, Baltimore, MD: Johns Hopkins University Press.
- [106] Skeates R. 2017. Mobility and place making in Late Pleistocene and Early Holocene Italy. *J Mediterr Archaeol* 30(2):167–188.
- [107] Formicola V, Pettitt P, Maggi R, Hedges R. 2005. Tempo and mode of formation of the Late Epigravettian necropolis of Arene Candide cave (Italy): direct radiocarbon evidence. *J Archaeol Sci* 32(11): 1598–1602.
- [108] Sparacello VS, Rossi S, Pettitt P, Roberts C, Riel-Salvatore J, Formicola V. 2018. New insights on final Epigravettian funerary behavior at Arene Candide Cave (Western Liguria, Italy). *J Anthropol Sci* 96:161–184.
- [109] Evins MA. 1982. The fauna from Shanidar Cave: Mousterian wild goat exploitation in northeastern Iraq. *Paléorient* 8(1):37–58.
- [110] Solecki RS. 1995. Johnson EMA, The cultural significance of the fire hearths in the Middle Palaeolithic of Shanidar Cave, Iraq. *Ancient Peoples and Landscapes*. Lubbock, Texas: Museum of Texas Tech University. p 51–63.
- [111] Demay L, Péan S, Patou-Mathis M. 2012. Mammoths used as food and building resources by Neanderthals: Zooarchaeological study applied to layer 4, Molodova I (Ukraine). *Quat Int* 276–277: 212–226.
- [112] Caron F, d'Errico F, Del Moral P, Santo F, Zilhão J. 2011. The reality of Neandertal symbolic behavior at the Grotte du Renne, Arcy-sur-Cure, France. *PLoS One*. 6(6):e21545.
- [113] Jaubert J, Verheyden S, Genty D, et al. 2016. Early Neandertal constructions deep in Bruniquel Cave in southwestern France. *Nature* 534:111–114.
- [114] Romandini M, Peresani M, Laroulandie V, et al. 2014. Convergent evidence of eagle talons used by late Neanderthals in Europe: a further assessment on symbolism. *PLoS One* 9(7):e101278.
- [115] Soressi M, D'Errico F. 2007. Pigments, gravures, parures: les comportements symboliques controversés de Néandertaliens. In: Vandermeersch B, Maureille B, editors. *Les Néandertaliens: Biologie et Cultures*, Paris: Édition CTHS. p 297–309.
- [116] Littleton J, Allen H. 2007. Hunter-gatherer burials and the creation of persistent places in southeastern Australia. *J Anthropol Archaeol* 26(2):283–298.

- [117] Vandermeersch B. 1981. *Les hommes fossiles de Qafzeh (Israël)*. Paris: Editions du Centre National de la Recherche Scientifique.
- [118] Gravina B, Discamps E. 2015. MTA-B or not to be? Recycled bifaces and shifting hunting strategies at Le Moustier and their implication for the late Middle Palaeolithic in southwestern France. *J Hum Evol* 84:83–98.

AUTHOR BIOGRAPHIES

Emma Pomeroy is Lecturer in the Evolution of Health, Diet, and Disease at the University of Cambridge and osteologist for the Shanidar Cave Project. Her research interests span Neanderthal morphology and behavior, the causes and contemporary health consequences of modern human variation, and environmental adaptation.

Chris O. Hunt is Professor in Cultural Paleoecology in the School of Biological and Environmental Sciences at Liverpool John Moores University, UK. He codirects the Shanidar Cave Project. He is a geoarchaeologist and archeopalynologist with research interests in the paleoecology of human–environment relationships, human interaction with and impact on landscapes, Quaternary landscape and environmental change, cave sedimentation, and pollen taphonomy.

Tim Reynolds received his PhD from the University of Cambridge (1988) for the investigation of Neanderthal technology and the transition to the Upper Paleolithic in Southwest France. He is currently a Senior Lecturer in Archeology at Birkbeck, University of London. His research interests include Neanderthal behavior, modern human origins, lithic technology, and landscape use. He has been a field director of excavations at the sites of Niah Cave, Malaysia, Haua Fteah, Libya, and is currently working in this capacity at Shanidar Cave, Iraqi Kurdistan.

Dishad Abdulmutalib is a heritage manager with the Directorate of Antiquities (Soran Province), Iraqi Kurdistan, and has been the Directorate's principal representative on the excavations at Shanidar Cave throughout the new work.

Eleni Asouti is a Reader in Environmental Archeology at the University of Liverpool. Her research focuses on the paleoecology of late Paleolithic societies, with emphasis on the transition from foraging to farming in the Eastern Mediterranean, and the impacts of climate and environmental change on prehistoric societies and landscape ecologies.

Paul Bennett is the Director of the Canterbury Archeological Trust, a Visiting Professor at Canterbury Christ Church University, and the head of mission of the Society for Libyan Studies. His research interest at Shanidar Cave relates to the development of cave stratigraphy and evidence for anthropogenic disturbance.

Marjolein Bosch is a zooarchaeologist, whose research focus lies in Paleolithic faunal assemblages and what we can learn from them about hominin biological and cultural adaptations. Her research aims to reconstruct past hunter-gatherer foraging behavior and its implications for hominin population dynamics and mobility.

Ariane Burke is a professor at the Université de Montréal, Canada and the director of the *Laboratoire d'Écomorphologie et de Paléanthropologie* and the Hominin Dispersals Research Group. Her

current research interests include studying the impact of global climate change on human population dynamics during the Last Glacial Maximum.

Lucy Farr was a postdoctoral research fellow in the Shanidar Cave Project 2014–2017 and now works as a field archeologist for the Cambridge Archeological Unit. Her research interests include cave geoarchaeology and human responses to Middle and Late Pleistocene environmental change.

Robert Foley is Professor in Human Evolution at the University of Cambridge. His long-term research interests have been in human evolution and in particular the ecological basis for patterns and processes of the evolution of human behavior. This has led to work covering social evolution, speciation and extinction in hominins, hunter-gatherer ecology, the origins of modern humans, and the application of evolutionary models to human evolution.

Charles French is Professor of Geoarchaeology and the Director of the McBurney Laboratory at the University of Cambridge. His research interests concern the recognition of human impact on landscapes, especially deforestation, agriculture, soil erosion, dewatering, and desertification through the micromorphological analysis of paleosols.

Amos Frumkin is a professor at the Hebrew University of Jerusalem, and the director of the Israel Cave Research Center. His interests include karst and cave morphology, cave sediments as indicators of paleoclimate, paleohydrology, and the development of karst aquifers, besides interests in geoarchaeology and ancient water supply systems using speleological evidence.

Paul Goldberg, a geologist by training, is a Visiting Research Professor at the Centre for Archeological Science, University of Wollongong and a Guest Professor at the Institute for Archeological Sciences, University of Tübingen. His main interests are in micromorphology and the formation of archeological sites.

Evan Hill is a postdoctoral researcher at Queens University Belfast for the Shanidar Cave Project. His research interests include human paleoecology, the use of mollusks as paleoenvironmental and climatic indicators, and experimental approaches for the use of terrestrial shells in radiocarbon dating and chronological modeling.

Ceren Kabukcu is a Leverhulme Early Career Fellow at the University of Liverpool, investigating archeobotanical remains from prehistoric sites in Northern Iraq (including Shanidar Cave) and Anatolia in order to research hunter-gatherer plant use and the deep roots of Neolithic crop domestication.

Marta Mirazón Lahr is Professor in Human Evolutionary Biology and the director of the Duckworth Collection at the University of Cambridge. Her interests cover diverse aspects of human evolution, from the study of morphological evolution in the genus *Homo*, to human evolutionary history and dispersals, evolutionary genetics and adaptation in hunter-gatherers, the formation of population boundaries, and the evolution of diversity in technology and tools.

Ross Lane is a project officer with the Canterbury Archeological Trust specializing in the application of archeological techniques. His research interests include the prehistoric landscape of the Trans-manche region, particularly the geographic, environmental, and social factors that led to the agglomeration of people and culture. He is also a senior field archeologist for the Shanidar Cave Project.

Curtis W. Marean received his PhD from the University of California at Berkeley in 1990. He is currently Foundation Professor and Associate Director of the Institute of Human Origins in the School of Human Evolution and Social Change at Arizona State University, and Honorary Professor at Nelson Mandela University, South Africa.

Bruno Maureille is a Director of Research at the French CNRS. His research interests include Neanderthal biological and behavioral evolution including funerary activities, and site functions. He is the osteological specialist or director of excavations at a number of French Mousterian sites including Les Pradelles and Régourdou.

Giuseppina Mutri is a Paleolithic archeologist specializing in raw material sourcing, technology, use-wear, and residue analyses on stone tools. After doctoral research in Rome, she held a Marie Curie postdoctoral fellowship as a visiting scholar at the McDonald Institute for Archeological Research in Cambridge working on lithic material from the Haua Fteah Cave, Libya, until in 2015 she was appointed as a postdoctoral research fellow in the “Hidden Foods” project based at Sapienza University Rome. She is also analyzing lithics from the Shanidar Cave Project for use wear and organic residues.

Christopher E. Miller is Professor of Geoarcheology at the University of Tübingen and holds an adjunct position at the University of Bergen, Norway. His research focuses on site formation processes, human–environment interactions, and hunter-gatherer settlement dynamics: interests that have led him to conduct fieldwork in Central Europe, Southern Africa, and South America.

Kaify Ali Mustafa is the Director General of the General Directorate of Antiquities for the Kurdish Regional Government in Iraq.

Andreas Nymark completed his doctoral studies with Tim Reynolds as part of the Shanidar Cave Project. He currently holds a research position at Birkbeck, University of London, where he is publishing the results of his PhD. His thesis focused on Middle Paleolithic lithic technology in the Zagros region in which Shanidar Cave is situated.

Paul Pettitt is Professor of Paleolithic Archeology at Durham University, UK. He specializes in the European Middle and Upper Paleolithic, with a specific interest in the evolution of hominin mortuary behaviors and visual culture.

Noheми Sala is a postdoctoral researcher at the CENIEH (Spain) and member of the Atapuerca Research Project. Her research is focused on aspects of geology and forensic-taphonomy with the goal of understanding the origin of the Pleistocene hominin fossil accumulations, especially at the Sima de los Huesos (Atapuerca) site.

Dennis Sandgathe is a Senior Lecturer in the Department of Archeology at Simon Fraser University. His primary interests are in the nature of Middle Paleolithic adaptations; the role that material culture played in these adaptations; how these adaptations and their associated lithic technologies changed over time; and how they differed between hominin species.

Chris Stringer is a Research Leader in Human Evolution at the Natural History Museum in London, where he studies the evolution of modern humans and their closest relatives, such as the Neanderthals. He collaborates widely with paleoanthropologists, archeologists, earth scientists, and geneticists in reconstructing recent human evolution.

Emily Tilby is an archeology PhD student in the Grahame Clark Laboratory for Zooarcheology at the University of Cambridge carrying out a PhD project focusing on the reconstruction of paleoclimates at Shanidar Cave using microfauna. Her research interests include paleoecology, microfaunal zooarcheology, and Neanderthal and modern human–environmental interactions.

Graeme Barker is Disney Professor of Archeology Emeritus at the University of Cambridge and Director of the Shanidar Cave Project. His research interests lie broadly in interactions between people and environment, particular foci being diachronic landscape histories, foraging-farming transitions, and Neanderthal and modern human behavioral adaptations and their responses to climate change.

How to cite this article: E Pomeroy, CO Hunt, T Reynolds, et al. Issues of theory and method in the analysis of Paleolithic mortuary behavior: A view from Shanidar Cave. *Evolutionary Anthropology*. 2020;29:263–279. <https://doi.org/10.1002/evan.21854>