

# Living and Dying in Mountain Landscapes: An Introduction

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**ABSTRACT** In this introduction to the thematic issue *Living and Dying in Mountain Landscapes*, we develop an analytical framework for the bioarchaeology and mortuary archaeology of highland landscapes. We highlight new theoretical, methodological, and comparative contributions to the anthropological study of upland spaces. Theoretical contributions include examining identity, connectivity, and adaptation from an explicitly biocultural perspective. By bridging the biological anthropological focus on the somatic with an archaeological focus on the long term, bioarchaeology allows for the development of an embodied understanding of “marginal” highland environments, investigating how such landscapes shape and are shaped by human action over time. Recent advances in bioarchaeological methods, including isotopic analyses of mobility and diet and ancient DNA studies of kinship and relatedness, are combined with traditional osteological examinations of age, sex, ancestry, and disease to reconstruct the lifeways of mountain communities. These methodological advances take advantage of the topographical, geological, and ecological diversity of mountain landscapes. Finally, a comparative bioarchaeology of upland and lowland communities across space and time provides a deeper understanding of highland adaptations and identities. The papers share a number of unifying themes, including the impact of mountain landscapes on channeling resource control, creating or mediating diverse identities, and the importance of interdisciplinary investigations for developing an understanding of the relationship between people and place. As this issue demonstrates, the study of human remains must be situated within a holistic bioarchaeological approach to life and death in order to understand the dynamic relationships between people and the highland environments they occupy.

*Keywords:* mountains; marginality; identity

En esta introducción a la cuestión temática 'Vivir y morir en paisajes de montaña' desarrollamos un marco analítico para la bioarqueología y la arqueología mortuoria de los paisajes serranos. Destacamos un conjunto de nuevas contribuciones teóricas, metodológicas, y comparativas al estudio antropológico de estos paisajes. Entre ellas destacan los análisis de la identidad, la conectividad y la adaptación, todos aproximados desde una perspectiva explícitamente biocultural. Al unir el énfasis bioantropológico en lo somático con el interés arqueológico en la larga duración, la bioarqueología favorece una aproximación corporizada a los ambientes “marginales” de las tierras altas, investigando cómo estos paisajes moldean y son moldeados por la acción humana a lo largo del tiempo. Los recientes avances en métodos bioarqueológicos, como los análisis isotópicos de movilidad y dieta o los estudios de ADN antiguo sobre parentesco y otros principios de existencia compartida, se combinan con los tradicionales exámenes osteológicos de edad, sexo, ascendencia y enfermedad para reconstruir las formas de vida de las comunidades de montaña. Estos avances metodológicos aprovechan la

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diversidad topográfica, geológica y ecológica de los entornos serranos. Finalmente, una comprensión más profunda de las adaptaciones e identidades de las serranías requiere de una aproximación bioarqueológica comparativa de las comunidades serranas y de las que habitan las tierras bajas a través del tiempo y del espacio. Todos estos trabajos comparten una serie de temas comunes: la manera en la que los paisajes de montaña canalizan las formas de control de los recursos, la creación o mediación de distintas identidades y la importancia de las investigaciones interdisciplinarias para desarrollar una comprensión de la relación entre personas y lugares. Como se demuestra a lo largo de este número, el estudio de los restos humanos requiere de un enfoque bioarqueológico holístico de la vida y la muerte que permita comprender las relaciones dinámicas que se desarrollaron entre las personas y sus respectivos entornos serranos.

*Palabras clave:* montañas; marginalidad; identidad

In his exploration of the paradoxes characterizing “remote areas,” social anthropologist Edwin Ardener (1987:41) underscores the importance of topography: “Mountains conventionally add to the ‘remoteness’ experience, but so very frequently do plains, forests, and rivers—so much so that the inhabitants of ‘unremote’ places sometimes say that they do not have ‘real’ mountains, plains, forests, or rivers—only something else, hills (say), woods, or streams.” However, Ardener (1987:49) also cautions that “‘remoteness’ is a specification, and a perception, from elsewhere, from an outside standpoint; but from inside the people have their own perceptions.” The tension between the perceived marginality of mountain landscapes and the realities of their human occupation is one that has infused much of the recent literature on this topic in anthropology, human geography, and cultural ecology.

Mountain landscapes are apparently still deeply paradoxical spaces for anthropologists and other social scientists. Bates and Lozny (2013:2), in their edited volume on cultural adaptations to mountain environments around the world, emphasize that despite their perceived status as “pristine” or “primeval” refugia, highland landscapes are historically contingent spaces, shaped by management practices ranging from road construction to mineral extraction. Similarly, Kuklina and Holland (2018) stress that the perception of particular mountainous areas as remote or inaccessible can be a relatively recent historical phenomenon, rooted in the organization of state-imposed infrastructure (e.g., “distance-demolishing technologies” [Scott 2009:xii]) rather than inherent or long-standing inaccessibility. Instead of being ecologically marginal spaces, mountains are important reservoirs of biocultural diversity (Stepp et al. 2005), and even harsh climatic conditions do not always prove a deterrent to upland occupations by local human groups (Walsh 2005).

Depending on the topographic criteria used to define mountains, geographers estimate that between 12% and 24% of all terrestrial land area outside Antarctica is composed of mountains (Kapos et al. 2000;

Körner et al. 2011; Meybeck et al. 2001). Given the prevalence of mountain landscapes and the frequency with which humans interact with mountains across the globe, anthropologists are increasingly aware of the need to better understand these landscapes.

The primacy of upland landscapes for structuring and mediating social relationships has led increasing anthropological attention to be paid to these environments, as evidenced by the popularity of Scott’s (2009) volume on the deliberate statelessness of highland communities in Southeast Asia, or the recent Institute for European and Mediterranean Archaeology (IEMA) conference at the University of Buffalo on the topic of the “Archaeology of Mountain Landscapes” (IEMA 2017). While bioarchaeologists have grown more invested in elucidating the relationships between people and the social and environmental landscapes they inhabit (Austin 2017; Becker 2019; Berger and Juengst 2017; White et al. 2009), there has not been an edited volume or journal issue devoted to the bioarchaeology of mountain landscapes. This absence has contributed to an incomplete understanding of human-environment interaction at a time when such approaches are growing in importance within the field (see Robbins Schug 2020). For example, mountains are among the regions most susceptible to climate change (Adler et al. 2019; Kohler et al. 2014). Understanding how people in the past navigated mountain landscapes can provide critical insights into the role of landscapes in affecting human behavior, add to emerging scholarship on migration and human mobility, and contribute to broader examinations of human responses to environmental change in the past and present.

The scholarship in this issue addresses three overarching themes in order to work toward building a new theoretical, methodological, and comparative framework to deepen our understanding of the biocultural context of mountain communities. First, mountain landscapes have been approached from a variety of theoretical perspectives. What are the most

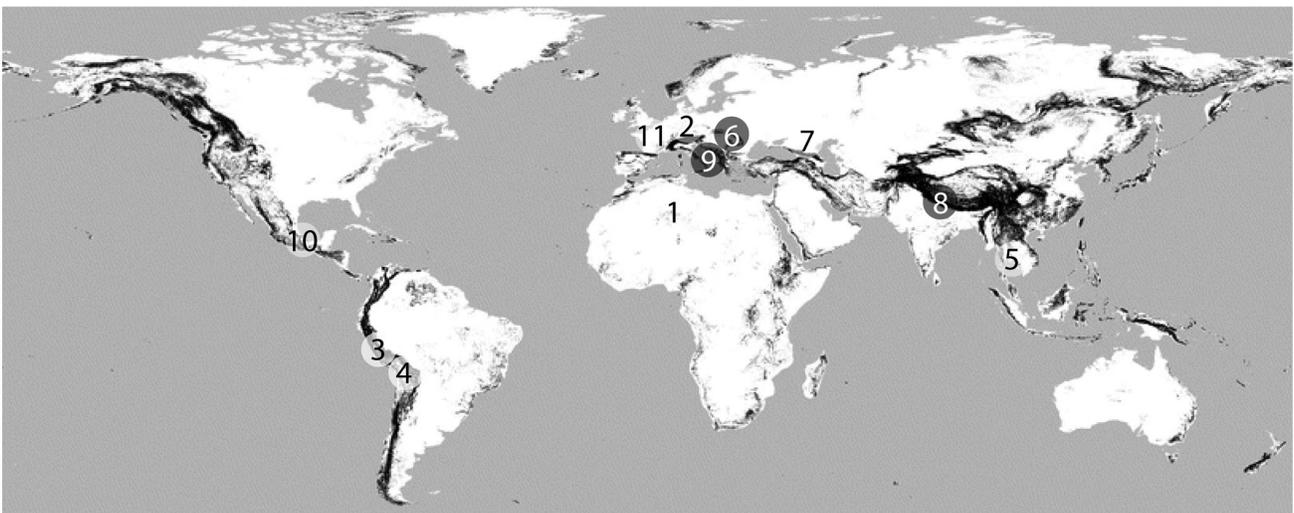
promising existing approaches and future developments in theorizing a bioarchaeology of mountain landscapes? For example, archaeological approaches to upland landscapes often focus on issues of mobility and marginality. In what ways do upland communities use and manipulate their local topographies, and in what ways are such groups constricted by mountain landscapes? Mountains can be arenas in which people contest and assert claims to territory, resources, and power. Visibility and accessibility within such landscapes affect communication, interaction, and engagement with other features of local social topographies. Second, what are the methodological opportunities and challenges for a bioarchaeology and mortuary archaeology of mountain landscapes? For example, the geological diversity of mountain landscapes can be an asset to isotopic studies of mobility, but limitations on sampling and accessibility may inhibit our ability to construct adequate base maps. How do new methods elucidate the lives and funerary practices of people buried in mountain landscapes? Finally, how do mountain communities compare with contemporaneous groups in the lowlands? Isolation must be demonstrated, rather than assumed. To understand highland adaptations, lifeways, and ideologies, mountain communities must be situated within a larger macroregion to identify the extent to which the landscape uniquely structured the social lives of upland communities.

This issue presents a novel approach to these questions by bringing together nuanced case studies from eastern Europe (Beck, Ciugudean, and Quinn), southeastern Europe (Zavodny), and central Asia (Eng and Aldenderfer) (Fig. 1, Table 1). In this

introduction we contextualize these case studies within broader archaeological approaches to mountainous landscapes across the globe. Recurring themes include the biocultural implications of mountains as channels of resource control, the use of mortuary ideology to unify or distinguish upland identities through mediating relationships between the living and the dead, and the importance of multiple lines of evidence—from paleoclimatic to textual to skeletal—for understanding the complex relationships between upland peoples and the landscapes they inhabit.

### 1. Approaching Mountain Landscapes from a Biocultural Perspective

There is no simple way to define mountains. Researchers in the natural sciences have relied upon ruggedness, the maximal elevation differences within a specified distance, to characterize mountains by their one common feature: steepness (Körner et al. 2011). Other factors, such as elevation, climate, and biodiversity, are unable to fully encapsulate the variability in mountain landscapes (Körner et al. 2011). While some researchers have tried to quantitatively classify landscapes based on elevation and ruggedness (e.g., Kapos et al. 2000), others have used ruggedness alone (e.g., Meybeck et al. 2001). Such parameters, however, may lead portions of foothills or less rugged mountain chains, such as the older Apuseni mountain range (Beck et al. 2020), to be excluded from this kind of classification. As a result, no globally accepted definition of mountains exists



**Figure 1.** Map of mountainous landscapes across the globe (*black*). Examples of bioarchaeological research in mountain landscapes are marked on the map with numbers that correspond to the entries in Table 1. Case studies from this special issue are surrounded by gray circles: (6) Beck et al., (8) Eng and Aldenderfer, (9) Zavodny (based on Körner et al. 2011:Figure 1).

**Table 1.** Mountainous landscapes referenced in bioarchaeological case studies discussed in text. Bolded numbers and asterisked references denote case studies introduced in this thematic issue.

Number	Mountainous Landscape	Region	Research Topics	References
1	Acacus Mountains	North Africa	Isotopic analysis of mobility	Tafari et al. 2006
2	Alps (Central)	Western Europe	Isotopic analysis of mobility	Holden 2003; Müller et al. 2003
3	Andes (Central)	South America	Isotopic analysis of mobility	Tung and Knudson 2011;
4	Andes (South Central)	South America	Analyses of osteoarthritis; isotopic analysis of mobility; analyses of artificial cranial deformation, nonmetric traits, and demographic profiles	Becker 2019; Blom et al. 1998; Knudson et al. 2005
5	Cardamom Mountains	Southeast Asia	Mortuary archaeology, radiocarbon dating	Beavan et al. 2012
6	Carpathians (Western)	Eastern Europe	Mortuary archaeology, bioarchaeological analysis of mortuary treatment	Beck et al. 2020*
7	Caucasus (Greater)	Eurasia	Isotopic analysis of diet	Knipper et al. 2018
8	Himalayan Arc	Central Asia	Genomic, isotopic, bioarchaeological, anthropological, and archaeological analyses	Eng and Aldenderfer 2017, 2020*
9	Lika region of Croatia	Southeastern Europe	Mortuary archaeology	Zavodny 2020*
10	Sierra Madre (South)	Mesoamerica	Isotopic analysis of mobility	Price et al. 2015
11	Vosges Mountains	Western Europe	Isotopic analysis of mobility	Bentley et al. 2003

(Gerrard 1990; Körner et al. 2011; Smith and Mark 2003).

As anthropologists, we argue that mountains are not only defined by their physical characteristics; they are also understood as socially mediated cultural landscapes. Consequently, it is not possible to draw strict definitional boundaries between mountainous and non-mountainous landscapes. We acknowledge that complex ontologies within past societies could have defined such landscapes in myriad ways (Smith and Mark 2003). Here, we employ a more holistic conceptualization of mountain landscapes as spaces with topographic ruggedness where human behavior and interaction are shaped by the physiological and environmental complexity the landscapes encompass.

The common conceptualization of mountains as marginal areas is partially related to the very real physiological constraints on human high-altitude occupation. High-altitude (> 2,500 m above sea level) mountainous landscapes present significant obstacles to human habitation, ranging from decreased levels of oxygen (hypoxia) to weather extremes, high levels of solar radiation, and the low primary productivity of local ecologies (Rademaker et al. 2014; Aldenderfer 2019). Such harsh environments require major genetic, physiological, and cultural adaptations in the human groups occupying these landscapes. Research focused on the populations of three areas—the Tibetan Plateau, the Ethiopian Plateau, and the

Andean Altiplano—has revealed measurable differences in the hematological, circulatory, and respiratory features of high-altitude groups (Beall 2001, 2006; Beall et al. 2001; Bigham et al. 2013). Cultural adaptations include the use of particular kinds of technology and material culture, as well as residential, resource, and subsistence strategies that allow human groups to overcome the problems of hypoxia, seasonality, and cold stress with which they are confronted within high-altitude environments (Aldenderfer 2006).

Despite the undisputed harshness of life at high altitudes, archaeological research demonstrates that humans have deliberately exploited mountainous landscapes for thousands of years. The foothills of the North Caucasus have been occupied since the Middle Paleolithic, between 70,000 and 30,000 years B.P. (Skinner et al. 2005), while the foothills of the South Caucasus have been inhabited since the Upper Paleolithic, some 33,000 to 27,000 years BP (Bar-Yosef et al. 2011), with occasional evidence of higher-altitude occupations, as at the site of Hovk 1 Cave in Armenia (Pinhasi et al. 2008; Sagona 2017). Recent research has extended the human occupation of the Tibetan Plateau, one of the highest human-occupied environments on Earth, from ~12,700 years B.P. (Meyer et al. 2017) to at least 30,000 to 40,000 years B.P. (Zhang et al. 2018). The earliest archaeological sites in the high Andes of Peru and Bolivia have been dated to over 12,000 years B.P., though widespread and

year-round occupations did not occur until several thousand years later (Capriles et al. 2016; Rademaker et al. 2014).

Bioarchaeology has the potential to make major contributions to debates about mountain communities through the use of a biocultural and embodied perspective. By combining skeletal evidence with mortuary archaeology, bioarchaeology allows us to embed our understandings of mountain communities within explicit discussions of human choice and agency in order to explore how, when, and why human groups occupy highland areas.

## 2. Theorizing a Bioarchaeology of Mountain Landscapes through Interrogating Marginality

Mountain landscapes are commonly framed as socially and environmentally marginal spaces, as evidenced through the vocabulary used to describe them: upland regions are “remote” (Kuklina and Holland 2018), “inaccessible” (Hammond 1976), “low-yielding” (Guillet 1983), “risky” (Walsh 2005), “on the fringe” (Walsh 2005), “rugged” (Salomon 2018), and “forbidding” (Cole and Wolf 1974) areas characterized by extreme “isolation” (Galaty 2013). This reputation often has long-lasting effects; as Drummond (2018) notes, the economic and historical marginality of highland areas often has led to delays in toponymic recording, so that in addition to being viewed as inaccessible, many of these areas remained officially nameless until relatively recently.

As a result of the presumed marginality of upland environments, archaeological approaches to “peripheral” landscapes are particularly helpful for guiding the development of bioarchaeological understandings of mountain communities. Much of the vocabulary used to describe peripheral regions is rooted in disciplinary adaptations of world systems theory (Wallerstein 1974), which have applied various iterations of core-periphery frameworks to the prehistoric past (Kardulias and Hall 2008; Peregrine 2000; Sherratt 1993a, 1993b). The overarching goal of such analyses entails situating social and economic networks within a broader regional or extra-regional core-periphery framework that structures interactions at a variety of scales. Many of these core-periphery relationships are at least partially defined by environmental factors. In his discussion of the intersection between physical and social geographies, Hall (2000:251) specifies that “the interaction between valley people and hill people is perhaps the earliest form of world-system formation,” emphasizing that ecological borders, such as those between the steppe and

arable lands or between plains and mountains, are key areas for studying the social tensions and transformations precipitated by intergroup interactions. Such approaches are not without their detractors (e.g., Harding 2013; Stein 2002). However, what is most relevant for our purposes is that mountains are often assumed to be marginal areas, and useful archaeological interrogations of the concepts of “margins” and “peripheries” have been developed in response to early applications of world systems theory.

Such interventions began during the 1990s, with Sherratt (1993b:250) pointing to marginal regions in Bronze Age Europe as areas that were “culturally transformed, but structurally independent” of Near Eastern urban centers and their peripheries. He highlights the independence and agency of marginal communities in picking and choosing elements of urban society—be they technological, political, or ideological—to reinterpret in new social contexts. This foregrounding of choice and agency on part of actors on the margins is also encapsulated by the notion of “negotiated peripherality” (Kardulias 2007; Morris 1996), whereby actors in peripheral zones are not passive recipients in thrall to external forces but rather “active players” (Kardulias 2007:76) in intergroup interactions. These framings are echoed by other work that highlights the status of “peripheries” (Stein 2002) and “frontiers” (K. G. Lightfoot and Martinez 1995) as productive areas of cross-cultural contact, where microscalar analyses of human agency and macroscalar understandings of broader socioeconomic systems both affect the outcome of interactions and events.

Just as mountains are assumed to be politically marginal spaces, they are also assumed to be environmentally hazardous. As Walsh (2005:298–299) argues, “There is little doubt that mountain environments are risky . . . and many of these risks increase with altitude.” Researchers working with contemporary mountain communities emphasize that life in such landscapes is difficult due to the demands of making a living in a harsh and unpredictable environment, though it is worth noting that these characterizations are based on high altitudes in temperate zones where climate and ecology are subject to large-scale seasonal changes (Cole and Wolf 1974; Schon and Galaty 2006). Mountain communities cope with environmental challenges through a variety of cultural adaptations ranging from seasonal migration, to the development of a range of agropastoral strategies, to the diversification of productive activities and their scheduling (Lozny 2013:396). As Halstead (1990) demonstrates in his study of transhumant pastoralism in the Pindhus Mountains of northern Greece,

such strategies are often dependent on complex interconnections that link those living at high altitudes to other communities. In the Pindhus, transhumant pastoralism was underlain by a variety of overlapping strategies, including access to both extensive summer and winter pasture, reliable means of converting animals into agricultural staples, participation in overland trade networks allowing for a degree of economic specialization, and irrigated summer crops that could be used to buffer risks in the winter months. Halstead's work reveals that pastoralists in the Pindhus were not relics of a stubborn prehistoric self-sufficiency but were instead deeply connected to modern economic systems of land management and exchange.

Archaeological work in Alpine France likewise highlights the importance of historical context for understanding how environmental risk was perceived in mountain landscapes in the past. Through a program of combined survey and test excavations, Walsh (2005:289) demonstrates that human occupations of the Faravel Plateau "waxed and waned" in patterns that did not correspond predictably to regional climatic shifts. During the Roman period, when climatic conditions were optimal, the highlands were relatively empty. During the medieval and post-medieval periods, which coincided with the climatic deterioration wrought by the Little Ice Age, these alpine environments were at their busiest. Such patterns are the result of culturally and historically mediated perceptions of risk, folded into larger social, economic, and political frameworks. Walsh argues that people did not avoid the highlands during the Roman period because the mountains were viewed as economically or ecologically marginal spaces, but instead because patterns of land occupation were shaped by Roman policies and attitudes toward land management, territorial boundaries, and population control.

While the Romans provide one example of a larger imperial power acting to keep people *out* of the mountains, there are many documented upland communities whose presence *within* mountain landscapes is rooted in resistance to larger systems of control. Scott (2009), in particular, reads the continued occupation of the Zomia—the massive expanse of the Southeast Asian Massif which spans ten countries—as an explicit response to the expanding power of lowland states and empires: "Virtually everything about these people's livelihood, social organization, ideologies, and (more controversially) even their largely oral cultures, can be read as strategic positionings designed to keep the state at arm's length" (2009:x). Schon and Galaty (2006) highlight the deployment of similar strategies in the Shala Valley of

northern Albania, one of the last refugia of tribal societies in twentieth-century Europe. Shala Valley communities have occupied this upland region since the fifteenth century in response to both internal and external factors, including changes in settlement patterns and land use within Albania and the ever-encroaching influence of the Ottoman Empire. Galaty (2013) argues that occupants of the Shala Valley took advantage of the opportunity for autonomy afforded by the relative isolation and inaccessibility of the mountain landscape, maintaining their negotiated peripherality through a program of violence, feuding, and warfare, supplemented by intermittent political interaction with the larger powers that surrounded them. In this case, while politics were local, decisions and alliances were still embedded within an understanding of external political frameworks: here, "'isolation' was not so much a condition to be endured, but was rather a strategy engaged, one used to fend off conquest and incorporation by external powers and preserve a degree of autonomy" (Galaty 2013:145).

Even a cursory survey of the existing literature devoted to mountain communities thus demonstrates that marginality is relative, and careful consideration of cultural and historical context is necessary before characterizing highland spaces as the wastelands of "freezing privation" often imagined by outsiders, as is the case in the Andes (Salomon 2018:24). Importantly, bioarchaeology can make key contributions to theorizing marginality, whether social or environmental, in mountain landscapes. Many of the critiques of world systems theory hinge on problems of scale and focus (i.e., Harding 2013:385), with archaeologists resisting sweeping, top-down economic explanations of cultural transformations that treat peripheral communities as passive recipients of change fomented by external systems. Such critiques call for more fine-grained, microscale examinations of how outside influences are received, reconfigured, or resisted at the level of individuals and communities. As K. G. Lightfoot and Martinez (1995:483–485) emphasize in their research on fur-trading in western North America, the "backgrounds, interests and motivations" of individuals inhabiting frontier zones vary as a result of ethnic, socioeconomic, and gendered identities, creating a rich potential for individuals and factions to participate in intercultural interactions to further their own agendas. Tica (2019) likewise highlights the dynamic fluidity of social relations at borders and frontiers, while Tica and Martin's (2019) geographically and chronologically wide-ranging edited volume provides a demonstration of the ways in which bioarchaeology can investigate areas that are either spatially or symbolically

liminal. Bioarchaeology is well positioned to explore these marginal dynamics through investigating how dimensions of social identity (e.g., age, gender, class) and lived experience (e.g., disease, violence, stress) affect how intergroup interactions are received at the level of individuals (Quinn and Beck 2016).

In addition to providing a more fine-grained understanding of the social dynamics of the “periphery,” bioarchaeology can also make unique contributions to theories of marginality through the investigation of social connectivity and environmental risk from an embodied perspective. Lived experiences of travel, intercommunity relationships, resource consumption, and physiological stress can become “literally incorporated” into human skeletal remains (*sensu* Krieger 2005). All of these experiences and the individual and/or communal choices that they entail—deciding where to move, what to eat and drink, what kinds of labor to undertake, and whom to interact with—are important considerations for comprehending the biosocial context of marginal landscapes. As we outline in the next section, recent techniques in archaeological science, ranging from isotopic analyses of mobility and diet to ancient DNA (aDNA) studies of kinship and relatedness, can be combined with traditional osteological examinations of age, sex, ancestry, disease, and stress to deepen our understanding of the ways in which marginality is incarnated or resisted in mountain communities.

Finally, the mortuary practices of mountain communities have the potential to illuminate the ways in which distinct upland identities are maintained, negotiated, and communicated to others (Parker Pearson 1995). All contributions to this issue highlight the ways in which the treatment and placement of the dead can convey particular messages about resource ownership (Beck, Ciugudean, and Quinn), territorial control (Zavodny), or regional cultural identity (Eng and Aldenderfer). Beavan et al. (2012) report similar practices for the Cardamom Mountains of Cambodia in the fourteenth through sixteenth centuries A.D. Archaeological research in this region has documented multiple mortuary sites on mountain cliffs and ledges, where the bones of the dead were deposited in imported ceramic vessels that were then placed in coffins carved out of local wood. These animistic upland funerary practices were distinct from the predominant mortuary rituals of the lowland Khmer Empire and highlight the strategies by which people “whose lives were contemporary with, yet a world apart, from Angkor” maintained distinct identities in both life and death (Beavan et al. 2012:20). Theoretical attention to the ways in which upland

mortuary practices act as forums in which community identities are affirmed or contested provides greater anthropological insight into the ways in which mountain communities distinguished themselves from, or incorporated themselves into, wider social networks.

### 3. Methodological Opportunities and Challenges of Mountain Landscapes

While bioarchaeology has the ability to contribute to the development of new theoretical approaches to mountain landscapes through a focus on the embodied dimensions of marginality and identity, expanding methodological toolkits have also increased the scope of osteoarchaeological research. New developments in bioarchaeological and archaeological science make it possible to investigate multiple aspects of lived experience from a biocultural perspective, including mobility, diet, disease, stress, and kinship.

The geological and topographical complexity of mountains makes them ideal contexts in which to use isotopic analyses of strontium and oxygen to examine patterns of individual and regional mobility. These techniques have been profitably employed in a series of studies comparing upland and lowland landscapes in South America (Knudson et al. 2005; Toyne et al. 2014; Tung and Knudson 2011; White et al. 2009), North America (Price et al. 2015), Europe (Bentley et al. 2003), and North Africa (Tafari et al. 2006). There is also a rich and expanding literature that uses such techniques to document animal mobility, particularly in areas where questions persist about the origins and organization of pastoral practices (Chazin 2018; Chazin et al. 2019; see Ventresca Miller and Makarewicz 2018 for a summary of recent research). Because oxygen isotope ratios are influenced by many environmental factors—including latitude, altitude, climate, precipitation levels, and seasonality (Knudson 2009; E. Lightfoot and O’Connell 2016)—many of the most promising new studies combine oxygen isotope analysis with a reliance on geological distinctions between mountains and lowlands, as materialized in different ranges of strontium isotope ratios, in order to identify migrants and locals. Indeed, Bentley’s (2006) foundational and highly cited overview of strontium applications in archaeology itself uses a case study from a mountainous region, the Upper Rhine Valley of Germany, to illuminate the potential of the strontium isotopic approach for identifying migrants in geologically and topographically variable landscapes.

Strategies that sample multiple teeth from a single skeleton to reconstruct patterns of mobility over the course of individual life histories (Hrnčič and Laffoon 2019) have particular potential for deepening our understanding of lived experience in mountain environments. These methods take advantage of the developmentally staggered formation times of the permanent teeth in order to compare strontium isotope ratios that were taken up at different times during an individual's life. One well-publicized demonstration of the utility of these fine-grained strategies is the interdisciplinary approach to tracing the lifetime mobility of "Ötzi," or the "Iceman," the famously well preserved Late Neolithic individual found in the Ötztal Alps along the border of Italy and Austria. In this case, researchers used a multidisciplinary toolkit including strontium and oxygen isotopes sampled from a variety of tissues to demonstrate that this individual's lifetime movements were likely restricted to a 60 km radius of where his body was found (Holden 2003; Müller et al. 2003). Importantly, Stojanowski and Duncan (2015) suggest that these kinds of deeply textured reconstructions of individual life histories are one way to attract public attention to archaeological research, an observation that has been echoed by other scholars focused on osteobiographical approaches to the human past (e.g., Boutin and Callahan 2019; Hosek and Robb 2019; Robb 2009; Robb et al. 2019).

Recent advances in aDNA research provide another avenue for understanding migration and interaction in mountain landscapes. For example, paleogenetic studies have documented large-scale patterns of prehistoric migration in the study of European prehistory (e.g., Haak et al. 2015; Kristiansen et al. 2017). At the same time, research in late prehistoric central Europe has demonstrated the value of archaeogenetic studies for understanding patterning in kinship, mobility, and social relations at a more localized scale. Mittnik et al. (2019) examine Bronze Age inheritance and inequality in southern Germany, bringing together aDNA, mortuary archaeology, and isotopic analysis to elucidate the links between kinship and control over metal resources over the course of the Neolithic to Bronze Age transition. Knipper et al. (2017) employ similar methods—embedding local paleogenetic and isotopic analyses within a well-established regional archaeology—to explore patterning in patrilocality and exogamy in Bell Beaker Complex and Early Bronze Age southern Bavaria. Such interdisciplinary initiatives highlight the potential of aDNA approaches for informing biocultural research design in mountain landscapes. As Walsh (2005:300) indicates, the presence of larger numbers of people is one strategy that can be used to

reduce risk in mountain environments. Relationships between individuals and communities that occupied mountain landscapes and new migrant communities are one kind of interaction that could be identified through aDNA research.

In addition to providing a deeper understanding of mobility at the individual and community level, isotopic approaches are also useful for understanding other distinctions in lived experience between highland and lowland groups, particularly when it comes to subsistence. Knipper et al. (2018), for example, explicitly compare the diets of groups exploiting the Caucasus uplands and groups exploiting the adjacent humid steppe in their diachronic exploration of the Russian North Caucasus region. Here, isotopic analysis of carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotopes preserved in the human bone collagen of "mountain dwellers and valley residents" (135), combined with GIS analyses of land type and use, revealed dietary shifts that appear to have been linked to changes in settlement patterns and subsistence practices. In this case, the explicit collection and comparison of samples from a variety of habitats and time periods (Knipper et al. 2018:Table 9.1) helped to provide a detailed cultural and ecological framework within which to examine the diet of upland communities.

As the aforementioned studies demonstrate, biomolecular analyses can provide insight into differences in diet, mobility, and connectivity between upland and lowland communities. However, standard skeletal indicators of dietary or physiological stress are also important for reconstructing mountain lifeways. Eng and Aldenderfer's bioarchaeological research in the Himalayas of Nepal offers a useful template for exploring multiple aspects of lived experience in the highlands. Through examining patterns of dental disease and childhood stress markers in a sample of three sites in the Mustang District of Nepal, the authors outline evidence for intersite differences in oral health in tandem with low frequencies of stress markers across all samples, identifying a "complex picture of adaptive responses among high altitude communities" (2017:11) whose lifeways are adapted to, but not determined by, their environment.

Traditional forms of skeletal analysis can be embedded within an understanding of archaeological context to provide deep insights into patterns of disease, labor, ritual practices, and ethnicity in mountain communities. For example, in their diachronic study of influence and colonization within the Tiwanaku polity, Blom et al. (1998) assess the frequency of nonmetric cranial, dental, and skeletal traits, as well as patterning in demographic profiles and artificial cranial deformation styles to provide a

bioarchaeological test of archaeological models of interaction between the highland Tiwanaku heartland and local groups from the lowlands of the Moquegua Valley. As Torres-Rouff (2002) emphasizes, practices such as artificial cranial deformation can be used as a form of physical and symbolic demarcation or as a means of signaling and materializing social ties to other communities. Such somatic manifestations of social practice could be used to denote various social identities—whether religious, ethnic, or status-related—within mountain groups.

While multiple social identities can thus be read through treating the body as a form of material culture (Sofaer 2006), human skeletal remains also encode unconscious information about the daily practices of past societies. In her investigation of labor practices in the Tiwanaku state, Becker (2019) profitably borrows from Ingold's notion of "taskscape" to explore the ways in which human skeletal remains preserve a record of habitual activities in the past. Through comparing the frequency and anatomical patterning of osteoarthritis in a large sample of individuals from the highland Tiwanaku state core and a lower-elevation colony, this research identifies regional differences in activity patterns between the core and colony, as well as gendered and occupational differences in labor practices at varying scales. Such studies provide valuable models for bioarchaeologists tasked with understanding the social lives of mountain communities.

While methodological developments in bioarchaeology thus demonstrate the novel insights and rich detail that analyses of human remains can provide into the experiences of individuals living in mountain landscapes, significant challenges remain. As Beavan et al. (2012:1) indicate, archaeological research focused on upland cultures is faced with particular obstacles, including issues of archaeological preservation, accessibility of samples, and researcher access to sites. In their paper in this issue, Eng and Aldenderfer likewise point to the potential need for lowland-adapted researchers to acclimate physically to high-altitude study sites and the limited laboratory infrastructure available in many highland regions. Also problematic is the concentration of salvage archaeological work in lowlands due to the predominance of infrastructural projects in these areas; the highlands often lack the rich cultural and historical backdrop such an existing record can provide (see Beck, Ciugudean, and Quinn's paper in this issue). Research-focused excavations are thus often a prerequisite for understanding mountain communities from a biocultural perspective, but such research programs come with a particular set of financial constraints and ethical considerations, including

questions about when and why it is appropriate to embark on new excavation campaigns. However, without targeted programs of upland bioarchaeological research, the spatial distribution of archaeological research will produce biased samples which exclude mountain communities as a result of their remoteness in modern infrastructural contexts. The geological and topographic complexity of mountains also requires that we increase the quantity of samples used to create baseline maps of bioavailable strontium when compared with less geologically complex landscapes. Such challenges require careful consideration moving forward and underscore the importance of this special issue for developing clear and effective strategies for mountain bioarchaeological research.

#### 4. A Global Bioarchaeology of Mountain Landscapes

The contributions to this thematic issue highlight the emerging potential for a global bioarchaeology of mountain landscapes. Zavodny's investigation of mortuary practices in Bronze and Iron Age Lika, Croatia, demonstrates the utility of incorporating previously excavated data into new theoretical frameworks. Her research uses a novel and systematic examination of mortuary evidence—including grave goods, body treatment, and cemetery type—to counter culture-historical narratives that portray the Iapodian culture as appearing fully formed in the region during the Late Bronze Age. Her work shows that the emergence of a coherent Iapodian identity was a complex process that played out differently in different valleys, relative to localized distinctions in geography that may have been linked to the ability to control and channel exchange networks. Zavodny highlights the ways in which treating mortuary components as a "discrete comparative package" can assist archaeologists and bioarchaeologists untangling the complex patterns of interaction and integration that permeate the social geography of mountain regions.

Similarly, Eng and Aldenderfer use genetic analyses to unpack the "mosaic" population history of highland Nepal, arguing that this region has been a nexus for intergroup interaction and movement for long periods of time. Their archaeogenetic evidence provides new data against which to evaluate long-standing historical and archaeological claims about the human inhabitation of the area, leading them to forcefully underscore that "a modern perception of the 'remoteness' of these valleys should not be projected uncritically into the past" (Eng and Aldenderfer 2020:143).

Importantly, Eng and Aldenderfer emphasize that different lines of evidence tell different, and incomplete, stories about the human past. It is only through bringing together archaeological, bioarchaeological, genomic, ethnohistoric, and paleo-environmental evidence in a comparative framework that a holistic and detailed picture of migration and biocultural adaptation begins to materialize for Himalayan prehistory.

Our own research in Transylvania, presented in this issue, has begun to explore the degree to which upland mortuary practices during the Early Bronze Age—which incorporated different forms of mortuary treatment and structural elements than lowland tombs—may have been one way local communities signaled a distinct cultural and ethnic identity (Beck, Ciugudean, and Quinn). Here, our explicitly biocultural approach will provide a fine-grained anthropological framework for understanding the local impact of the “massive migrations” that have been argued to characterize European late prehistory (Haak et al. 2015). In this region, evaluating how lowland and upland communities maintained or negotiated distinct identities through mortuary practice has important implications for examining how “peripheral” regions responded to the larger-scale social transformations that characterized the European third millennium B.C. (Harris et al. 2013).

The papers in this issue also demonstrate the multi-scalar potential of bioarchaeological approaches to mountain landscapes. Our case study in Transylvania is locally focused, comparing the bioarchaeological and mortuary evidence from two sites that could have been accessed in a day’s journey on foot in prehistory. This local scale allows us to examine the ways in which mortuary practices may have acted as a venue for signaling differences in community identity, even between groups located in close geographic proximity to one another. Zavodny tacks back and forth between the local scale and the regional scale, situating her analysis of the important center of Gacka within an examination of other Late Bronze Age sites in the *Caput Adriae*, assessing how patterning in the material culture incorporated into mortuary practices can provide new information about patterns of exchange and resource control. Eng and Aldenderfer pursue a regional approach, drawing upon biocultural evidence from six sites in the Mustang and Manang districts of Nepal to explore variation in migration, adaptation, and lived experience over space, time, and altitude.

Finally, all of the studies included in this issue emphasize the utility of interdisciplinary approaches that incorporate multiple lines of evidence and compare bioarchaeological data from the human skeleton

to data drawn from archaeological, historical, and paleoclimatic records. Whether examining resource access and control (Beck, Ciugudean, and Quinn), channels of exchange (Zavodny), or high-altitude adaptation (Eng and Aldenderfer), the research presented in this issue is careful to compare not only lowland and highland communities but also the results from a range of studies and specialities. That diverse lines of evidence are consistently incorporated into mountain bioarchaeological research from a wide variety of regions and time periods suggests that collaborative, interdisciplinary projects that involve multiple anthropological subfields and academic disciplines will provide key insights into the lives of mountain communities moving forward.

## 5. Conclusions

As Lozny (2013:395) emphasizes, social scientists have taken two essential approaches to mountain landscapes: “(1) the comparison of the adaptation of similar cultures or similar technological systems to different environments, and (2) the comparison of the adaptations of different cultures to similar ecosystems.” The tension between seeking human universals and highlighting cultural particularity is not new within anthropology, but bioarchaeology is capable of contributing to both dimensions in an anthropological study of mountain communities through framing new theoretical and methodological insights within an explicitly comparative approach.

Bioarchaeology and mortuary archaeology offer unique theoretical contributions to an anthropological understanding of mountain communities. First, both specializations provide an opportunity to assess marginality from an explicitly biocultural perspective. By combining isotopic, aDNA, and morphometric approaches to the analysis of human skeletal remains, while embedding such investigations in a nuanced understanding of archaeological and cultural context, bioarchaeologists can examine connectivity and adaptation through a biosocial lens. Second, bioarchaeology bridges biological anthropology’s emphasis on the somatic with an archaeological focus on the long term. This dual approach allows for the development of an embodied understanding of “risky” or “remote” environments and allows anthropologists to explore how such landscapes shape and are shaped by human action over time. As the articles in this issue demonstrate, such examinations can be undertaken at a variety of scales, ranging from the local (Beck, Ciugudean, and Quinn) to the regional (Eng and Aldenderfer; Zavodny). Finally, the unique

relationship between skeletal and mortuary evidence (Quinn and Beck 2016) permits a focus on community identity as communicated through mortuary practice. Examining how the “lived” identities and experiences materialized in human remains intersect with the “performed” identities reified through funerary treatment allows for a holistic understanding of life and death in mountain landscapes.

The methodological strategies and considerations outlined in this issue highlight the new opportunities afforded by recent developments in archaeological science and the necessity of framing such approaches within an appropriate research design. Insights into the lives and deaths of individuals in mountain communities are generated both through the use of multiple lines of evidence and through bioarchaeological participation in truly interdisciplinary projects that incorporate the perspectives of multiple disciplines. The research described here includes work from bioarchaeologists, archaeologists, biomolecular anthropologists, ethnographers, cultural ecologists, and climate scientists, and the knowledge and contributions of each discipline cannot be siloed. Multidisciplinary collaborations like the High Himalayas Archaeological Research Project (Eng and Aldenderfer) provide a model for this kind of research moving forward.

Finally, the research undertaken in this issue underscores that mountain communities cannot be considered in isolation. Both ethnographic (Cole and Wolf 1974; Galaty 2013; Schon and Galaty 2006) and archaeological research (Beavan et al. 2012; Walsh 2005) reveal the extent to which the dynamics of upland living are affected and structured by events in the lowlands. That highland and lowland communities are often tightly socially and politically interlinked, however does not mean that mountain communities are merely “passive object[s] to be manipulated by outside forces” (Harding 2013:385). Instead, a recurring motif in anthropological examinations of these landscapes is the extent to which upland occupations balance participation in larger systems with human agency in response to economic (Halstead 1990), political (Scott 2009), or social (Walsh 2005) factors. It is therefore important that bioarchaeological investigations of these communities are attentive to patterns of both reciprocity with and resistance to lowland agendas. Although mountain communities may be conceived of as socially and environmentally peripheral, we must remember that this peripherality is often intentional and negotiated (Kardulias 2007; Morris 1996).

Understanding the interplay between social practice and the environment is a critical avenue for

bioarchaeological research. The risks and opportunities provided by the topographic, geological, and ecological characteristics of mountain landscapes are part of the daily lives and ideological systems of communities that inhabit them. The articles in this issue demonstrate that through examining how identity and lived experience shape social dynamics in “remote” regions and investigating marginality from an embodied perspective, bioarchaeology can provide unparalleled insight into living and dying in mountain landscapes.

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